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We would like to thank Prof. Dr. Muzaffer ELMAS, Rector of Sakarya University for his support of organizing these conferences.

We also would like to thank Prof. Dr. Robert DOYLE from Harvard University for his collabration and support. Without his efforts and help, this conference would not be possible at Harvard University. We would also like to thank to Harvard University for hosting us here during three days.

Also we would like to thank our distinguished guests, keynote speakers for their collaborations and contributions for the success of these conferences.

And finally, we would like to thank to all of our participants who have presented their academic works in ISTEC 2017, Berlin, Germany and at Harvard University, Boston, USA.

We would like to sincerely thank all of you for coming, presenting, and joining in the academic activities.

We would also like to thank all of those who have contributed to the reviewing process of ISTEC conference papers, which will be also published in TOJSAT.

Thank you

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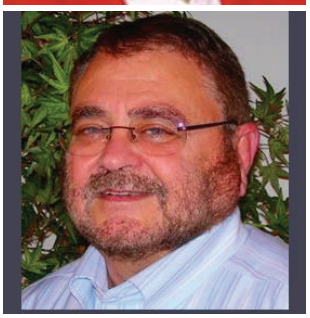

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TABLE OF CONTENT

4. SANAYI DEVRIMI ILE BIRLIKTE BILIŞIM TEKNOLOJILERININ BIREYIN GÜNDELIK YAŞAM PRATIKLERINE ETKISI 1
Ece BABAN, Serra ORKAN, Sinan ORKAN

A CASE STUDY OF AN ANAEROBİC DIGESTER STRUCTURE 2
Aykut EROL, Zülküf KAYA, Erdal UNCUOĞLU, Hacı Bekir KARA

A CLASS OF SOME FUZZY CONTINUITY 8
Ahu AÇIKGÖZ

A COMPERATIVE STUDY OF SiC REINFORCEMENT EFFECT ON MECHANICAL AND PHYSICAL PROPERTIES OF Al2024-SiC AND Al6061-SiC COMPOSITES PRODUCED BY POWDER METALLURGY METHOD 9
Kadir GUNDOGAN, Dilan KOKSAL

A NEW HYBRID DECISION MAKING MODEL TO OPTIMIZE MACHINING OPERATIONS 17
Mehmet Alper SOFUOĞLU

A QUALITATIVE STUDY ON SONG TEACHING TO PRIMARY SCHOOL CHILDREN: THE SAMPLE OF ARTVIN 21
Ömür Bütev DOLĞUN

A STUDY ON CORROSION BEHAVIOUR OF DIFFERENT AL MATRIX COMPOSITES 22
Kadir GUNDOGAN, Dilan KOKSAL, Alperen Refik Bilal ÖZSARI

A STUDY ON SEVERAL TYPES OF CONTINUITIES IN FUZZY SETTINGS **22**
Ahu AÇIKGÖZ, Ferhat ESENBEL 29

A STUDY ON THE REDUCTION OF BLACK-CARBON USING EMULSION FUEL IN A MARINE DIESEL ENGINE
Changhee LEE, Hyeonku PARK 30

A WORKING PROTOTYPE OF THE EVALUATION SYSTEM FOR BUILDING FACADE MODULES BASED ON COLORFUL SEMI-TRANSPARENT SOLAR CELLS
Seung-Hoon HAN 31

Abrasive Flow Machining of TI-6AL-4V
Kursad GOV, Omer EYERCİOGLU 32

ADIYAMAN İLİN'DE KIRSAL TURİZM POTANSİYELİ VE KULLANMA İMKANLARI
Abdulkadir GÜZEL, Mehmet ÖZCANLI, Mehmet AKBIYIK 40

ADOPTION OF PRECISION AGRICULTURE TECHNOLOGIES IN DEVELOPED AND DEVELOPING COUNTRIES
Sait M. SAY, Muharrem KESKİN, Mustafa SEHRI, Yunus Emre SEKERLI 41

ADSORPTION OF SUNSET YELLOW FCF ONTO MCM-41
Fatma OGUZ ERDOGAN, Taner ERDOGAN 50

AHİLİK KURUMU VE SOSYAL İNOVASYON İLİŞKİSİ
Sabiha ANNAÇ GÖV 55

ALÜMİNYUM ALAŞIMLARININ SÜRTÜNME KARIŞTIRMA NOKTA KAYNAĞI
Yahya BOZKURT, Ersin TOPTAŞ, Sezgin ERSOY 61

AN ERROR ANALYSIS OF AUTOMATIC CONVERSION OF PHONETIC ALPHABET FOR ENGLISH USING SEQUENCE-TO-SEQUENCE MODEL 81
Kong Joo LEE

AN EXAMPLE OF IMMIGRATION'S IMPACT ON THE LINGUISTIC LANDSCAPE OF THE CITY: ARABIC SIGNS IN ŞANLIURFA 90
Veysi GÜNAL

 Copyright © International Science and Technology Conference (ISTEC)

AN EXPERIMENTAL AND COMPUTATIONAL STUDY ON THE SYNTHESIS OF 1-(2-PHENYL-2-(2-PHENYLHYDRAZINEYLIDENE)ETHYL)-1H-IMIDAZOLE 91

Taner ERDOGAN, Fatma Oguz ERDOGAN

AN INVESTIGATION ON VIBRATIONAL ANALYSIS OF CANTILEVER BEAMS BASED ON FIBER BREAKS IN UNIDIRECTIONAL FIBER COMPOSITES 98

Ersin TOPTAŞ, Sezgin ERSOY, Garip GENÇ, Yahya BOZKURT, Nihat AKKUŞ, İshak ERTUĞRUL

ANTIMICROBIAL PROPERTIES of WOOD WATER OBTAINED by A HIGH FREQUENCY VACUUM DRYING METHOD 104

Mehmet BUDAKÇI, Murat AYDIN, Tülin AŞKUN, Pınar GÜNER

ASSESSMENT OF THE ANTIMICROBIAL, ANTIOXIDANT AND CYTOTOXIC ACTIVITIES OF THE WILD EDIBLE MUSHROOM PLEUROTUS ERYNGII FROM HAKKARI, TURKEY 109

Hİlal ACAY, Semra KAÇAR, Abdurrahman DÜNDAR, Cumali KESKİN

ASYMPTOTICALLY $\boldsymbol{\alpha fp(I)}$-LACUNARY EQUIVALENT SEQUENCES SPACES 110

Tunay BİLGİN

AŞILAMA MODİFİKASYON YÖNTEMİNİN TEKSTİL YÜZEYLERİNE UYGULANMASI - (DERLEME) 117

İsmail YÜCE

APPLICATION OF GRAFTING MODIFICATION METHOD TO TEXTILE SURFACES – (REVIEW) 118

Ismail YUCE

ATIK ZİRKONYA TOZLARI İLE ÜRETİLEN YARI SİNTERLİ KOMPAKTLARIN MEKANİK ÖZELLİKLERİ 122

Handan TURAN MATİK, Mustafa BOZ

AYDINLATMA FAKTÖRÜNÜN İŞ SAĞLIĞI VE GÜVENLİĞİ AÇISINDAN İNCELENMESİ 128

Turhan KURŞUN, İsmail Erdem KIZILGÖZ

$BaCO_3$ KATKILI CaO, MgO, SiO_2 ve Al_2O_3 (CMAS) CAM SERAMİK SİSTEMİNİN ÜRETİMİ 133

Utku Kıvanç KURTKAPMAZ, H. Özkan TOPLAN, Nil TOPLAN

BAĞLAM (YAŞAM) TEMELLI ÖĞRENME YAKLAŞIMI ÜZERINE TEMATIK VE METODOLOJIK BIR DEĞERLENDIRME 140

Zühal ÇUBUKÇU, Tuğba INCI

BAKIR İZABE CÜRUFUNDAN DEĞERLİ METALLERİN HİDROMETALURJİK OLARAK GERİ KAZANILMASI 141

Zeynel Abidin SARI, Mehmet Deniz TURAN, Aslıhan DEMIRASLAN, Hasan NIZAMOĞLU

BAKIR ÜRETİM CÜRUF KARIŞIMININ AMONYUM HİDROKSİT VE PERKLORİK ASİT İLE LİÇİNİN İNCELENMESİ 142

Hasan NİZAMOĞLU, Mehmet Deniz TURAN, Aslıhan DEMİRASLAN, Zeynel Abidin SARI

BİLGİSAYAR PROGRAMLAMA DİLLERİ: ÖĞRETME VE ÖĞRENME STRATEJİLERİ 143

Mustafa OF, Sinan AYDIN, İsmail KILIÇARSLAN, Okan ŞENELDİR, Yusuf TOLA, Celal MUTLU

BREAST CANCER CLASSIFICATION USING K-NEAREST NEIGHBORS ALGORITHM 150

Can EYUPOGLU

CaO, MgO, SiO_2 ve Al_2O_3 (CMAS) SERAMİK SİSTEMİNE STRONSİYUM ZİRKONAT ($SrZrO_3$) KATKISININ ETKİSİ 156

Sedanur AYTAN, Utku Kıvanç KURTKAPMAZ, H.Özkan TOPLAN, Nil TOPLAN

CARDIAC ARRYTHMIA CLASSIFICATION BY NEURONAL NETWORKS (MLP) 164

Bochra TRIQUI, Abdelkader BENYETTOU

CHARACTERIZATION OF NATURAL AND MODIFIED CHABAZITE 170

Burcu Erdoğan ALVER, Aytaç GÜNAL

CHARACTERIZATION OF THERMOSTABLE $\boldsymbol{\beta}$-GALACTOSIDASE FROM *Anoxybacillus ayderensis* AND OPTIMAL DESIGN FOR ENZYME INHIBITION USING SEMIPARAMETRIC EIV MODELS 171

Fatma MATPAN BEKLER, Seçil YALAZ, Reyhan Gül GÜVEN, Omer ACER1, Kemal GÜVEN

COLD METAL TRANSFER (CMT) WELDING TECHNOLOGY 177

Turhan KURŞUN

COMPARING THE TURKISH FOREST ROAD TYPES AND SPECIFICATIONS TO DIFFERENT COUNTRY REGULATIONS 182

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Bekir AKTAŞ, Kemal ERŞEKERCİ

COMPARISON OF QUALITY PARAMETERS FOR RING AND OPEN-END ROTOR SPUN YARNS 188

Suat CANOGLU, S.Muge YUKSELOGLU, Nagihan KUCUK

COMPARISON OF THE VIBRATION PROPERTIES OF MATERIALS AA2124/SiC/25p and ALUMINUM 6061-T6 194

Yahya BOZKURT, Mevlüt BUÇAN, Kadir BACAKSIZ, Ersin TOPTAŞ, Sezgin ERSOY

CONVERSION PROCESS OF VISUAL-RELATED PRAISES OF WOMEN DURING YEŞİLÇAM PERIOD OF TURKISH CINEMA TO VISUAL CODES OF CULTURE AS EMBODIED BY TÜRKAN ŞORAY 198

Nevin ALGÜL

CREEP BEHAVIOR PREDICTION OF ALUMINUM-TITANIUM DIBORIDE (Al-TiB_2) METAL MATRIX COMPOSITE USING FINITE ELEMENT SIMULATION 205

Mine USLU UYSAL

CULTURAL EXTINCTION: THE FULANI SHARO FESTIVAL IN NORTH EASTERN NIGERIA 211

Eldah Ephraim BUBA, Jamila Mohammed WAZIRI

ÇELİK YAPILARDA AZALMIŞ VE AZALTILMAMIŞ KESİTLERDE GERİLME VE DEFORMASYONLARIN İNCELENMESİ 212

Erdal COŞKUN, Bülent KOPARAN, Yusuf TOLA, Kazım KAHRAMAN, Üzeyir AKÇA

DESIGN, MANUFACTURING AND EXPERIMENTAL INVESTIGATION OF ORGANIC RANKINE CYCLE APPARATUS 226

Alper ERGÜN

DETECTION AND MOLECULAR CHARACTERIZATION OF *HSP90* GENES IN CUCUMBER GENOME 233

Mehmet Cengiz BALOGLU, Necdet Mehmet UNEL

DETECTION OF CARDIAC PATHOLOGY BY NEURAL NETWORKS 234

Hicham Kaid SLIMANE, Abdelkader BENYETTOU

DETERMINATION OF HEAVY METALS IN SAPANCA LAKE, TURKEY WITH MICROWAVE ASSISTED DIGESTION AND ICP- MS METHODS 235

Zeynep KARAÇOBAN, Huseyin ALTUNDAG, Mustafa Şahin DUNDAR, Asude ATES, Mehmet Ali GUNGOR, Selma ALTUNDAG

DETERMINATION OF SIDEROPHOREGENIC BACILLUS SPP. ISOLATED FROM NATURAL MEDIUM AND EVALUATION OF PROBIOTIC CHARACTERISTICS 236

Hikmet KATIRCIOGLU, Hatice Ece ÖZ, Sema TAKMAZ, Yılmaz MIRAÇ 237

DETERMINATION OF SOIL PROPERTIES USING MASW AND MICROTREMOR METHODS: ADAPAZARI EXAMPLE

Ali SİLAHTAR 238

Development of a complete AUTOSAR 4.0 Software Project with the AUTOSAR Education Environment

Peter WILL, Parthib KHOUND, Jaysheel MEHTA, Robert MAYR 247

DEVELOPMENT OF POTENTIAL BIOACTIVE COMPOUNDS FROM BOESENBERGIA ROTUNDA

Sri Atun SRI, Sri Handayani SRI

DIGITAL HUMANIZATION ON QUANTUM (MULTIPLE THINKING ACTION), PROCESSABLE COLLECTIVE RAW MIND, YOUTUBER, APPLE:NETFLIX RELATED WITH SEMIOTICS 248

Nevin ALGÜL 249

DOĞALGAZIN İÇTEN YANMALI BİR MOTORDA HESAPLAMALI AKIŞKANLAR DİNAMİĞİ İLE YANMA ANALİZİ

Hüseyin KURT, S. Enes HACIBEKTAŞOĞLU, Engin GEDİK

DRILL TOOL FLANK WEAR IN DRILLING OF PURE AND CARBON BLACK REINFORCED HIGH DENSITY POLYETHYLENE 254

Alper UYSAL

EFFECT OF ACID TREATMENT ON SPECTROSCOPIC AND THERMAL PROPERTIES OF CLINOPTILOLITE 260

Aytaç GÜNAL, Burcu Erdoğan ALVER

EFFECT OF PRINTING LAYER THICKNESS ON TECHNOLOGICAL PROPERTIES OF 3D PRINTED SAMPLES MADE FROM WOOD FLOUR/PLA FILAMENT 261

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Nadir AYRILMIŞ

Effect of Viscosity Parameter on the Numerical Simulation of Reinforced Concrete Deep Beam Behavior 268

Aydin DEMİR, Hakan OZTURK, Kemal EDIP, Marta STOJMANOVSKA, Aleksandra BAGDANOVIC

EFFECT OF WELDING TIME ON WELD PROPERTIES OF 30% COLD ROLLED TWIP STEEL RESISTANCE SPOT WELDS 275

Hakan AYDIN, Mümin TUTAR, Ali BAYRAM

EFFECTS OF HIGH-ENERGY BALL MILLING PARAMETERS ON STRUCTURE AND THERMAL BEHAVIOR OF TINCAL 282

Tuğba TUNÇ PARLAK, Neşe GÜÇLÜ KALEİÇLİ, Kenan YILDIZ

EFFECTS OF MACROECONOMIC INDICATOR FLUCTUATIONS ON TURKISH SECTORS BEFORE AND AFTER THE FAILED COUP ATTEMPT 292

Ogan Erkin ERKAN, Canan ERKAN

ELEKTRİK MOTORLARINDA DALGACIK DÖNÜŞÜMÜ VE BULANIK MANTIK KULLANARAK ARIZA ANALİZİ YAPILMASI 293

Üzeyir KUZU, Ibrahim AYDIN, Can GONENLI

ENDÜSTRİ 4.0 VE TÜKETİM OLGUSU BAĞLAMINDA YENİ MEKÂN ANLAYIŞLARI 294

Mergül SARAF, Ece BABAN

ENDÜSTRİYEL TESİSLERDE KULLANILAN YAPI MALZEMELERİNİN YANGIN DAYANIMLARININ YARATTIĞI SORUNLAR 295

Saadet ALKIŞ

EPIDEMIOLOGY OF BRUCELLOSIS IN SHEEP AND GOATS IN THE IRAQI KURDISTAN REGION. 296

Emad A. Aziz ALSHWANY, Ian D. ROBERTSON

EVALUATING USER SATISFACTION IN STUDENT APARTMENTS BASED ON COMFORT CONDITIONS: BURSA / GORUKLE EXAMPLE 301

Filiz ŞENKAL SEZER, Secil BALLI HEPTASKIN

EXAMINING THE ACCEPTABILITY OF DESTINATION LOCAL FOOD BY DOMESTIC TOURIST VISITING NORTHERN NIGERIA 310

Jamila Mohammed WAZIRI, Eldah Ephraim BUBA, Hafsat HUSSAINI

EXPERIMENTAL INVESTIGATION OF USING ANIMAL FAT BASED BIODIESEL-DIESEL BLENDS IN A DIESEL ENGINE 311

Rasim BEHÇET, Abdülvahap ÇAKMAK

Exploring the Relationship between Job Satisfaction and Turnover Intention among Employees in Hospitality Industry: The g Role of Gender Moderatin 319

Edip Sahabattin METE, Alev SÖKMEN

EXPLORING THE STUDENTS' PERCEPTIONS ON BUSINESS ENGLISH COURSE / GAZANFER BILGE VOCATIONAL TRAINING SCHOOL EXAMPLE 323

Güven ÖZAL

EXTRACTION OF CUSTOMER DEMOGRAPHIC CHARACTERISTICS IN SUPERMARKETS BASED ON IMAGE PROCESSING TECHNIQUES 324

Selay ILGAZ SÜMER, Görkem ÖZGÜRBÜZ, Emre SÜMER

EXTRACTION OF THE ACOUSTIC FEATURES OF SEMI-VOWELS IN THE KURDISH LANGUAGE 330

Özlem BATUR DİNLER, Nizamettin AYDIN

FACULTY DEVELOPMENT EXPERIENCE USING TECHNOLOGY TO IMPROVE TEACHING AND LEARNING IN HIGHER EDUCATION 335

Jabbar AL-OBAIDI

GELİŞMEKTE OLAN ÜLKELERDE DEMOKRASİNİN EKONOMİK BÜYÜME ÜZERİNDEKİ ETKİSİ* 336

Emrah SOFUOĞLU

GENOME-WIDE DETERMINATION OF HSP60 GENES IN WATERMELON (CITRULLUS LANATUS) 343

Yasemin CELIK ALTUNOGLU, Merve CAFEROGLU

GÖÇLERIN ŞEHRIN DILSEL GÖRÜNÜMÜNE YAPTIĞI ETKİYE BIR ÖRNEK: ŞANLIURFA'DAKI ARAPÇA LEVHA VE TABELALAR 344

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Veysi GÜNAL, Mehmet Sait ŞAHİNALP, Salih TUR, Necmettin ELMASTAŞ

GREEN PROCESSES IN THE TEXTILE DYEING AND FINISHING 345

Erhan ÖNER

HARRAN ÜNİVERSITESI OSMANBEY KAMPÜSÜ'NDE BIYOKLIMATIK KONFOR ŞARTLARININ ARAŞTIRILMASI 352

Ahmet Serdar AYTAÇ, Hurşit YETMEN, Mehmet AKBIYIK, Mesut KOLBUKEN

IDENTIFYING PREDICTIVE GENES FOR SEQUENCE CLASSIFICATION USING ARTIFICIAL IMMUNE RECOGNITION SYSTEM 353

Canan BATUR, Banu DİRİ

İLKÖĞRETİM ÖĞRENCİLERİNİN BİLGİSAYAR OYUNLARINDAKİ OYUN TÜRÜ TERCİHLERİNE YÖNELİK BİR ARAŞTIRMA 362

Aysun COŞKUN

IMMUNOLOGICAL NUMERATION AND CHARACTERIZATION OF LEUKOCYTES BY FLOW CYTOMETRY 368

Hanan AL-KHALIFA

INCOMPLETE DISCUSSION ON THE TAXATION OF LABOR AND CAPITAL REVENUES: GROWTH? JUSTICE? 369

Hilmi ÜNSAL, Selin ERTÜRK ATABEY, Gonca BIYIK

INTEGRATING KANSEI, KANO DAN REFINED IVA KANO-HWWP FOR SERVICE EXCELLENCE (CASE STUDY : XXX COMPANY) 370

Mm Wahyuni INDERAWATI, Ronald SUWADI, Sella FALIAN, Budi SANTOSO

INVESTIGATING PRIMARY SCHOOL STUDENTS' LEVELS OF KNOWLEDGE OF CYBER CRIME 371

Aysun COSKUN

INVESTIGATION OF BURSA, ESKIKARAAGAC USING VERTICAL ELECTRICAL SOUNDING METHOD 372

Gökçen ERYILMAZ TÜRKKAN, Serdar KORKMAZ

INVESTIGATION OF ELECTRICAL PROPERTIES IN MALIC ACID-ADDED BULK MGB2 SUPERCONDUCTING SAMPLES 377

Ezgi Taylan KOPARAN, Burcu SAVAŞKAN

INVESTIGATION THE MICROSTRUCTURAL, MECHANICAL AND THERMO-ELECTRICAL PROPERTIES OF THE DIRECTIONALLY SOLIDIFIED SN-8.8ZN EUTECTIC ALLOY 378

Mevlüt ŞAHIN

İSRAİL İLE FLİSTİNLİLER ARASINDA YAPILAN OSLO BARIŞ ANLAŞMASININ ARAP ŞİİRİNE YANSIMASI 379

Salih TUR

KALDIRMA ARAÇLARININ KULLANIMINDA KARŞILAŞILAN İŞ KAZALARI İSTATİSTİKLERİ VE ALINMASI GEREKEN ÖNLEMLER 380

Hakan SARIKAYA, Mesut ÇETİN, Hatice SARIKAYA

KATI ATIKLARDAN ENERJİ ÜRETİMİ: SAMSUN İLİ ÖRNEĞİ 386

Abdülvahap ÇAKMAK, Faruk ORAL, Rasim BEHÇET

KURDISH RECOGNITION SYSTEM DIGIT 387

Özlem BATUR DİNLER, Nizamettin AYDIN

KÜRESEL TEKNOLOJININ TOPLUMSAL YAPIYA ETKISI BAĞLAMINDA DÖNÜŞEN EMEK 392

Serra ORKAN, Ece BABAN

LENGTH-WEIGHT RELATIONSHIPS AND CONDITION FACTOR OF TENCH, TINCA TINCA (L., 1758) INHABITING SIDDIKLI KÜÇÜKBOĞAZ DAM LAKE, KIRŞEHIR, 393

Okan YAZICIOĞLU, Ramazan YAZICI

MARDİN'DE GÜNLÜK MAKSİMUM YAĞIŞLARIN ANALİZİ VE SEL AFETİYLE İLİŞKİSİ 394

Hurşit YETMEN, Ahmet Serdar AYTAÇ, Mehmet ÖZCANLI, Mehmet AKBIYIK

MATHEMATICAL MODELLING OF NEUTRAL–TYPE NEURAL NETWORKS 395

Ruya SAMLI

MEDICAL IMAGE FUSION USING DIFFERENTIAL EVOLUTION ALGORITHM 401

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Veysel ASLANTAS, Abdullatif DOGAN
MESLEK YÜKSEKOKULU ÖĞRENCİLERİNİN SAYISAL BECERİLERİ ÜZERİNE: SINAVLI-SINAVSIZ GEÇİŞ KARŞILAŞTIRMASI 414
Bülent KOPARAN, Yusuf TOLA, Kazım KAHRAMAN, Sinan AYDIN, Celal MUTLU, Mustafa OF
METAL MALZEMELERIN DOĞAL FREKANSININ SICAKLIĞA BAĞLI OLARAK DEĞIŞIMININ İNCELENMESI 418
Mustafa Ali ÇIPILOĞLUC, Üzeyir KUZU, Ibrahim AYDIN, Zeki DIRIL
NOISE LEVEL IN A DISTRICT OF BURSA 419
Melike Yalılı KILIÇ, Ilker KILIÇ
NOVEL POLY(E-CAPROLACTONE) MACROMONOMERS BEARING 2-[(4-FLUOROBENZYL)THIO]ETOXY AND 3-[(4-FLUOROBENZYL)THIO]PROPYLOXY UNITS: SYNTHESIS AND CHARACTERIZATION 420
Murat MISIR, Çiğdem YAĞCI, Ahmet BILGIN
NUMERICAL INVESTIGATION OF MACHINING CHARACTERISTICS OF HASTELLOY-X 422
Mehmet Alper SOFUOGLU, Fatih Hayati ÇAKIR, Selim GÜRGEN, Sezan ORAK, Melih Cemal KUSHAN
NUMERICAL STUDY OF THE EFFECT OF PARTICLES SIZE AND VOLUME FRACTION OF AL2O3\ WATER NANOFLUID IN LAMINAR CONVECTIVE HEAT TRANSFER IN HORIZONTAL CIRCULAR TUBE 427
Saoudi LEILA, M. GARECHE, F. IACHACHENE, N. AZRIL, F. YAHI, N. ZERAIBI
OKUL ÖNCESİ ÇOCUKLAR İÇİN GÖRSEL PROGRAMLAMA ÖĞRENİMİ: CODE.ORG 428
Hüseyin ESKI, Ümit KOCABICAK
ÖRGÜTSEL ETİK VE GÜVENİN TAKIM PERFORMANSINA ETKİSİ: OTOMOTİV SEKTÖRÜ ÇALIŞANLARINA YÖNELİK BİR ARAŞTIRMA 429
Alev SÖKMEN, Alptekin SÖKMEN, Yunus BIYIK
PARTICULATE MATTER EMISSIONS FROM LAYING HENS HOUSES IN SUMMER SEASON 434
Ilker KILIÇ, Melike Yalılı KILIÇ
PHYSICS' TEACHERS CONCEPTION ABOUT THE DEVELOPMENT OF THE MATTER CONCEPT DURING HISTORY 435
Abdeljalil MÉTIOUI, Louis TRUDEL
REAL TIME SOLID WASTE MONITORING USING CLOUD AND SENSORS TECHNOLOGIES 441
Eunice LIKOTIKO, Dmitry PETROV, Dr. Joseph MWANGOKA, Ulrich HILLERINGMANN
RHEOLOGICAL CHARACTERIZATION OF AQUEOUS SOLUTIONS OF HEC 451
Remli SAMIA
ROBUST FEATURE SELECTION AND CLASSIFICATION USING HEURISTIC ALGORITHMS BASED ON CORRELATION FEATURE GROUPS 452
Canan BATUR, Banu DİRİ
RÜZGÂR VERİLERİNİN ÖLÇÜMÜ VE ENERJİ POTANSİYELİNİN BELİRLENMESİ 460
Faruk ORAL, Rasim BEHÇET, Emre GÖNEL
SELECTIVE IRON DISSOLUTION FROM CHALCOPYRITE CONCENTRATE 466
Mehmet Deniz TURAN, Zeynel Abidin SARI, Aslıhan DEMIRASLAN, Hasan NIZAMOGLU
SOVYET RUSYA'DA BİR PROPAGANDA ARACI OLARAK DİN KARŞITI ALFABE 467
Gamze ÖKSÜZ
SPACE OF Λ SEQUENCES OF ORDER α DEFINED BY AN ORLICZ FUNCTION 474
Tunay BILGIN, Mahmut KARAKUŞ
SPECIATION OF ANTIMONY USING DITHIZONE LIGAND VIA CLOUD POINT EXTRACTION AND DETERMINATION BY USN-ICP-OES 478
Mustafa S. DUNDAR, Ferhat KAPTAN, Celal CANER, Huseyin ALTUNDAG
STATISTICAL SIGNIFICANCE TESTING OF THE PARTICLE CIRCULARITY VALUES FROM VARIOUS PRODUCTS OF SPHALERITE COLUMN FLOTATION BENEFICIATION WITH ULTRASONIC PRE-TREATMENT 479
Uğur ULUSOY, Hülya KURŞUN, İbrahim ERDOĞAN

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SYNTHESIS AND CHARACTERIZATION OF NOVEL SCHIFF BASES CONTAINING BENZOIMIDAZOLE AND THEIR COPPER (II) COMPLEXES 492

Turgay TUNÇ

Synthesis and Characterization of Vegetable oils/oily acids Graft Copolymers 493

Sema ALLIA, Abdulkadir ALLIB

ŞANLIURFA İLİ BİRECİK İLÇESİ KÖY YERLEŞMELERİNİN TOPONİMİK ANALİZİ 495

Mehmet AKBIYIK, Abdülkadir GÜZEL, Ahmet Serdar AYTAÇ, Mehmet ÖZCANLI, Hurşit YETMEN

ŞANLIURFA ŞEHRINDE SURIYELILERIN SOSYAL ENTEGRASYONUNDA YAŞANAN SORUNLAR 497

Sedat BENEK, NecmettİN ELMASTAS, Mehmet ÖZCANLI, Abdulhalik PINAR, Fatma KIZILTOPRAK

ŞEHİRSEL ARAZİ KULLANIMI VE ŞEHİRSEL ARAZİ KULLANIMI SORUNLARI: SURUÇ ŞEHRİ (ŞANLIURFA) ÖRNEĞİ 498

Mehmet Sait ŞAHİNALP, Veysi GÜNAL, Necmettin ELMASTAŞ

TEACHING ENGLISH FOR CHEMISTRY AT A JAPANESE UNIVERSITY 499

Makoto SHIMIZU, Masaki MURATA, Kris RAMONDA

TECHNOLOGICAL PROPERTIES OF PLYWOOD BONDED WITH PHENOL-FORMALDEHYDE RESOL RESIN MODIFIED WITH BIO-OIL 503

Nadir AYRILMIŞ, Günay ÖZBAY

THE ANALYSIS OF A POLICY DOCUMENT: “TURKISH SCIENCE POLICY FROM 1983 TO 2003” 510

Ibrahim ARAP, Veysel ERAT

THE ANALYSIS OF COMPUTER ENGINEERING PHD THESIS IN TURKISH UNIVERSITIES BETWEEN 2010 AND 2017 519

Ruya SAMLI

THE DEVELOPMENT OF INITIAL ATOMISM AND EMPIRICAL ATOMISM: THE EPISTEMOLICAL RUPTURE 520

Abdeljalil METIOUI, Mireille Baulu Mac WILLIE, Louis TRUDEL

THE DEVELOPMENT OF TEMULAWAK (CURCUMA XANTHORRHIZA) HERB PRODUCT AND PHARMACOLOGICAL TEST AS ANTI HYPERCHOLESTEROLEMIA 521

Nurfina Aznam NURFINA, Sri Atun SRI

THE EFFECT OF CHENILLE YARN PROPERTIES ON THE UPHOLSTERY FABRIC PERFORMANCE 522

S. Muge YUKSELOGLU, Suat CANOGLU

THE EFFECT OF CORPORATE SOCIAL RESPONSIBILITY ACTIVITIES ON CONSUMER AFFECTIVE SATISFACTION IN HEALTHCARE INSTITUTIONS 527

Zuhrem YAMAN

THE EFFECT OF ROAD ROUGHNESS ON THE HALF VEHICLE MODEL AT DIFFERENT SPEEDS 528

Yusuf Alptekin TÜRKKAN, Gürsel ŞEFKAT

THE EVALUATION OF TURKEY'S TRANSPORTATION POLICY UNDER THE NATIONAL DEVELOPMENT PLANS 534

Nuriye SAY, Nermin Merve YALÇINKAYA

THE EXAMPLES OF SUSTAINABLE LOCAL DEVELOPMENT IN TURKEY: SEFERİHİSAR AND AKYAKA 539

Nuriye SAY, Sinem ÖZYURT ÖKTEN

THE INVESTIGATION OF AIR, HEAT AND SOUND PERMEABILITY OF PERLITE COATED NONWOVEN FABRICS WITH DIFFERENT WEIGHTS 546

Seyda EYUPOGLU, Habip DAYIOGLU, Nigar MERDAN, Mehmet KILINC

THE INVESTIGATION OF MECHANICAL PROPERTIES OF HYDROXYAPATITE COATING MATERIALS BY USING LACTIC ACID - SODIUM LACTATE BUFFER SYSTEM AND TY6AL4V MATERIAL SURFACE 551

Ibrahim AYDIN, Can GÖNENLI, Üzeyir KUZU

THE INVESTIGATION OF SOCIAL PROBLEM SOLVING ABILITIES OF MOTHERS WITH PHYSICALLY DISABLED CHILDREN BY THE USE OF QUASI-EXPERIMENTAL METHOD 552

Begüm Fatma ARSLAN, Banu Yazgan İNANÇ, Sebahat AYDOS

THE LINK BETWEEN ORGANIZATIONAL JUSTICE AND WORKPLACE DEVIANCE: A RESEARCH ON PUBLIC INSTITUTIONS 560

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Belgin AYDINTAN

THE MEDIATING ROLE OF PERCEIVED ORGANIZATIONAL SUPPORT ON THE RELATIONSHIP BETWEEN MANAGER'S ETHICAL BEHAVIOR AND ORGANIZATIONAL IDENTIFICATION: A RESEARCH ON UNIVERSITY ASSISTANTS 564

Alptekin SÖKMEN, Emre Burak EKMEKÇİOĞLU, Kamil ÇELİK

THE ROLE OF "ARCHITECTURAL ACOUSTIC COURSE" IN ARCHITECTURAL EDUCATION IN TURKEY 568

Sebahat Gül ILISULU

THE ROLE OF "HISTORY OF TURKISH GRAPHIC DESIGN" IN DESIGN EDUCATION AT TURKISH UNIVERSITIES AND EXEMPLARY MENTION OF "SAIT MADEN" 569

Tevfik İnanç İLİSULU

TOZ METALURJISI İLE ÜRETİLEN Ni-P KAPLI SiC_P TAKVİYELİ Al7075 KOMPOZİTLERİN YOĞUNLAŞMA VE SERTLİK ÖZELLİKLERİ 578

Ulaş MATİK

TÜRK KÜLTÜRÜNDEKİ BATIL İNANIŞLAR VE SEMBOLİK BESİNLER 583

Semra AKAR ŞAHİNGÖZ

TÜRKİYE'DE İKLİM DEĞİŞİKLİĞİNİN BİYOLOJİK ÇEŞİTLİLİK VE EKOSİSTEM HİZMETLERİ ÜZERİNDEKİ ETKİLERİNİN BELİRLENMESİ VE İZLENMESİ İÇİN YÜRÜTÜLEN KURUMSAL ÇALIŞMALAR 588

Nuriye SAY, Gülay TOKGÖZ, Nermİn Merve YALCINKAYA

TÜRKİYE'DE NEOKLASİK BÜYÜME MODELİ ÇERÇEVESİNDE EKONOMİK BÜYÜMENİN BİLEŞENLERİ VE İÇ BORÇ STOKUNUN EKONOMİK BÜYÜMEYE OLAN ETKİSİNİN ANALİZİ 589

Gonca BIYIK, Selin ERTÜRK ATABEY

TÜRKİYE'DE YENİLENEBİLİR ENERJİLERİN GELİŞİM SÜRECİ 590

Unal Özdemİr, Muhammed Oral

TÜRKİYE'NİN BATISINDA YETİŞEN FERULAGO W. KOCH (UMBELLIFERAE) CİNSİ TÜRLERİNİN TOHUM YAPILARININ KARŞILAŞTIRILMASI 591

Meltem ATABAY, Yusuf MENEMEN, Emine AKALIN

TÜRKİYE'NİN COĞRAFİ FARKLILIKLARI VE GASTRONOMİK ÇEŞİTLİLİĞİN BÖLGESEL TURİZMİN GELİŞTİRİLMESİNDEKİ 592

Mehmet KIZILELI

TÜRKİYE'NİN ENDÜSTRİ 4.0 HAZIRLIK STRATEJİSİNİN ÖNCELİKLERİ Strategical Priorities of Turkey's Industry 4.0 Readiness 603

Canan ERKAN

TYPES OF *DA`WAH* COMMUNICATION USED BY *DA`WAH* WORKERS IN CONVEYING THE MESSAGE OF ISLAM TO THE ABORIGINALS

Zulkefli bin AINI, Nur Damia Husna binti Nor SAD

ULTRASONIC ECHO SIGNAL ANALYSIS FOR WELDING INSPECTION 616

Seong-Geun KWON, Dong-Hyung LEE, Jong Dock SEO

URBAN LAND USE AND URBAN LAND USE PROBLEMS: A CASE STUDY OF SURUÇ CITY. (ŞEHİRSEL ARAZİ KULLANIMI VE ŞEHİRSEL ARAZİ KULLANIMI SORUNLARI: SURUÇ ŞEHRİ ÖRNEĞİ) 620

Mehmet Sait ŞAHINALP, Veysi GÜNAL, Necmettin ELMASTAS

USE OF INFORMATİON TECHNOLOGİES İN APPLICATION SPHERE 622

Jana Krátká, Lenka Hrušková

USING LEARNING STYLES TO BECOME BETTER TEACHERS 627

George SELITTO

UŞAK İLİ VE ÇEVRESİNDE KULLANILAN YAPI MALZEMELERİNİN DOĞAL RADYOAKTİVİTESİNİN BELİRLENMESİ 628

ÜNIVERSITE ÖĞRENCILERININ YAŞAM KALITESI ALGISININ BAZI FAKTÖRLER AÇISINDAN İNCELENMESI 629

Canan Erkan, Banu Sarıbay, Efe Sarıbay

ÜNİVERSİTELERDE SEKTÖR UYGULAMALARI EĞİTİMİNİN ÖNEMİ VE DEĞERLENDİRİLMESİ 630

Ibrahim AYDIN, Zeki DIRIL, Üzeyir KUZU

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VALIDATION OF SIC PRESENCE IN SILICA SUPPORTED NI CATALYSTS VIA CHARACTERIZATION ANALYSES **Gamze Gunduz MERIC, Huseyin ARBAG, Kirali MURTEZAOGLU, Levent DEGIRMENCI** 631

VAN GÖLÜ HAVZASI'NDAKI YERALTI SULARINA VAN GÖLÜ SUYUNUN ETKISI VE YERLATI SULARININ TARIMSAL SULAMA AÇISINDAN DEĞERLENDIRILMESI: AHLAT İLÇESI ÖRNEĞI 632

Necmettin ELMASTAS, Hurşit YETMEN, Sedat BENEK, Mehmet ÖZCANLI

VOLATILE COMPOUNDS AND MICROBIOLOGYCAL QUALITY IN ROSEWATERS 633

A. Fatih FIDAN, Recep KARA, Recep ASLAN

Yürüme Engellilere Yönelik Yapılan Düzenlemelerin Kamu Kurumlarına Maliyeti İçin Örnek İnceleme Alanı; Erciyes Üniversitesi 634

Z. Ö. Parlak BICER, E. YILDIRIM, G. ISIK, İ. KUSKAYA, Ç. ISVILIR

ZEOLİT BENTONİT KARIŞIMLARININ SU EMME KARAKTERİSTİKLERİNE BENTONİT ORANININ ETKİSİ 648

Gül AKINCI, Seda DURUKAN

ZEOLİT, SEPİYOLİT VE DOLOMİT KULLANILARAK CMAS ESASLI SERAMİKLERİN ÜRETİMİ 649

Umut KARAÇAYLI, Utku Kıvanç KURTKAPMAZ, H. Özkan TOPLAN, Nil TOPLAN

ODOR MANAGEMENT IN WASTEWATER TREATMENT PLANTS: CASE OF MANISA INDUSTRIAL PARK WWTP 658

Birkan AKYOL, Barış YILMAZ

A MODEL SUGGESTION FOR TRAUMA AND PSYCHOLOGICAL PROCESS LIVING PEOPLE AFTER EARTHQUAKE 659

Tarık İLHAN

A NEW COMPUTERIZED TEST FOR DETAILED DIAGNOSTICS OF COLOUR-BLINDNESS 666

Murat ISIK

A STUDY ON FUTURE GROWTH ENGINE POLICY IN KOREA 667

Soo-Yong JEON

A STUDY ON THE PRODUCTION OF PH INDICATOR GEL PEN HOLDER 669

Şeyda TASAR, Ahmet OZER

A STUDY ON THE RESEARCH TREND ANALYSIS OF STEM CELL BASED ON PATENT INFORMATION AND IMPLICATIONS FOR NATIONAL R&D INVESTMENT OF KOREA 670

Juwon KIM

A STUDY ON THE STRUCTURAL ANALYSIS OF FIVE SIMILAR MOSQUES OF ARCHITECT SINAN 672

Z. Özlem Parlak BICER , Hürmet COPUROGLU, Merve HASOZHAN, Zehra AKSOY

ABOUT THE CONCEPT OF TIME BETWEEN PHYSICS AND MATHEMATICS 683

Paolo Di SIA

ACCESSIBILITY FOR INCLUSION AND WELL-BEING IN THE CLASSROOM 684

Maria Concetta CARRUBA

ADAM SMITH'IN AHLAK ANLAYIŞI: SAĞGÖRÜ MERKEZLI OKUMA DENEMESI 690

Tufan COTOK

AGRESİF VERGİ PLANLAMASI İLE BAĞIMSIZ DENETİM KALİTESİ ARASINDAKİ İLİŞKİ: BORSA İSTANBUL ÖRNEĞİ 691

Zeynep YAROGLU, Yasin ERTURK

AN EMPIRICAL INVESTIGATION OF GREEN PURCHASING AND ENVIRONMENTALLY FRIENDLY BEHAVIOUR 692

Gözde YANGINLAR, Aynur ACER 700

Ancient Kartvelian Scripts of Crete (2): The Disc of Phaistos

Nino SHENGELAIA 707

Benzetilmiş Yaşlandırma Test Cihazları Ve Bazı Sektörlerde Kullanımı

Nevzat ÇAKICIER, Göksel ULAY 708

$CaO-Al_2O_3-SiO_2$ (CAS) ESASLI CAM-SERAMİKLERİN ASİT KOROZYONU

Aslıhan ONCU, Bahadır AYDIN, H. Özkan TOPLAN, Nil TOPLAN

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CARDIAC ARRYTHMIA CLASSIFICATION BY TSOM 717

Bochra TRIQUI, Abdelkader BENYETTOU

CHEMICAL MODIFICATION, CHARACTERIZATION, AND HEAVY METAL ADSORPTION OF CELLULOSE-BASED NATURAL FIBERS 726

Mohammad H. AL-SAYAH,* Mariha ISLAM, Nada A. AS'AD, Mohammed S. MOHAMMED, Aya H.

COMPOUND WORDS FORMED WITH THE LEXEME -*WEAR* IN CONTEMPORARY FRENCH 732

Radka MUDROCHOVÁ

ÇOCUKLARDA RENK TONU FARKINDALIĞININ ARTTIRILMASINA YÖNELİK MOBİL BİR OYUN TASARIMI 740

Fidan KAYA GÜLAĞIZ, Ekin EKİNCİ, Suhap ŞAHİN

DEPREM'DEN SONRA İNSANLARIN YAŞADIĞI TRAVMA VE PSİKOLOJİK SÜREÇ İÇİN BİR MODEL ÖNERİSİ 752

Tarık ILHAN

DEVELOPMENT OF A GREEN ALTERNATIVE PROCEDURE FOR SIMULTANEOUS SEPARATION AND QUANTIFICATION OF PHYTOCHEMICALS 753

Yu-Chiao Yang, Pei-Hui Lin, Da-Hsiang Wei, Show-Jen Hong, Ko-Chun Chen, Ming-Chi Wei

DEVELOPMENT OF A GREEN PROCEDURE WITH ULTRASOUND IMPROVED SUPERCRITICAL CO2 TO PRODUCE EXTRACTS ENRICHED IN ROSMARINIC ACID FROM PERILLA FRUTESCENS AND DETERMINATION OF ITS FICTITIOUS SOLUBILITY 754

Ming-Chi Wei, Show-Jen Hong, Da-Hsiang Wei, Pei-Hui Lin, Yu-Chiao Yang

DIGITAL STORYTELLING AND TRAINING IN HEALTH CARE SETTINGS 755

Barbara BRUSCHI

DIŞ MEKÂN SÜS BİTKİSİ İTHALİ VE OLASI SORUNLARI 760

Bilal ÇETİN, Oktay YILDIZ

ECO BAKERY FOR FRIENDLY ENVIRONMENTS IN ECOLOGICAL - CASE STUDY FROM THAILAND 761

Pathawit Chongsermsirisakul1

ECZACILARIN YAŞADIĞI GÜNCEL SORUNLAR VE ECZACI ADAYLARININ BU SORUNLARA ILIŞKIN BILGI DÜZEYI 768

Ali BASAR, Kerim KARABACAK

EMG BASED HAND PATTERN RECOGNITION USING ARTIFICIAL NEURAL NETWORKS CONTROL 769

Beyda TASAR, Arif GULTEN

ENDÜSTRIYEL MUTFAKLARDA İŞ GÜVENLIĞI 770

Dİlek ÜnlÜ

ENVIRONMENT OF CULTURE AND ART IN THE OTTOMAN EMPIRE IN 19th CENTURY 771

Nesli Tuğban YABAN

ENVIRONMENTAL-MAFIA. THE ROLE OF LITERATURE IN EDUCATION IN ENVIRONMENTAL EDUCATION PROJECTS. 779

Alessandro PERISSINOTTO

EVALUATION OF FIRE RESISTANCE OF GLASS FIBRE REINFORCED CONCRETE IN TERMS OF VARIOUS PARAMETERS

784 **Musa Hakan ARSLAN, Mustafa ALTIN, Ali Murtadha All**

EVALUATION OF POLYETHYLENE BASED INSULATION MATERIAL IN TEXTILE DYEING MACHINES 785

Betül OZER, Behçet GUVEN

FACIAL EXPRESSION RECOGNITION WITH ROBUST FEATURE SELECTION 797

Ismail OZTEL, Gozde YOLCU, Cemil OZ, Serap KAZAN

FARKLI KAYNAK YÖNTEMİ İLE STELLITE 6 KAPLANAN YAPISAL ÇELİK MALZEMELERDE KOROZYON DİRENCİNİN İNCELENMESİ 805

Serkan APAY, Behçet GÜLENÇ

GAMIFICATION: SOFTWARE USAGE ECOLOGY 806

Carlos J. COSTA

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GETTING INFORMATION, SOCIALIZING OR WHAT? EVIDENCE FROM INTERNET AND SMARTPHONE USE 815
Emmanuel ADUGU

GLOBAL EKONOMİK KRİZ SONRASI PARA POLİTİKALARINDA GELİŞMELER VE TÜRKİYE 816
Mustafa ÇALIŞIR, Mahmut BİLEN

INCREASED POLITICAL EFFECT OF SOCIAL MEDIA IN THE UNITED STATES PRESIDENTIAL ELECTION 2016: REPUBLICAN CANDIDATE TRUMP'S DIGITAL STRATEGY 830
Mehmet SADIOGLU

INFORMATION SECURITY EDUCATION: WATCHING YOUR STEPS IN CYBERSPACE 831
Tharindu SENANAYAKE, Suchinthi FERNANDO

KALIN MALZEMELERİN CNC PLAZMA KESİM İŞLEM PARAMETRELERİNİN YÜZEY KALİTESİNE ETKİSİ 842
Serkan APAY, Ömer EGELIOGLU

KİTLE KÜLTÜRÜ, POPÜLER KÜLTÜR VE HALK KÜLTÜRÜ EKSENİNDE SOSYAL ETKİLEŞİM 843
Nesrin Akinci COTOK

LIMONI SERVI (*CUPRESSUS MACROCARPA*) ÇELIKLERININ KÖKLENMESINE HORMONUN ETKISI 844
Bilal ÇETİN, Recep DAŞTAN

MUSIC, SOCIETY, POLITICS: ROCK MUSIC IN AMERICA AS COUNTER-CULTURE BETWEEN 1960-1980 845
Fatma GURSES

ODUN İTHALATI VE YEREL EKOSISTEMLERE OLASI RISKLERI 846
Nevzat ÇAKICIER, Oktay YILDIZ, Derya EŞEN, Hasan ÖZDEMİR

OKUL ÖNCESİ ÖĞRETMENLERİNDE "DUYGUSAL BAĞLILIK" "İŞ TATMİNİ" VE "ÖRGÜTSEL GÜVENİN" BİREYSEL İŞ PERFORMANSI ÜZERİNDEKİ ETKİLERİ 847
Ali KUZU, Sabiha SEVİNÇ ALTAŞ, Güner ÇÖL

ON THE DECIPHERMENT OF LINEAR A INSCRIPTIONS IN THE COMMON COLCHIAN LANGUAGE: MATHEMATICS 856
Gia KVASHILAVA

OUTSIDE THE BOX: CHANGE – VARIOUS FORMS OF CONNECTING PRACTITIONERS IN THE PROCESS OF INTENSIVE KINDERGARTEN DEVELOPMENT 865
Edita SLUNJSKI

PERFORMANCE OF RUSSIAN-OLIVE, LOCUST, ASH AND BLACK-PINE USED IN ARIDLAND AFFORESTATION EXPERIMENT IN CENTRAL PART OF TURKEY 870
Oktay YILDIZ, Ernaz ALTUNDAG, Bilal ÇETİN, Ş.Teoman GUNER, Murat SARGINCI, Bülent TOPRAK

PERLİT KULLANILARAK ÜRETİLEN CMAS (CaO-MgO-Al_2O_3-SiO_2) ESASLI SERAMİK MALZEMELER 871
Mevlüt İhsan TUĞ, Erdoğan ÖNGER, H.Ö. Toplan, Nil TOPLAN

PLANNING IN HIGHER EDUCATION The Future of the Faculty of Statistics and Informatics, Universidad Veracruzana, Mexico 879
Jaime JIMÉNEZ and Juan C. ESCALANTE

POTENTIAL USAGE OF SOME OF THE GROUND-COVER VEGETATION FOR ECOSYSTEM RESTORATION IN CENTRAL ANATOLIAN REGION OF TURKEY 887
Oktay YILDIZ, Ernaz ALTUNDAG

PREFABRİKE YAPILAR: TEK KATLI MAFSALLI BİRLEŞİMLERİN YARI MAFSAL HALE GETİRİLMESİ 888
Erdal COŞKUN, Bülent KOPARAN, Yaşar GENEL, Üzeyir AKÇA, Kazım KAHRAMAN, Yusuf TOLA

PRODUCTION OF FLAME RETARDANT WOOD COMPOSITES BY USING HUNTITE AND HYDROMAGNESITE 893
Hüsnügül YILMAZ ATAY

PRODUCTION OF HEMICELLULOSE BASED BIODEGRADABLE GEL FILM FROM TEA PULP (I) 903
Şeyda TASAR

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SELECTIVE CO-PRECIPITATION OF CU^{2+} METAL IONS USING ULTRASOIIC NEBULIZER-INDUCTIVELY COUPLED PLASMA OPTIC EMISSION SPECTROMETRY 911

Mustafa Sahin DUNDAR, Murat BUYURAN, Celal CANER, Huseyin ALTUNDAG, Mustafa ARSLAN

TAX INCENTIVES FOR INNOVATION IN THE LIGHT OF IT GOVERNANCE BEST PRACTICES (EVIDENCE FROM THE FINANCIAL SERVICES INDUSTRY AND IMPLICATIONS FOR EXECUTIVES) 912

Hülya BULUT

Using In Vitro Digestion model, measurement of bioaccessibility of heavy metals in Turkish Hazelnuts (Corylus Avellana L.) by ICP-OES 913

Huseyin ALTUNDAG, Ebru MUTLU

Wet and microwave digestion methods for Cu and Zn determination in food samples using ICP-OES 914

Huseyin ALTUNDAG, Muhammet YILMAZ

Eğitim Bağlamında Kur'an İsminin Düşündürdükleri 915

Muhammed AYDIN

AZ GELİŞMİŞ ÜLKELERDE EKONOMİK BÜYÜMENİN BİR BELİRLEYİCİSİ OLARAK DEMOKRASİNİN ÖNEMİ

Oktay KIZILKAYA

Will Unfair Distribution of Income Affect Economic Course of Events in terms of Balance of Payments in Turkey ? 920

Salih Kalayci

Testing the transportation-induced EKC hypothesis The case of Turkey 921

Salih Kalayci

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4. SANAYI DEVRIMI ILE BIRLIKTE BILIŞIM TEKNOLOJILERININ BIREYIN GÜNDELIK YAŞAM PRATIKLERINE ETKISI

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Abstract: Sanayi devriminin hayatımıza girmesiyle birlikte hem üretim hem de tüketim süreçlerinde, toplumsal yapıyı teknolojik ve kültürel olarak yeniden şekillendiren önemli gelişmeler yaşanmıştır. Buhar makineleri ile başlayan ilk sanayi devrimi elektrik gücünün kullanılması ile yerini ikinci sanayi devrimine bırakmış; bilişim teknolojilerindeki gelişmeler ve dijital devrim üçüncü sanayi devriminin kapısını aralamıştır. Sanayi Devrimi sonrasında teknolojik ilerlemeler bugün "bilgi toplumu" adını verdiğimiz ve ana unsuru "bilgi" olan yeni bir oluşum ortaya çıkartmış ve tüm dünyayı etkisi altına almıştır. Bilgi toplumu tarafından kullanılan bilişim teknolojileri insan hayatını kolaylaştırıp, bireylerin ve toplumun dönüşmesine sebep olurken, sürtünmesiz kapitalizm ile üretim ve tüketim sürecine de büyük etkide bulunmuştur. Bilgi toplumunun günümüzde geldiği nokta siber-fiziksel sistemlerin, nesnelerin ve hizmetlerin interneti ile tamamlanan dördüncü sanayi devrimine zemin hazırlamıştır. Çalışmamızda sanayi devrimlerinin ve bilişim teknolojilerinin gelişimi ve gündelik yaşam pratikleri üzerine etkisi dördüncü sanayi devrimi temel alınarak açıklanmaya çalışılacaktır.

Keywords: 4. Sanayi Devrimi, Bilişim Teknolojileri, Gündelik Yaşam Pratikleri

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A CASE STUDY OF AN ANAEROBIC DIGESTER STRUCTURE

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Abstract: A wastewater treatment plant named as Kızıltepe Wastewater Treatment Plant, construction area is located at the city of Mardin and district of Kızıltepe. The purpose of this study is to design the deep foundation system composed of vertical pile elements for the anaerobic digester structures planned to build in the construction area of Waste Water Treatment Plant. The pile group designed is subjected to vertical and lateral loads. The weight of the digester structure, waste weight containing in the digester structure and the foundation weight have been considered as vertical loads. However, the wind and earthquake loads have been taken into account as lateral loads. The experimental studies both laboratory and in-situ have been performed to obtain the geotechnical parameters which are necessary for the design of the foundation system of anaerobic digester structures. The boring logs including N values obtained from Standart Penetration Tests (SPT) and results of the laboratory studies belonging to the borehole drilled in the anaerobic digester structures construction area have been used for this study.

Keywords : deep foundation, pile group, bearing capacity, lateral load.

1. Introduction

Pile as a structural element commonly are employed to overcome the problems like low bearing capacity of subsoil layers, high values of overturning moments, considerable subsidence and etc. However, since the very early stage of geotechnical engineering profession, estimation of the bearing capacity of piles had been a challenge for engineers (Karimpour-Fard & Eslami, 2013).

Pile foundations are extensively used to support various structures built on loose/soft soils, where shallow foundations would undergo excessive settlements or shear failure. These piles are used to support vertical loads, lateral loads, or a combination of vertical and lateral loads. However, in view of the complexity involved in analyzing the piles under combined loading, the current practice is to analyze the piles independently for vertical

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loads to determine their bearing capacity and settlement and for the lateral load to determine their flexural behavior (Karthigeyan, Ramakrishna & Rajagopal, 2007).

The main object of this study is to design the foundation system composed of vertical pile elements for the anaerobic digester structure. As a first step, the pile group designed is subjected to vertical and lateral loads. The weight of the digester structure, waste weight containing in the digester structure and the foundation weight have been considered as vertical loads. Also, the wind and earthquake loads have been taken into account as lateral loads.

The boring log, N values obtained from Standart Penetration Tests (SPT) and results of the laboratory studies have been used in the preparation of this study.

2. Site Conditions

One borehole was drilled in the anaerobic digester structures construction area. The depth of borehole was about 30.0 m. Laboratory test results performed on the specimen obtained from the borehole BH7 and the SPT-N values belonging to this borehole (S7 in Turkish report) have been used while preparing this study. The layout of the wastewater treatment plant and locations of the soil borings performed in construction area have been shown in **Figure 1**.

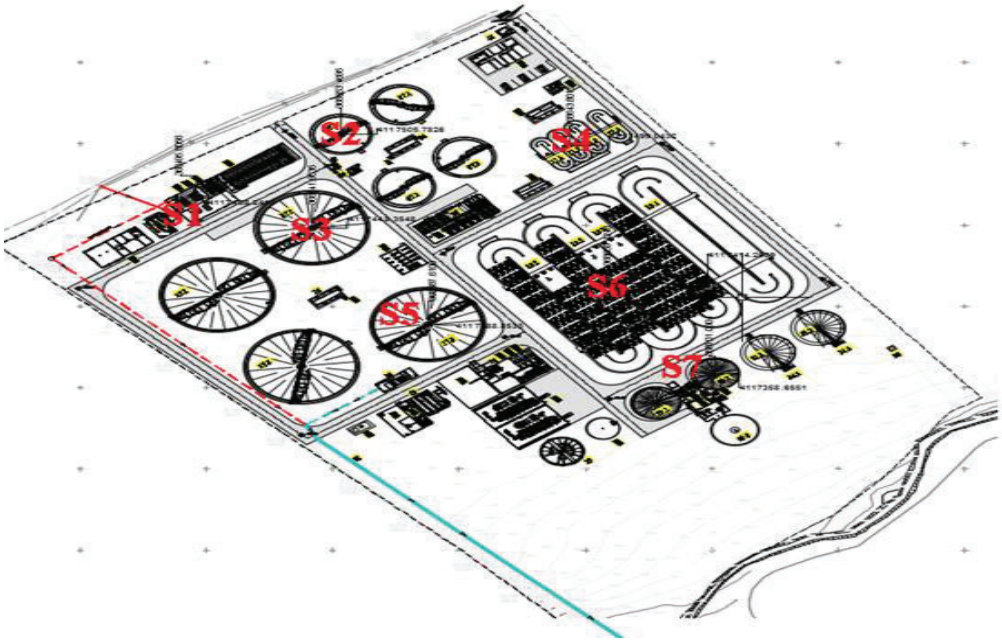

Figure 1. The layout of the Wastewater Treatment Plant and Locations of the Soil Borings

The N_{30} values obtained from Standart Penetration Tests (SPT) for corresponding depths have been summarized for the borehole BH7 in **Table 1**.

The soil profiles encountered in the field has been given in below for borehole BH7.

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BH 7 (Boring Log)

0.00 – 0.50 m Vegetable Soil

0.50 – 30.00 m Sandy Silty CLAY

The groundwater level was encountered at the depth of **-13.0 m** in the boring.

Table 1. SPT N_{30} Values

Depth (m)	**SPT**-N_{30}	Depth (m)	SPT-N_{30}
1.50	16	16.50	R
3.00	22	18.00	R
4.50	21	19.50	R
6.00	26	21.00	R
7.50	34	22.50	R
9.00	43	24.0	R
10.50	45	25.50	R
12.00	46	27.00	R
13.50	61–R	28.50	R
15.00	58-R	30.00	R

3. The Vertical and Lateral Load Capacities of A Vertical Pile

Pile foundations for buildings and bridges are often subjected to vertical and horizontal loads simultaneously. Yet, the axial and lateral responses of piles are often evaluated separately without considering their possible interactions (Zhang et al., 2002).

Behaviour of single pile under uplift load is well established and classical solutions are available for estimating the uplift load carrying capacity of pile. But, piles are installed in group in general (Ayothiraman & Tank, 2010). In this study, the pile group designed is subjected to vertical and lateral loads. The weight of the digester structure, waste weight containing in the digester structure and the foundation weight have been considered as vertical loads. However, the wind and earthquake loads have been taken into account as lateral loads.

Design methods for piled foundations still concentrate on providing axial capacity from the piles to carry the total structural load (de Sanctis & Mandolini, 2006). The total load has been taken into as equal to **87000 kN** in this study. The base of the pile will have been on the layer which has a SPT N value greater than 50. Therefore, it is not expected settlements which are significantly large.

3.1 The Vertical Load Capacity of A Vertical Pile

The axial load capacity of the single vertical pile has been calculated as indicated in below (Table 2).

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Table 2. The Axial Load Capacity of the Single Vertical Pile

	c (kPa)	L (m)	ϕ (cm)	Q_f (formula)	Q_f (kN)
1	80	4.50	80	$Q_f = A_s * \alpha * c_u$	507.00
2	150	6.00	80		905.00
3	200	4.50	80		860.00

Q_f = ultimate friction load or skin load
A_s = total surface area of pile embedded below ground surface
c_u = average undrained shear strength of clay along the shaft
α = adhesion factor
ϕ or D = diameter of pile
L = length of pile

The axial load capacity of the single vertical pile has been calculated as indicated in below [7].

$Q_b = (c * N_c * A_b) = 200 * 9 * 0{,}503 = \mathbf{905{,}0\ kN}$ (the base or point load) (1)

$Q_a = (507{,}0 + 905{,}0 + 860{,}0 + 905{,}0)/2{,}5 = \mathbf{1271{,}0\ kN}$ (allowable total loads) (2)

The axial load capacity of the pile element has been chosen as equal to the **Q_a = 1270 kN.**

The pile length, diameter and spacing of the pile centers are summarized in below:

- L = 15 m D=80cm S=2.40 m = 3D

The pile number in the pile group has been calculated as the ratio of total load / axial load capacity of a pile.

Number of the pile in the pile group = 87000 kN / 1270 kN = **69**

The piles will be placed beneath the foundation of the digester structure with the grid of **2.40 m x 2.40 m.**

The distance between the centers of the piles is equal to **3D**.

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3.2 The Lateral Load Capacity of A Vertical Pile

Pile foundations are generally preferred when heavy structural loads have to be transferred through weak subsoil to firm strata. These foundations in some situations are subjected to significant amount of lateral loads besides vertical loads (Juvekar & Pise, 2008). In order to that, amount of lateral loads must have to known by researchers. The lateral load capacity of the pile element has been calculated using the method proposed by Broms. The smallest lateral load capacity value calculated for the cases mentioned above has been chosen as the lateral load capacity.

$$M_y = \frac{f'^c * I}{h} \tag{3}$$

For C30 concrete, $f_{ck} = 30\ MPa = 30000\ kN/m^2$,

$$I = \frac{\pi * R^4}{64} = \frac{\pi * (0.8)^4}{64} = 0.02011 \tag{4}$$

$$M_y = \frac{30000 kN/m^2 * 0.02011\ m^4}{0.40} = 1508.25\ kN \tag{5}$$

c=100 kPa L=15.0 metre Ø80 cm e=0

$$P_{ult-1} = \frac{M_y}{0.5L + 0.75b} = 845\ kN \tag{6}$$

$$P_{ult-2} = \frac{2M_y}{1.5b + 0.5f} = \frac{3016.5}{1.5 * 0.80 + 0.5 * 2.40} \cong 1256\ kN \tag{7}$$

The minimum $\rightarrow \boldsymbol{P_{ult} = 845\ kN}$ *are chosen.*

$$P = \frac{845}{3.0} = \boldsymbol{281\ kN}$$

4. Conclusions

In this study, the total load is about equal to 87000 kN. The axial load capacity of a single vertical pile has been calculated as 1270 kN. Number of vertical pile are 69. The lateral load capacity of the pile has been calculated using the method proposed by Broms and are chosen according to the smallest value. The smallest lateral load has been calculated 845 kN. Safety factor is taken 3.0 in this study. Allowable lateral load is about to equal to 281 kN.

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A CLASS OF SOME FUZZY CONTINUITY

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Abstract: In this document, we introduce new categories of functions named fuzzy na-continuous function and fuzzy strongly continuous function in fuzzy topological spaces. We study the characterization and the properties of fuzzy na-continuous function related to restriction function, graph function, composite function and product spaces. Additionally, the connection to other classes of functions that are defined on fuzzy topological spaces is analyzed.

Keywords: fuzzy topology, fuzzy regular-open sets, fuzzy a-open sets, fuzzy d-open sets, fuzzy strongly continuous, fuzzy na-continuous. 2010 AMS Classification: 54A40, 03E72

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A COMPERATIVE STUDY OF SiC REINFORCEMENT EFFECT ON MECHANICAL AND PHYSICAL PROPERTIES OF Al2024-SiC AND Al6061-SiC COMPOSITES PRODUCED BY POWDER METALLURGY METHOD

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Abstract: In thıs study, metal matrıces composite samples, Al2024 and Al6061, has been produced by powder metallurgy. Their partıcle sıze are 40 µm and 45 µm respectively and 12.5 µm partıcle sıze SiC powder helping with powder metallurgy. The diameter of chrome steel ball used in technique was 10 mm and weight ratio was 6:1. A homogeneous micrp structures have been obtaıned after SEM observatıons. Physıcal and mechanıcal propertıes has been defined by theorıtıcally and experımentally. Also, porosıty, hardness and thermal conductıvıty of the composıtes have been ınvestıgated ın thıs study. As a result, ıs has been achıeved that ıncreasıng of SiC content ıncreased the amount of pore ın composıte and thıs ıncrease caused decrease ın the mıcrohardness.

Keywords: composıte, powder metallurgy, SiC, hardness strength, porosıty.

Introduction

Allthough metals are used commonly in many industries, technologıcal progress is increase day by day and the industries need more superıor feature materials then metals. This materials called by composite materials and manufacturing of composites are increased because of their success. Composite materials are more superior than metals and they are reinforced materials. High strength and able to work with high temperatures are most prefable properties are composite materials. Usage areas of composite materials are extended as their advanced properties and various manufacturing methods.

Composite materials are obtained by adding of second phase on the single component materials like metal, ceramic or polymer. When choosing reinforcement material of composites, should be consider of mechanical properties. Aliminum and Al alloys are used for matrice materials and SiC, B_4C , Al_2O_3 , are used for reinforcement element generally. SiC has high strength, resistance and high density so that prefable for reinforcement element in many industries.

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Metal matrices composites, must have some advanced physical propertie such as high thermal conductivity, homogeneous micro structure, high strength for giving this properties to composites (Erdemir 2015). To specify properties of composites, there are some numeric and experimental methods. For instance, the hardness of samples are determined by Vicker Hardness method.

Al2000 and Al6000 series are commonly used series in metal matrices composites. Al 2000 series is consist of copper element. Strength of Al2000 is more than the others. Heat treatment processes are usable for this series. Al 2000 series are used frequently in aviation sector (Wu 2014).

On the other hand, Al6000 series contain Mg and Si elements. The most suitable series for aging process. Shaping ability is very high and after treatment, clean surface is obtained.

In lıterature, there are many theoritical and experimental studies about physical and mechanical properties of Al2000 and Al6000 series which are produced by powder metallurgy method. Mechanical and physical properties are played important role for determining microstructure of composites. Also, both of series have good mechanıcal properties and these are important parameters in production process and products.

In thıs study, the effect of SiC reinforcement on mechanical and physical properties of Al2024/SiC and Al6061/SiC composites produced by powder metallurgy method is researched, literature rewiev is done and results are disscussed and studied. In literature rewiev, based articles published in the year of 2015 and 2016 and the obtained datas are timely. And finally, there are actual photos which are used in specify of mechanical and physical properties of Al2000 and Al6000 alloys (Ates 2011).

Materials and Methods

Ih thıs study, effect of SiC reinforcement on mechanical and physical properties of Al2000 and Al6000 series and the results are disscussed comperatively for both series.

SiC is used reinforcement element as average microsize 12,5 μm, 40 μm grain size Al2024 and 45 μm Al6061. Their physical, chemical properties and compositions are given in the (Table1), (Table2), and (Table3) (Wu 2014).

Table 1. Physical and chemical compositions of Al2024 and Al6061 series.

Element	Cr	Cu	Fe	Mg	Mn	Si	Ti	Zn	Al
Al2024	0.10	5.3	0.5	0.4	0.3	0.50	0.15	0.15	Balance
Al6061	0.04-0.35	0.15-0.4	0.7	0.8-1.2	0.15	0.4-0.8	0.15	0.25	Balance

Table 2. Physical and chemical properties of Al2024, Al6061 and SiC.

		Al2024	Al6061	SiC
Physical properties	Density (g/cm^3)	2.83	2.7	3.22
Chemical properties	Thermal Conductivity (W/mK)	196	167	120

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Tablo3. Chemical composition of SiC.

Element	SiC	Fe_2O_3	C	SiO_2	Al_2O_3
%	94.0	0.10	4.5	0.70	0.70

In the Erdemir and friends study, average size of 40 and 45 **µ**m, and %5 reinforcement rate of SiC is mixed to obtain homogeneous mixture and they used for production of Al2024-SiC and Al6061-SiC by powder metallurgy method. And then obtained compositions are grained at 300 rpm speed for 10 hours. Chrome steel balls are used and their radius are 10 mm. Powder weight ratio determined as 6:1 and grain process was done in toluen solution because of prevent oxidation. Finaly, grained powders collected to 2, 5 and 10 hours interval and graining process was completed. SEM photos before grain process of Al6061 and SiC powders are shown (Yao 2015).

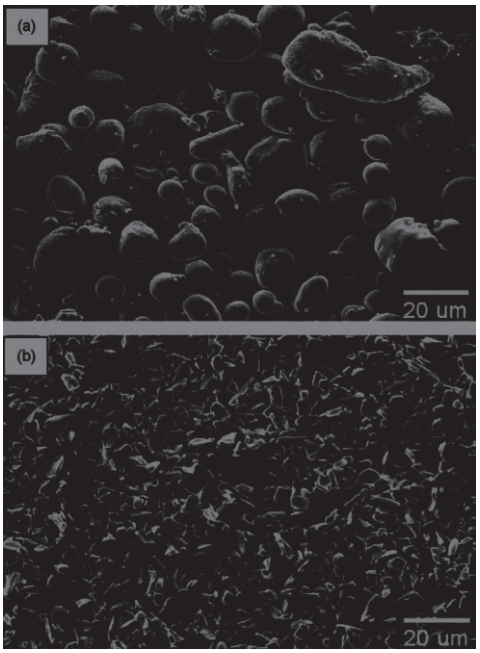

Figure 1. SEM photos of Al6061-SiC powders . (a) Al6061 (b) SiC

In the another study, Parvin and friends investigated Al2024-SiC and Al6061-SiC composites fracture surfaces produced by powder metallurgy with Scanning electron microscope (Hassani 2014). SEM pictures , which are showed in Figure2, its seen that grainin time is increased, composites are distributed homogeneously. Also, SiC was homogeneously distributed both Al series and increasing SiC reinforcement weight ratio, homogeneous structure obtained fast (Shaga 2016).

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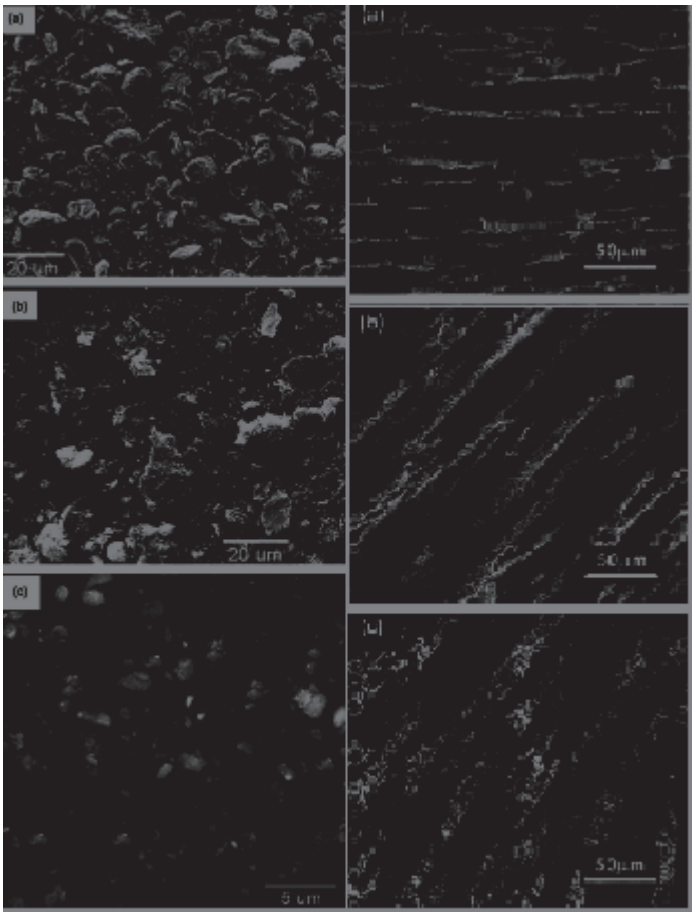

Figure.2 Al 6061-SiC ve Al2024-SiC composites's SEM photos. (a) 2, (b) 5, (c) 10 hours after graining.

Relative density measurement is done by Arshimed method comparing theoritical and experimental density, their values are nearly same. All of compiled studies given that theoritical density values obtained to %85-90. This results are good for this study.

Porosity measurements of components are done firstly calculation of theoritical density and then calculation of experimetal density of all component composites by Arshimed method. Secondly, porosity values are calculated by the formula (Cao 2016).

In the another study, X-ray diffraction specrtroscopy is used for microstructure characterization and determining phase distribution. SiC is added different weight ratios on composites, than XRD models are obtained both Al series. They are shown in Figure below. According to the models, microchemical structures and including element are determined also.

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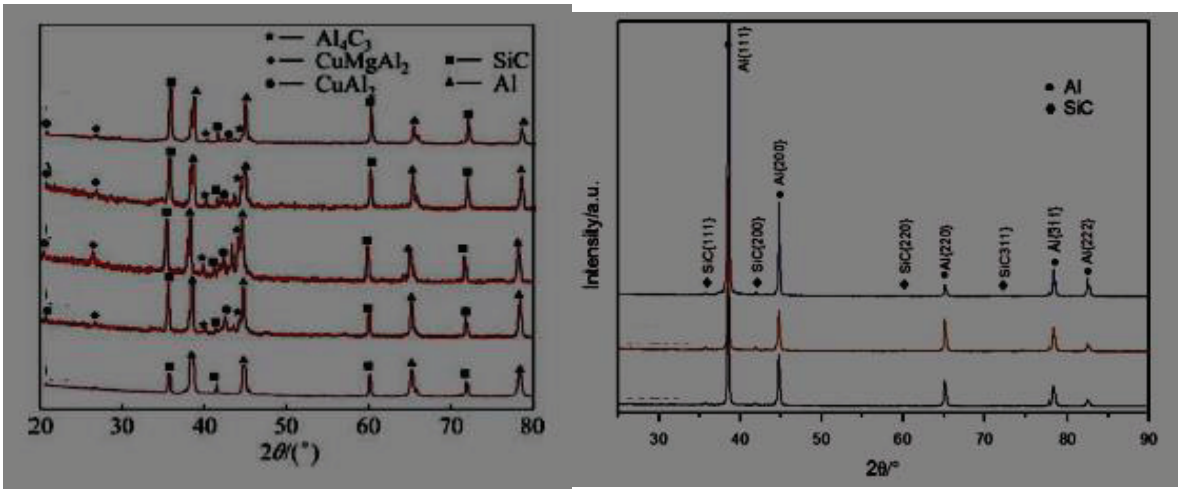

Figure.3 XRD models of Al6061-SiC ve Al2024-SiC composites in different weight ratios.

In thıs study, different analitical and numerical methods are shown which are used for determining physical and mechanical properties of metal matrices composites which is produced by powder metallurgy method. Also, density and hardness values are calculated byexperimental methods. Also, archimed method is used for determining porosity (Turkmen 2015).

Results and Discussion

In thıs study, effecct of SiC reinforcement on Al2000 and Al6000 series is investigated comperatıvely and lıterature rewiev collected and results are commented.

After studıes, Its clear that weıght ratıo of SiC reınforcement is affected porosity durıng productıon process of Al2024-SiC and Al6061-SiC composites. When, %5 of reinforcement volume ratıo of SiC ın metal matrix is increased, porosity of Al2024 is increased whereas porosity of Al6061 is decreased. For this reason Al6061 series has more clean surface than Al2024 series after heat treatment process.

Hardness experimentals of materials in compiled studies are done by Vicker Hardness testing method. The resul of experiments show that, ıncreasing amount of SiC is decreased hardness of material on Al6061-SiC composite. On the other hand, maximum hardness value of Al2024-SiC composite is obtained with %30 SiC weight ratıo ın composite. As, shaping processes are used frequently on Al600 series, decreasing hardness values are good charactheristic. On the series of Al2000, resistance strength is much more and this is important for industries.

Table.4 Hardness experiment of Al6061-SiC composite and percent porosity results.

SiC(vol%)	SiC size(µm)	Al6061 size(µm)	Hardness (VH)	Density (g/cm^3)	Theoritical density (g/cm^3)	Porosity (%)
45.8	12.5	45	153	2.73	2.93	0.932
55.9	12.5	45	86	2.61	2.98	0.874
66.3	12.5	45	42	2.44	3.03	0.803
45.8	12.5	45	176	2.78	2.93	0.969
55.9	12.5	45	155	2.71	2.98	0.898
66.3	12.5	45	67	2.42	3.03	0.833
45.8	12.5	45	157	2.84	2.93	0.950
55.9	12.5	45	135	2.68	2.98	0.909
66.3	12.5	45	47	2.53	3.03	0.797

Table.5 Hardness experiment of Al2024-SiC composite and percent porosity results.

SiC(vol%)	SiC size(µm)	Al2024size(µm)	Hardness (VH)	Porosity (%)
30	12.5	40	170	0.5674
40	12.5	40	225	0.5978
50	12.5	40	205	1.3811
60	12.5	40	180	2.0272
30	12.5	40	132	0.061
40	12.5	40	163	0.1925
50	12.5	40	155	0.2445
60	12.5	40	145	0.2015
40	12.5	40	175	0.59007

Finally, thermal conductivity of composites are studied experimental and theoritically. The result of experimental works, increasing SiC weight ratio, thermal conductivity of materials are increased both series. When the Al and SiC are combined in two series, thermal conductivity is reached the peak. Increasing thermal conductivity is contributed to both series of Aliminum for heat treatment processes.

SEM photos of composites show that SiC is dispersed in Al metal and its behaviour is appropriate for theoritical models. There is no heterogeneous wiev on Al2024-SiC and Al6061-SiC.

In compiled works, its clear that density of composite materials which are produced by powder metallurgy method, reach %85-90 of theoritical densities. Also, with high temperatures there is no change in micro structures of Al-SiC composites.

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A NEW HYBRID DECISION MAKING MODEL TO OPTIMIZE MACHINING OPERATIONS

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Abstract: Multi criteria decision making models (MCDM) are extensively used in material and process selection in engineering. In this study, a novel hybrid decision making model is developed. Best-Worst (BWM) and entropy methods are combined and hybridized with Reference Ideal Method. The model is tested in a face milling case study taken from literature. The developed model produced similar results with literature. The proposed model can be used by engineers and operators in manufacturing environment.

Keywords: Multi criteria decision making, Best-Worst method, Reference Ideal Method, Micromachining, face milling

Introduction

In recent years, there has been an increasing amount of literature on MCDM. When the studies in literature are investigated, MCDM techniques are grouped under 15 topics: Energy-environment-sustainability, supply chain management, material, quality management, Geographic Information Systems (GIS), construction and project management, safety and risk management, manufacturing systems, technology management, operation research and soft computing, strategic management, knowledge management, production management, tourism management and the other fields (Mardani et al., 2015). For MCDM techniques, there are a lot of studies in the area of material science (Jahan et al., 2011) production technologies (Streimikiene et al., 2013), mass production (Chang et al., 2013), manufacturing sector (Bagočius, 2013) manufacturing systems (Jana et al., 2013), global production (Tzeng and Huang, 2012) and production strategies (Yurdakul, 2004).

One of the new methods developed in recent years is Best-Worst method. This method provides to score only best and worst criteria. Therefore, pairwise calculations are only between best and worst criteria and calculations are simple. Furthermore, it is more consistent than AHP method. Reference Ideal method is another new MCDM method to rank the alternatives by using subjective decision matrix. Entropy method is an objective weighting method to determine criteria weights. By using this method, the entropy weights are calculated by using the information entropy (Razaei, 2015; Cables et al., 2016; Li et al., 2016).

Up to now, for MCDM techniques, previous studies are generally carried out in Operation Research-Soft Computing and energy-environment-sustainability. In machining operations, researchers rarely developed MCDM models. Furthermore, developed model in this study is a new hybrid decision making model and it is used for the first time in the literature.

In this study, Best-Worst and Entropy methods are combined and hybridized with Reference Ideal Method. The proposed model is tested in a face-milling operation. The criteria weights are calculated by using Best-Worst and entropy method. Using these criteria weights, the experiments are ranked by using Reference Ideal Method. In the second part of the study, methods used in the study are explained briefly. In the third section, case study taken from literature is summarized. In the final sections, results and discussion, conclusion sections are given, respectively.

Materials and Methods

The case study is taken from Yan and Li's study (Yan and Li, 2013). The experiments are carried out by using CNC micromachining center. Face milling operation is performed. 3 flutes carbide tool is used in dry cutting operations. The dimension of the workpiece is 50×30×1.2 mm. The measurements are carried out by changing four parameters: spindle speed, feed rate, depth of cut and width of cut. Three levels are used for experimental design. The design of the experiments is given in Table 1. The purpose of the study is to maximize material removal rate (MRR) and to minimize surface roughness (SR) and cutting energy (CE).

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Table 1. The design matrix of case study

Experiment no	Spindle speed (r/min)	Feed rate (mm/min)	Depth of cut(mm)	Width of cut (mm)	MRR (mm^3/min)	SR (µm)	CE (kj)
1	1000	200	0.2	5.00	200	2.15	555.802
2	1000	200	0.3	10.00	600	2.2	204.929
3	1000	200	0.4	15.00	1200	1.54	108.519
4	1000	250	0.2	5.00	250	3.28	446.109
5	1000	250	0.3	10.00	750	4.71	166.05
6	1000	250	0.4	15.00	1500	3.13	89.823
7	1000	300	0.2	5.00	300	4.43	381.832
8	1000	300	0.3	10.00	900	4.31	142.976
9	1000	300	0.4	15.00	1800	2.83	73.988
10	1500	200	0.2	5.00	400	3.05	357.042
11	1500	200	0.3	10.00	900	0.94	162.727
12	1500	200	0.4	15.00	400	3.48	319.031
13	1500	250	0.2	5.00	500	3.44	289.604
14	1500	250	0.3	10.00	1125	1.88	133.648
15	1500	250	0.4	15.00	500	3.73	258.476
16	1500	300	0.2	5.00	600	2.73	233.559
17	1500	300	0.3	10.00	1350	2.1	112.551
18	1500	300	0.4	15.00	600	1.99	213.109
19	2000	200	0.2	5.00	600	3.18	264.303
20	2000	200	0.3	10.00	300	3.89	445.797
21	2000	200	0.4	15.00	800	2.65	185.62
22	2000	250	0.2	5.00	750	2.58	213.939
23	2000	250	0.3	10.00	375	2.92	358.579
24	2000	250	0.4	15.00	1000	2.92	151.343
25	2000	300	0.2	5.00	900	2.39	180.886
26	2000	300	0.3	10.00	750	2.09	306.85
27	2000	300	0.4	15.00	1200	1.84	128.147

Results and Discussion

The purpose of the study is to maximize material removal rate (MRR) and to minimize surface roughness (SR) and cutting energy (CE). First, Best-Worst method is used to obtain these outputs' weights. According to five experts, criteria points are presented in Table 2. The average value of five experts' points are taken. Consistency ratio is lower than 0.1, so the analysis is consistent.

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Table 2. Criteria points according to 5 experts.

EXPERT-1	SR	CE	MRR	Objective
Best:MRR	4	2	1	2.2e-7
Worst:SR	1	2	4	
EXPERT-2	SR	CE	MRR	
Best:MRR	3	3	1	7.5e-7
Worst:SR	1	1	3	
EXPERT-3	SR	CE	MRR	
Best:MRR	3	1	1	1.204e-7
Worst:SR	1	3	3	
EXPERT-4	SR	CE	MRR	
Best:MRR	4	4	1	2e-7
Worst:SR	1	1	4	
EXPERT-5	SR	CE	MRR	
Best:MRR	4	1	1	2.79e-7
Worst:SR	1	4	4	

By using experimental results, entropy weights are calculated. All the weights used in the model is given in Table 3.Three different weights are used in the analysis.

Table 3. Criteria weights used in the analysis

Methods	**MRR**	**SR**	**CE**
Case study (Yan and Li, 2013).	0.3315	0.2329	0.4356
Entropy	0.4400	0.1700	0.3900
Best Worst	0.5400	0.1500	0.3100

Range and reference ideal matrices are determined as follows.
Range matrix: AB = [100, 2000, 0.5, 6, 50, 600]
Reference ideal matrix: CD = [1800, 1800, 0.94, 0.94, 74, 74]
By using criteria weights from Table 3, RIM is developed. In Table 4, RIM results are presented.

Table 4. RIM results according to different weighting methods.

Weighting methods	**Rankings**
Case study (Yan and Li, 2013)	27-13-4-25-15-3-24-11-1-22-7-21-20-6-19-16-2-14-18-26-10-12-23-8-9-17-5
Best worst	27-14-4-25-12-2-24-10-1-22-8-21-20-6-19-16-3-15-18-26-11-13-23-7-9-17-5-16-4
Entropy	27-15-4-25-13-2-24-10-1-22-8-21-20-6-19-17-3-16-18-26-11-12-23-7-9-14-5

In Table 5, correlation coefficients of these rankings are given. The correlation coefficients are significant at 5% level which means there is no significant difference between rankings.

Table 5. Correlation matrix (r/p)

Methods	**Case study**	**Best-Worst**	**Entropy**
Case study	1.000/0.000	0.995/0.000	0.991/0.000
Best-Worst	0.995/0.000	1.000/0.000	0.996/0.000
Entropy	0.991/0.000	0.996/0.000	1.000/0.000

In Table 6, comparison of the results with literature is given. Experiment #9 is the optimum experiment, so the optimum cutting conditions are the same.

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Table 6. Comparison of the results (Yan and Li, 2013).

Studies	Spindle speed	Feed rate	Depth of cut	Width of cut
Literature study	1000	300	0.4	15
Current study	1000	300	0.4	15

Conclusion

In this study, a new hybrid decision-making model is proposed. Best-Worst and entropy methods are used to calculate criteria weights and reference ideal method is used to determine the final rankings Face milling optimization problem was taken from the literature as a case study. The developed model was tested with this problem. The obtained results showed that calculated rankings are nearly same. There is no difference between these rankings at 5% significance level. The developed model can be used different optimization problems.

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A QUALITATIVE STUDY ON SONG TEACHING TO PRIMARY SCHOOL CHILDREN: THE SAMPLE OF ARTVIN

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Abstract: One of the main goals of music education is, undoubtedly, to leave impacts on students' affective, cognitive, intuitive and psychomotor structures. It is also aimed for the students to internalise these impacts and to be able to make a music culture on their own. At this stage of culture-making, the importance of song teaching is an inarguable fact. On the other hand, it is a known that there can occur various difficulties on the process of this training especially on the children at younger ages. It is a known fact that facing various issues about when to employ which method is rather common. While giving children music education we must sure have basic information about their affective, cognitive, intuitive and psychomotor developments. At the same time we must also have appropriate plans and programs scheduled. In this study; a qualitative practice on song teaching to 20 elementary school students is made. On song teaching; the melody of a song is given to 10 students only by playing the melody on the org monophonically and with vocals while the melody of the same song is given to another 10 students played polyphonically accompanied by the org and with vocals. The practice had been done for 40 minutes per week for 4 weeks. At the end of this study the findings had been gathered and presented with statistical information.

Keywords: Music education, song teaching, polyphony

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A STUDY ON CORROSION BEHAVIOUR OF DIFFERENT AL MATRIX COMPOSITES

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Abstract: Different Al matrix metal compozites' s corrosion behavior is studied as literature rewiev. Al 6061 and Al 7075 matrix with SiC reinforcement are examined by using literature. SiC reinforcement action of compozite corrosion is identified by experiments. Optimum reinforcement volume rate is detected. Also, different method is examined for corrosion behavior. Besides, Al 2024 matrix metal compozites' s corrosion experiments which different method used, are submitted.

Keywords: composıte, corrosıon, Al matrix,

Introduction

Aliminum is one of the materşal which is used after steel. Al is found in natüre easily. It has a density of 2,71 g/cm 3 nd the value is one third of steel's density.

Draft limit value of some Al alloys are higher than lot's of steel alloys. For this properties Al alloys are prefable for lightness desired applications.

Al based metal matrıx composıtes are important class of materıal, with non metallic reinforcements incorporated in metal matrices. Al alloy matrices, mainly 2024, 6061 and 7075 have been widely used as matrix materils with silicon carbide as their maor reinforcing agent. These materials have received incrased attention due to their potentially high fracture toughness and hıgh strength to weıght ratio.

The high thermal conductivity and low coefficient of thermal expansion of these materials have lead to a number of applications especially in automobile engine.

In corrosıve medıum, Al surface is coated with oxide layer to give a corrosion resistance to Al. With this property al is frequently used alloys. Al alloys consist of some elements such as Si, Zn, Mn and these are suitable for obtain galvanic ells. So that, ın terms of corrosion experiment Al is must be used for unique material. On the other hand, mechanical strength of Al is weakand single use of Al is not common (Chen 2016).

Mechanical and chemical properties of Al is change with micro structure and alloy elements. Most important alloy elements of Al are copper, Si, Magnezium and Zinc.

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Medium strength and curable AlSiC alloys are well-formed and common used. Also, corrosion resistance of these alloys are high. SiC is the most common reinforcement element in metal matrix composites. The advantage of SiC is high thermal resistance.

Al7075 is top alloys of reinforcement metals and excellent power, low density, corrosion resistance, high thermal stability, are some important roperties. Unlike, using of metal cage composites, Al7075 is to increase corrosion rate, it is a disadvantage.

Al6061 has a high hardness strength, high corrosion resistance and well weldable. The corrosion resistance of Al6061-SiC is lower than püre Al alloy. On the other hand tensile strength of alloys is quite high.

Finally, Al2024 alloys, heat treatment processes are workable and fatigue strength is high. With surface coating, corrosion resistance is increasing. Because of its high strength and low density ; Al2024 is extensively used as structural materials in the aircraft and aerospace industries.

In thıs study, SiC reinforcement Al alloys studied for effecting corrosion resistance and literatur rewiev is done. Al7075, Al6061 and Al2024 alloys are studied seperately and results are compared.

Materials and Methods

Al7075, Al6061 and Al2024 corrosion experiments are done different methods. All of alloys SiC used as a reinforcement element with %15 weight ratio. Firstly, before corrosion experiments Al alloys are obtained from different metods also. Then the corrosion experiments are started. In (Table 1.) chemical compositions of Al7075, Al6061 and Al2024 and (Table 2.) properties of these alloys is given respectively .

Table 1. Chemical composition of Al2024 Al6061 and Al7075.

Element	Cr	Cu	Fe	Mg	Mn	Si	Ti	Zn	Al
Al2024	0.10	5.3	0.5	0.4	0.3	0.50	0.15	0.15	Balance
Al6061	0.04-0.35	0.15-0.4	0.7	0.8-1.2	0.15	0.4-0.8	0.15	0.25	Balance
Al7075	0.2	1.55	0.4	2.82	0.11	0.27	0.15	0.3	Balance

Table 2. Physical and chemical properties of Al2024, Al6061 and Al7075.

		Al2024	Al6061	SiC
Physical properties	Density (g/cm^3)	2.83	2.7	2.64
Chemical properties	Thermal Conductivity (W/mK)	196	167	200

Sun and friends studied that Al 7075 is an alloy which is well known for its structural properties and which is used in the production of metals which are also affordable and light weight. 0.1 M solution of acid chloride and 3.5% of natural chlorite were used in corrosion tests of Al7075 alloy. SiC with grain size of 60-90 micron was used as reinforcement element. Alloy was obtained by adding 2% and 4% by volume of SiC to the molten Al metal in the composite formation. In the corrosion tests of the obtained Al7075 alloy, weight loss was used as a method (Manjunatha 2016).

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In corrosion experiments for Al7075, composite samples were washed, dried with acetone and weighted electronic scale. The samples were then dipped and weighed for 24 hours. Corrosion studies were carried out in hydrochloric acid, acid sulphate, acid nitrat and NaCl solutions. The weight loss of the samples was measured for 24 hours during 1 week. The beakers mouths were kept closed during the test to avoid weight loss. After a certain period of time, the specimens are removed from the solution and washed to remove the corrosion residues, washed with acetone water and dried. Then, weighed graphs were made by measuring the weights of the weighed samples (Manjunatha 2016).

Al6061-SiC metal matrix composite is prepared by mixing casting technique. In this method, %99 of pure SiC is used while corrosion experiment is done, % 15 volume of SiC is used and alloy is obtained as a rod form. Cylindrical test coupons were cut from the rods and sealed with epoxy resin in such a way that, the areas of the composite. It is then degreased with acetone, washed with distilled water two times and dried before immersing in the corrosion medium. Experiments are carried out using a thermostat at temperatures 30 C, 35 C, 40 C, in sodium hydroxide solutions of concentrations 0.05 M, 0.1 M and 0.25 M (Kumari 2016)

Finally, Al2024 corrosion experiment, corrosion specimens are soaked in prepared acid NaCl solution with silicone protection on both grip ends. The corrosion solution was %9,5 sodium chloride solution and pH value is adjusted to about 4 by adding dropwise of dilute sulfuric acid. After corrosion, specimens are washed with distilled water for 2 min and blown dry with air. Corrosion method is multiaxial fatigue tests for Al2024.

All of these corrosion experiment the results are commented and supported with SEM photos (Sun 2009).

Results and Discussion

For this paper Al7075, Al601 and Al2024 alloys's corrosion experiments are studied. Three different corrosion method is used. These are weight loss, multiaxial fatigue and corrosion in NaOH solution.

For all method results it is clear that corrosion is effected negatively physical properties of Aliminum alloys. Also, corrosion time is important for matrices and surface corrosion is obtained for three alloys with increasing corrosion time. This surface corrosion is about reinforcement elements, temperatures sometimes.

It is seen that Aliminum alloys (Al7075, Al061 and Al2024), which are consist of Mg element is slowly increase corrosion resistance and while adding other elements especially SiC, the mechanical properties are very well for three different corrosion methods.

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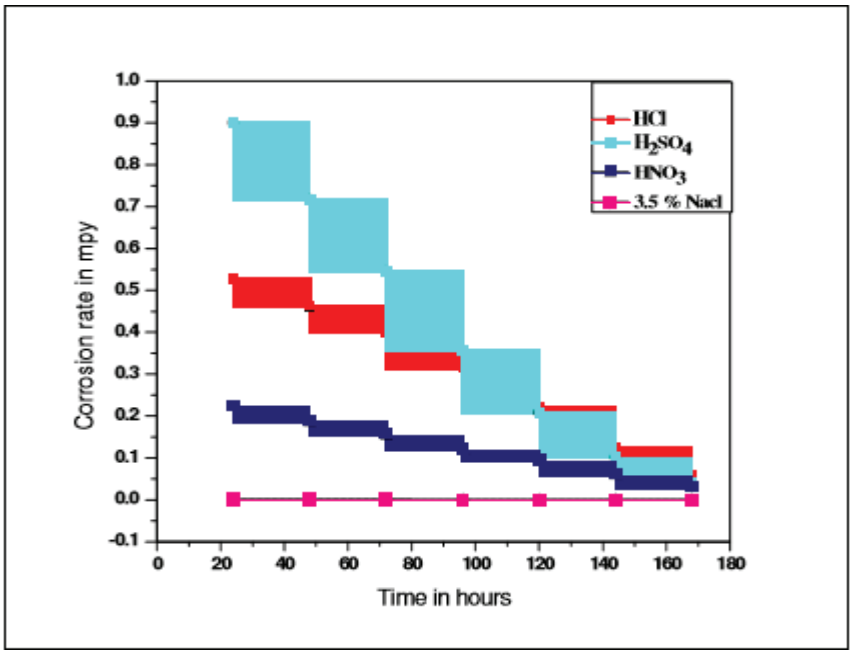

Figure 1. Weight loss corrosion test of Al 7075 alloy in different mediums.

As seen in Figure 1. Manjunatha and friends work's weight loss corrosion test results of Al7075, in NaCl, Sulfuric acid, Acid Nitrare and hydrochloric acid solutions. In NaCl solution, there is no corrosion rate. The maximum corrosion rate is obtained from sulfuric acid solution. In hydrochloric acid and acid nitrate solutions is also obtained high corrosion rate for Al7075 alloy.

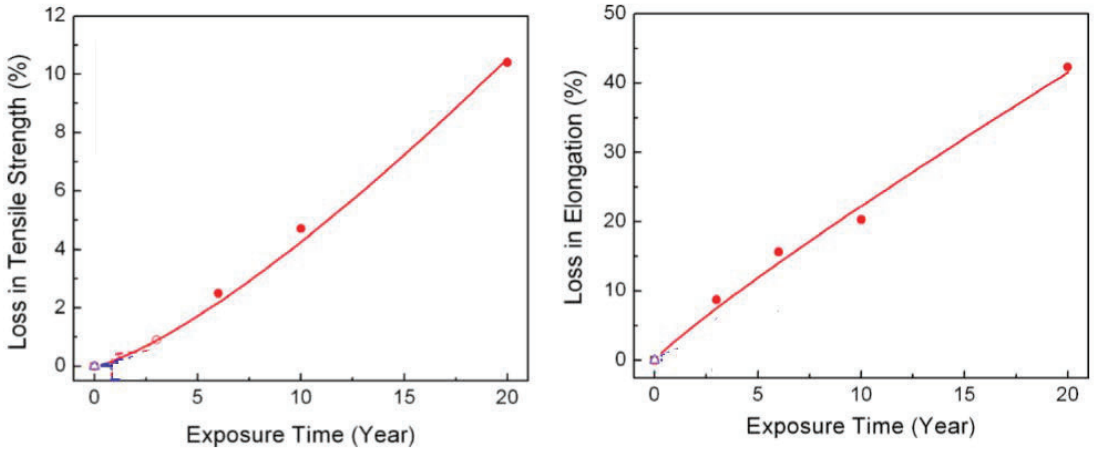

Figure 2. Losses in tensile strength and elongation for 7075 versus exposure time at wight loss method.

Tensile strength is important property for matrices and it is decreased with increaing corrosion rate and also corrosion rate is effected elongation. When the weight loss method is used in Al7075 alloy corrosion rate is effeccted mechanical properties. This method is effected negatively more than the others.

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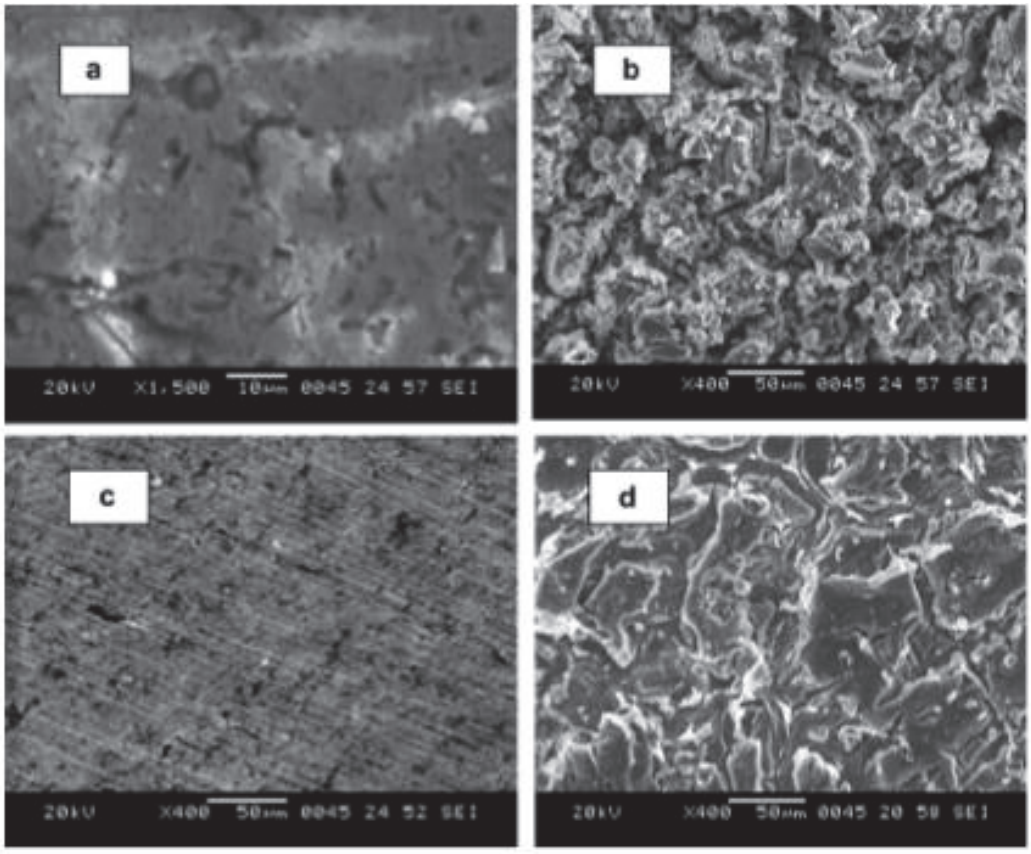

Figure 3. SEM image of Al6061 freshly polished surface of the composite (b) after immersion in 0.5 M NaOH. (c) Freshly polished surface of the base alloy (d) after immersion in 0.5 M NaOH.

As seen in (Figure 3.) SEM photos of composite surface and alloys photos which are in 0.5 M NaOH solutıon. It ıs clear that NaOH is formed high corrosıve medıum for Aluminum. Composıte samples are corrosive uniformly. The corrosion rate of Al-6061 increase with the increase in the concentration of sodium hydroxide. Also, it is observed the corrosion rate of Al6061 increase with the increase of temperature.

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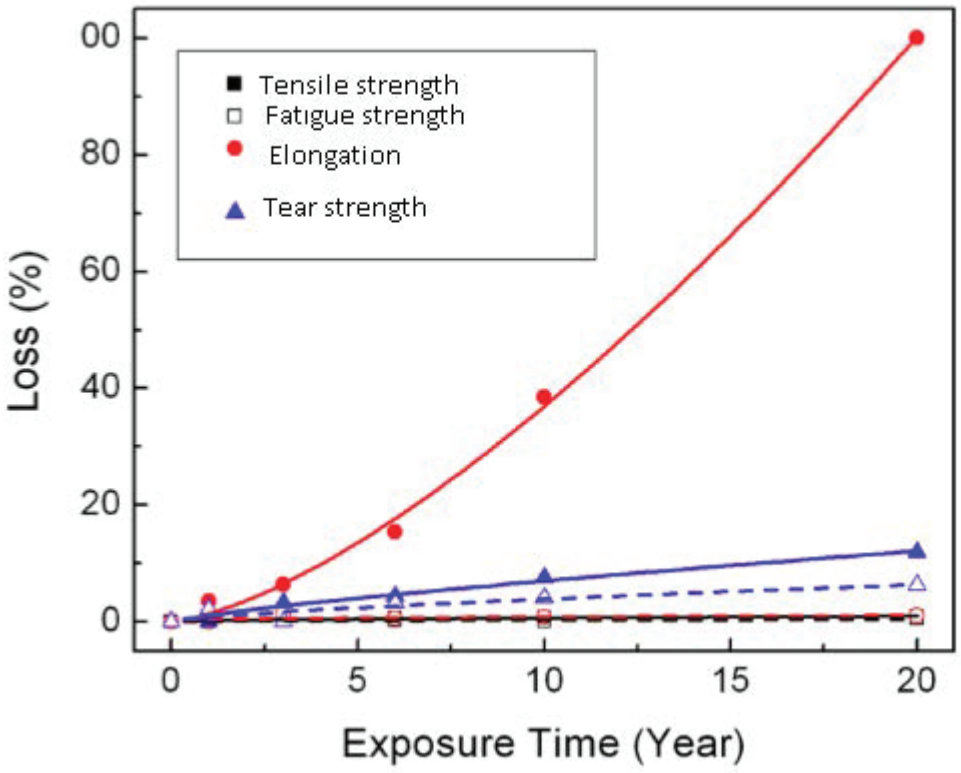

Figure 4. loss ın mechanical properties of Al2024 alloy.

With multiaxial-fatigue corrosion method mechanical properties of Al2024 is also studied. Tensile strength, fatigue strength, tear strength and elongatıon values are seen in Figure 4. It ıs clear that increasing corrosion time of specimens loss in physcial properties are increasd also.

2024 under pre-corroded condition, multiaxial fatigue life decreases gradually with the increase of corroson time. With increasing corrosion time, stress concentration of specimens are increase.

It has been reported that the corrosion resistance of Al matrix composites depends on many factors such as proceessing technique; type and charasteristic of the matrix alloy; type, size, shape and amount of the reinforcement; the type of corrosive media, and the environmental factors. The fabricaion and processing of matrix composites sometimes lead to the formation of an interphase between the matrix and the reinforcements, which can also influence corrosion (Bedir 2015).

Some investigators have concluded that the increased corrosion rate is due to the formation of Al alloys at the reinforcement interface. It has been reported that the einforcing phase, in this work SiC is used reinforcement element, can also affected the corrosion behaviour of matrices by modifying the distribution of intermetallic phases in Al alloys (Zakaria 2014).

Acknowledgement

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A STUDY ON SEVERAL TYPES OF CONTINUITIES IN FUZZY SETTINGS

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Abstract: In this study, we extend strongly na-precontinuity, strongly M-precontinuity, na-continuity to fuzzy topology and discuss characterizations of strongly na-precontinuity. Also, the properties of fuzzy strongly na-precontinuity about restriction function, graph function, composite function and product spaces are analyzed. Moreover, the relationship with the mentioned types of fuzzy continuities is also investigated on some fuzzy spaces.

Keywords: Fuzzy topology, fuzzy preopen set, fuzzy δ-open set, fuzzy strongly na-precontinuity, fuzzy strongly M-precontinuity. 2010 AMS Classification: 54A40, 03E72

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A STUDY ON THE REDUCTION OF BLACK-CARBON USING EMULSION FUEL IN A MARINE DIESEL ENGINE

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Abstract: This study analyzes the performance and exhaust emission characteristics of a diesel engine using marine diesel oil (MDO) and water emulsion fuel. Since an experiment with a ship's diesel engine would involve numerous restrictions and expenses, a scaled-down diesel engine for vehicles was used for this research. It was predicted that there would be some difference in terms of basic combustion characteristics because the automotive diesel engine was designed to use Ultra Low Sulfur Diesel (ULSD) fuel. Therefore, a preliminary experiment was conducted to investigate the difference between two fuels by analyzing the combustion characteristics. As a result, significant issues were observed, even when MDO was used in the automotive diesel engine, with the exception of the low-load section. Thus, MDO and water emulsified fuel were applied to an automotive diesel engine. From the test results of MDO and water emulsion fuel, the combustion performance of water emulsion fuel was shown to be superior to that of MDO. Latent heat from the evaporation of water particles in the fuel and micro-explosion phenomenon resulted in improvement of exhaust emission and combustion performances.

Keywords: Marine diesel oil (MDO), Marine diesel-water emulsion fuel (ME), Exhaust emission, Micro-explosion, Heat release (HR)

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A WORKING PROTOTYPE OF THE EVALUATION SYSTEM FOR BUILDING FACADE MODULES BASED ON COLORFUL SEMI-TRANSPARENT SOLAR CELLS

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This research aims at suggesting a fundamental technology for the building facade based on hybrid modules for colorful semi-transparent photovoltaic (PV) cells satisfying both functional factors such as energy efficiency and/or environmental performance and building aesthetics. In addition, an integrative evaluation system for building components with target technologies will be proposed to promote applications for AEC (Architecture, Engineering and Construction) industries by this development as well.

This study attempts to employ hybrid modules for colorful semi-transparent solar cells at the most initial step, and building guideline for utilizing the above developed photovoltaic modules are to be suggested through analyses and evaluations for specimen buildings with the target technology. Then, a prototype as a pilot business model for the facade module with the proposed colorful semi-transparent solar cells are proposed and their application manuals as the professional guideline will be implemented for supporting architectural industries after all.

Hybrid modules for colorful semi-transparent solar cells presented by this research are future-oriented and will have a variety of applications for increasing environmental capabilities through controls for daylighting and solar heats, improving spatial comfort and assisting for designing building evaluations in aspects of aesthetics. In addition, developed technologies and applied building components can be supported and diverse services in the field of architecture responding to building spaces could be further developed. Research outcomes will be useful not only for planning and designing buildings and communities supporting green building regulations, but also for supplying standard modules to develop business models and information databases for their design strategies.

Keywords: BIPV (Building Integrated Photovoltaics), Semi-transparent PV, Building Aesthetics, Building Facade, Energy Efficiency

Acknowledgments

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Keywords: BIPV (Building Integrated Photovoltaics), Semi-transparent PV, Building Aesthetics, Building Facade, Energy Efficiency

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Abrasive Flow Machining of TI-6AL-4V

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Abstract: Abrasive flow finishing is a non-conventional finishing process by means of which a wide range of applications, from die-mold industry to medical, aircraft and aerospace components in which critical components must be finished to within precise or especially demanding tolerances. Ti-6Al-4V displays high strength, corrosion and heat resistant properties and are commonly used in high temperature applications such as turbine blades and rocket engines. It is considered more difficult to finish using conventional techniques (grinding, lapping, etc.) than other metallic materials. This paper conducted on the finishing of the difficult to machine material of Ti-6Al-4V. The influence of the Abrasive flow finishing process on Ti-6Al-4V workpiece was investigated. The results show that the white layer formed during wire electrical discharge machining is successfully removed by abrasive flow finishing in a few cycles for each workpiece. Although the surface quality is improved by abrasive flow finishing for wire electrical discharge machined difficult to machine material as the level of lapping process.
Keywords: Abrasive Flow Finishing, Surface Roughness, EDM, Ti-6Al-4V

Introduction

The conventional finishing processes, in spite of recent technical advancement, are inadequate to finish hard, high strength, heat resistant alloys and complex shapes. Today, more non-conventional finishing processes are being placed on replacing traditional, hand-work finishing and polishing with mechanized, automatic processes. Abrasive flow machining (AFM) is one of these processes. Abrasive flow machining (AFM) is a specialized non-conventional finishing process which uses abrasive media to improve the surface quality of the surfaces. The AFM process can be successfully applied to the aerospace, aircraft, medical, and other precision manufacturing areas.
In AFM process, the pressurized abrasive media passes through or over the workpiece surfaces to reach the desired surface quality. Especially the internal passages which are difficult to polish by other techniques, are finished by AFM process successfully, workpiece holder is used to restrict the media flow over the appropriate surfaces for external passages. By using AFM process excellent surface finish and close geometric tolerances can be reached economically for different kinds of engineering materials from soft to hard, ferrous to nonferrous, and also metallic to non-metallic.
AFM process parameters, abrasive media parameters and workpiece parameters can be classified as main AFM parameters. Some researcher has been studied these parameters to evaluate the success of AFM process. Number of cycles, extrusion media pressure, media flow speed, and machining time are named as AFM process parameters. Media viscosity, abrasive type, abrasive mesh size and its concentration are abrasive media parameters. The type of workpiece material (metallic and non-metallic etc.), the shape of workpiece, hardness of the workpiece, and the pre-machining process of workpiece are named as workpiece parameters for AFM process.
Rhodes *et al*. studied AFM process and evaluated process parameters such as extrusion pressure, speed of the abrasive media, volume of the abrasive media, types of abrasive, which affects the finishing of workpiece (Rhoades 1991). Jain *et al.* (Jain and Adsul 2000) carried out a detailed experimental study to investigate the main AFM parameters such as number of cycles, abrasive media pressure, media velocity, abrasive mesh sizes, abrasive concentrations and workpiece materials effects on performance parameters. They concluded that effective AFM process parameters (from high to low effects) are abrasive concentration in media, abrasive mesh size, number of cycles and media flow speed. Jain *et al.* developed a theoretical model for AFM process and compared with the experimental studies. The results showed that well agreement between theoretical and experimental results.(Jain and Jain 2003)
AFM media parameters (abrasive mesh size and concentration, temperature and viscosity) were studied by Jain *et al*.(Jain, Ranganatha et al. 2001). They concluded that the media viscosity increases with increasing abrasive concentration and decreases with the increase in mesh size and media temperature. Higher the viscosity results in high material removal rate (MRR) and better surface roughness. Flether and Fioravanti (Fletcher and Fioravanti 1996) studied the rheology of the abrasive media, they used polyborosiloxane as polymeric carrier for abrasive media. They concluded that the abrasive concentration is more effective parameter than mesh size and polymeric carrier. The thermal effect on machining efficiency of abrasive media were studied by Flether and Fioravanti

(Fletcher and Fioravanti 1996) They concluded that when abrasive concentration is increased, the media thermal conductivity is increased. The surface heat transfer coefficient is directly related to the abrasive media concentration. Gorana *et al*. (Gorana, Jain et al. 2004) studied the AFM media parameters such as media pressure, abrasive concentration and mesh size. Silly-putty and silicon carbide (SiC) abrasive were used as abrasive media for experiments. The acting forces on the surfaces were measured during the finishing process. The influence of the abrasive media parameters on the surface roughness were concluded. Agrawal *et al*. (Agrawal, Jain et al. 2005) studied the media parameters, the polyborosiloxane was used as polymeric carrier for abrasive media. The viscoelastic properties of abrasive media such as viscosity, creep compliance and bulk modulus were predicted. Loveless *et al*. (Loveless, Williams et al. 1994) studied the AFM process on the various machined surfaces obtained from grinding, milling, turning, and WEDM operations. They reported that the best improvement in the surface quality was obtained on the WEDMed surfaces.

Nowadays some new finishing process have been developed from AFM process, centrifugal force assisted abrasive flow machining (CFAAFM) was studied by Walia *et al.(Walia, Shan et al. 2006)* The results show that the productivity is higher in CFAAFM process then traditional AFM. FEM models were studied to simulate the CFAAFM process. Sharma *et al. (Reddy, Sharma et al. 2008)* also studied the CFAAFM process, Material removal and surface finish are both effected by the CFG rod speed, media pressure and the abrasive mesh size. Kenda and Pusavec (Kenda, Pusavec et al. 2011) studied the influence of process parameters on surface integrity. They used EDM pre-machined hardened tool steel AISI D2 as workpiece and reported that AFM is capable to remove EDM damaged surface and significantly improve surface roughness as well as inducing high compressive residual stresses onto the finished surface. Jain *et al*. (Sankar, Ramkumar et al. 2009) studied the influence of AFM process parameters on metal matrix composite (MMC) workpiece surface. They concluded that the finishing mechanism and material removal in case of MMC is different from that in case of steels.

Gov *et al*. (Gov, Eyercioglu et al. 2013) studied the effects of the workpiece hardness on AFM process. They used WEDM pre-machined and three level hardened AISI D2 tool steel as workpiece. They concluded that AFM process has better performance on the hardest workpiece. Y.C. Lin *et al*. (Lin, Chow et al. 2007) studied the effects of the AFM process on micro holes which were fabricated using electrical discharge drilling machine (EDM). The stainless steel (SUS 304) and titanium alloy (Ti-6Al-4V) plates were used as workpiece material. The effects of the AFM process parameters on performance parameters and the experimental results compared to the Taguchi method.

The AFM process is an effective finishing process for difficult to machine materials, aerospace and aircraft components. However there is only one study (Lin, Chow et al. 2007) in the literature, and it was carried out for micro holes. This paper is focused on the effect of AFM process on difficult to finish materials Ti-6Al-4V and Inconel 718. Specimens were cut by wire electrical dis charge machine (WEDM). The surface roughness (R_a) values were measured through and perpendicular to the abrasive media flow lines, material removal (MR) was calculated and scanning electron microscopy (SEM) images were taken from the surfaces before and after AFM for various processing cycles. The improvement of the surfaces quality according to the workpiece materials were observed and compared.

Experimental works

Experimental set-up

In this study, a two-way AF machine that has two vertically opposed chambers was used (shown in Figure 1). The machine consists of a main frame, hydraulic unit, electronic control unit and heating-cooling unit. The specifications of the machine are given in Table 1. The hydraulic unit ensures adequate movement and media pressure that can be automatically configured. The control system is designed to control the volume of abrasive media and the number of cycles. One cycle in two-way AFM is composed of reciprocating motion of forward and backward of the piston ram in the media cylinder. Thus, cycle time depends on the piston speed and one cycle in the experimental study takes 2 minutes.

Table 1. Abrasive flow machine

Machine specification	
Hydraulic pressure	10–400 bar
Media capacity	6 litres
Stroke	400 mm
Bore diameter	140 mm

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Figure 1. Two-way abrasive flow machine

Workpiece material

The experiments were performed on Ti-6Al-4V. The specimens were cut from the slabs by using wire electro discharge machine (WEDM) to 5x10x20 mm as shown in shown in Figure 2. The WEDM parameters kept constant for all specimens to ensure the pre-surface characteristics of the specimens. The surface roughness values of the specimens before AFM are given in Table 2 (R_a), the physical and chemical properties of Ti-6Al-4V, Inconel 718 and some most common used steels are given Table 3.



Figure2. Workpiece geometry

Table 2. Surface roughness R_a values of the specimens before AFM

Ti-6Al-4V	
Specimen No	R_a (µm)
Ti-01	2.78
Ti-02	2.44
Ti-03	2.22
Ti-04	2.13
Ti-05	2.66
Ti-06	2.49

Table 3. Physical, mechanical and thermal properties of some materials

Material	Hardness (HRC)	Ultimate Tensile Strength (MPa)	Yield strength (MPa)	Thermal Conductivity (W/m-K)	Melting Point (ºC)
Inconel 718	36	1375	1100	11.4	1344
Ti-6Al-4V	35	1170	1100	6.7	1660
AISI 1112	21	385	240	51.9	1420
AISI D2	15-55	520	415	20	1420

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Abrasive media

The abrasive media that were prepared for the present study is a mixture of polymeric carrier, silicon carbide (SiC) abrasive particles, and 10% of hydraulic oil. The polymeric carrier has specific gravity of 1.0 (at 25 ºC) and viscosity about 60 Pas. 100, 180 and 240 mesh size silicon carbide (SiC) abrasives of 60% ratio by weight were used. However, the common definition of the percentage abrasive concentration is given by: weight of abrasive particles x 100/ (weight of abrasive media). Before performing the experiments, the abrasive media is run for 3–5 cycles with a trial workpiece, so as to get uniform mixing. The specifications of the abrasive media are summarized in Table 4.

Experimental procedure

The experiments were performed on the Ti-6Al-4V. The workpiece holder (see Figure 3) was used to hold the specimens allowing the flow of abrasive media through the WEDMed surfaces with an opening of 10x20 mm. 12 litres of abrasive media was flown through in each cycle. The experiments were carried out for 1,3,5,10,20 and 50 cycles. The AFM pressure was 10 MPa and flow rate was 3 litres/min. Number of cycles, abrasive mesh size and abrasive concentration were taken as AFM parameters. The experiments were repeated for three specimens in each condition and the averages of the 5 surface roughness measurements were taken by using Mitutoyo SJ 401 surface measuring machine, with the cut off length 0.8 mm. The specimens were cleaned by ethyl-alcohol and weighed before and after the experiment by using SHIMADZU AUX220 balance.

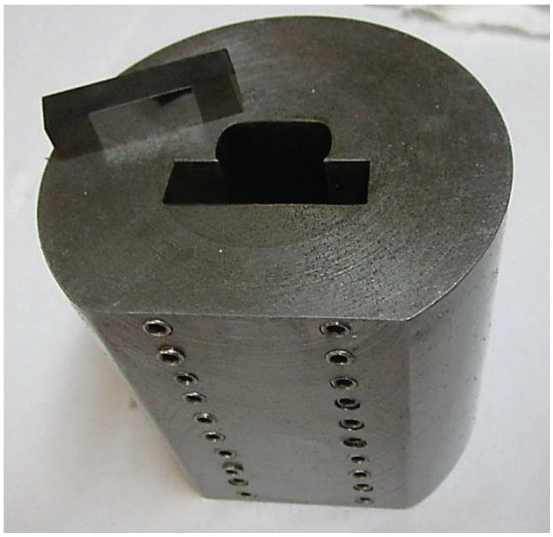

Figure3. Workpiece holder

Table 4. Experimental parameters

Variable Parameters	
Number of Cycles	1, 3, 5, 10 ,20, 50, 100
Abrasive Mesh Size	100, 180, 240
Constant Parameters	
Abrasive Type	SiC
Abrasive Concentration	60 % wt.
Abrasive Media Speed	400 mm/min

Results and discussion

Measurements of surface roughness

Number of Cycles

As seen from the Figure 4, the surface roughness value decreased with ncreasing in number of cycles. The surface improvement is better in the first AFM cycles and gradually saturated to a certain level. The surface improvement in Ti-6Al-4V alloy in the first cycle reach to 1.4 µm (R_a).

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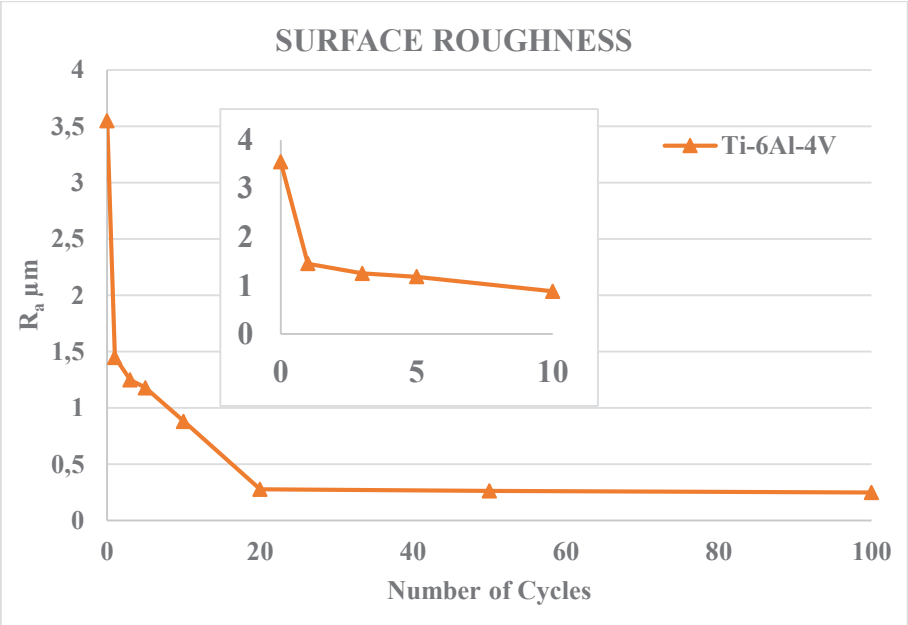

Figure 4. Surface roughness values

Abrasive Mesh Size

Figure 5 shows that as the abrasive mesh size increases, the R_a value decreases. Further, the effect of mesh size on change in R_a is very low over the 240 mesh abrasive particles for Ti-6Al-4V alloy workpiece.

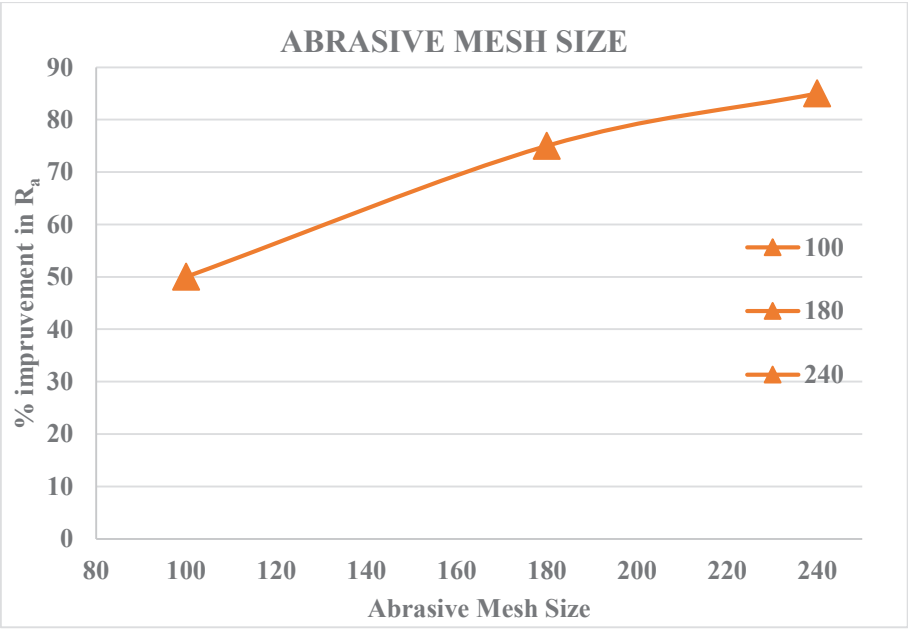

Figure 5. Effect of abrasive mesh size on R_a

Material removal

Number of Cycles

The Figure 6 shows that the material removal (MR) increases nonlinearly ith the increase in the number of cycles. The rate of MR decreasing with increasing number of cycles. The reason for this slight decrease in material removal rate can be explained as the result of asperities on the workpiece surface

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before AFM. When the abrasive particles within the media machine the peaks, they become flatter than before and in the following cycles, the material removal is decreased. The trend of material removal for each specimen is similar, except that the total material removal is lower in the case of the Ti-6Al-4V workpiece.

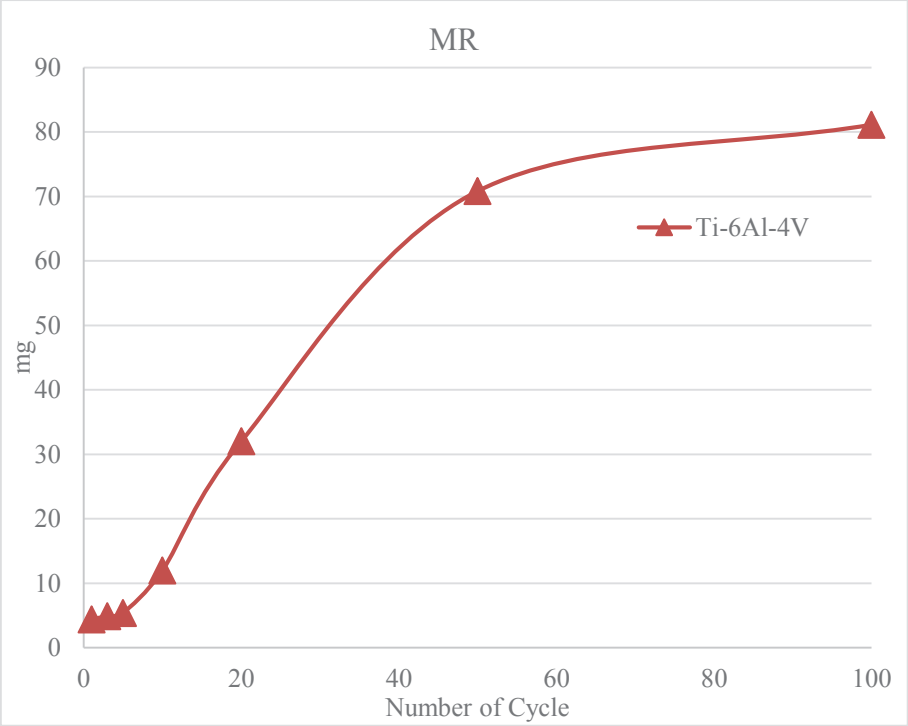

Figure 6. Change in material removal with respect to AFM cycles

Abrasive Mesh Size

Figure 7 shows the effect of mesh size on material removal. As mesh size ncreases, material removal decreases. The reason for a decrease in material removal is that with an increase in mesh size (or decrease in grain size in mm) the depth of penetration, as well as width of penetration, decreases.

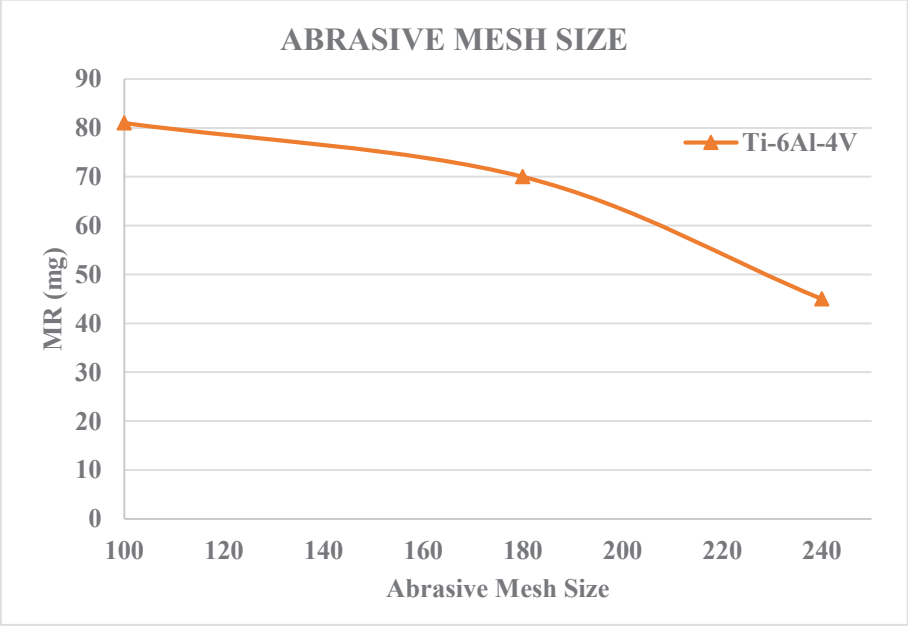

Figure 7. Effect of abrasive mesh size on MR

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Abrasive media

The EDMed surface is unlike that produced by any traditional machining process; it is characterized by globules and random debris of re-deposited and recast material. The high temperature changes the metallurgy of the material. The region affected by these thermal changes is referred to as the heat-affected zone (HAZ). The HAZ is included of a recast layer (white layer) of material that has been melted and re-solidified at the surface, white layer that is harder than the original material; contains micro cracks(Rhoades 1996). White layer thickness for the specimen is given in Figure 8, the white layer thickness of Ti-6Al-4V specimen is about 60 µm. Figure 9 shows the white layers of each specimen, according to the figure in fifth cycle the globules and debris are fully removed from the Ti-6Al-4V workpiece surface. After removal of the white layer, abrasion behaviours of each specimen were changed. In the Ti-6Al-4V specimen, high smearing and ploughing have been observed.

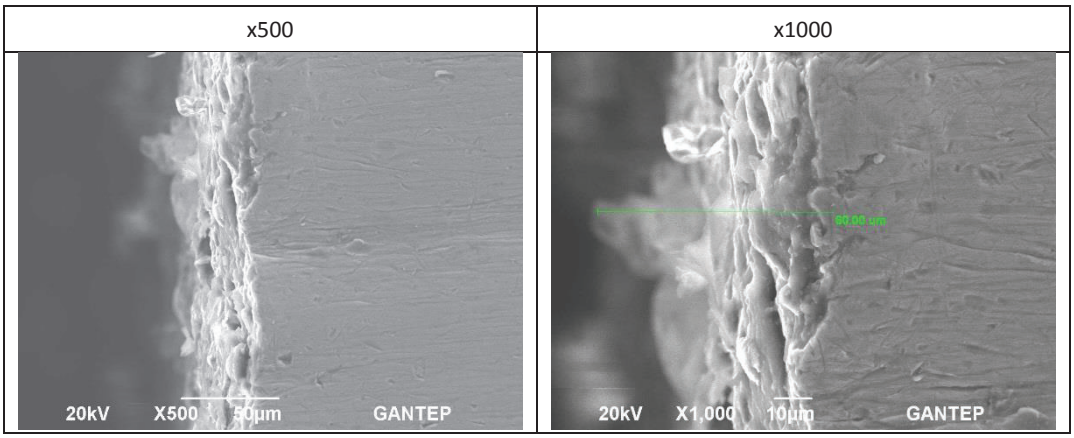

Figure 8. WLT views of specimens

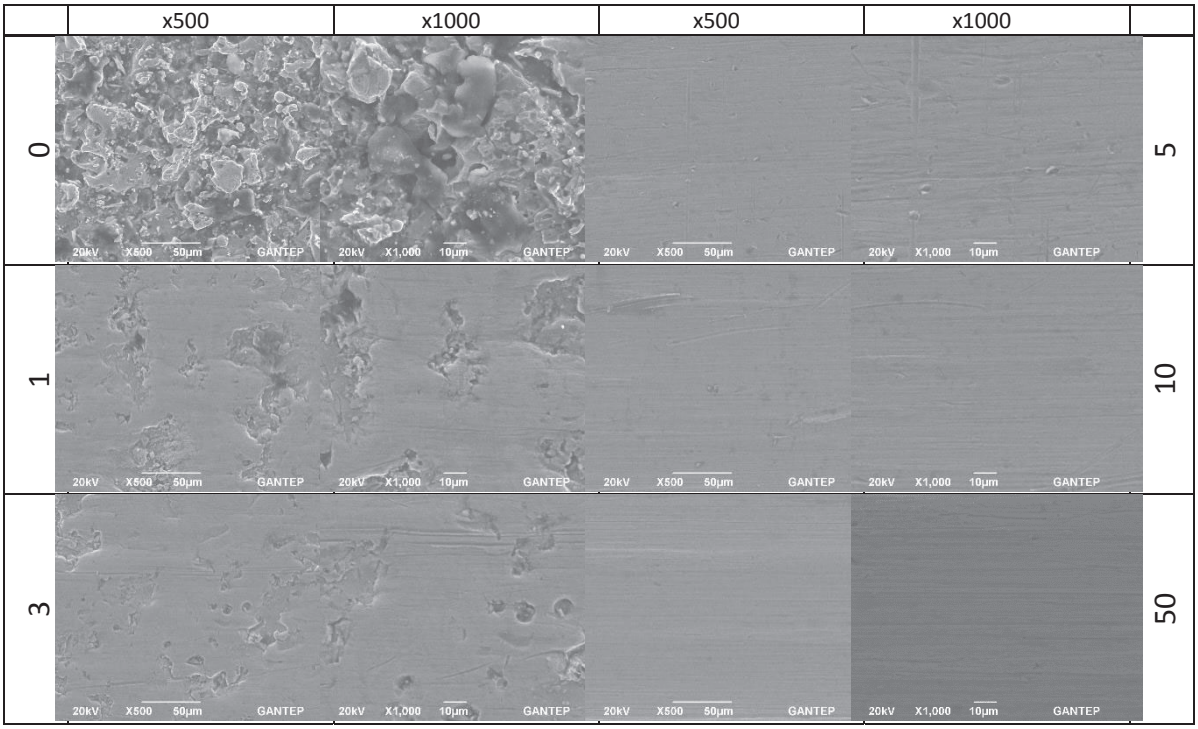

Figure 9. SEM images of AFM process of Ti-6Al-4V workpiece

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Conclusions

The influence of the AFM process on Ti-6Al-4V workpiece were investigated. From the experimental results, the following conclusions have been derived:
The white layer formed during WEDM is successfully removed by using AFM for Ti-6Al-4V workpiece. The results of SEM images of surface and the sectional views are in well agreement. The white layer was removed in the first cycle for Ti-6Al-4V specimen and five cycles were required to fully remove the white layer.
Although the trends of surface roughness Ra value started to be settled after the 10 operating finishing cycle.

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ADIYAMAN İLİN'DE KIRSAL TURİZM POTANSİYELİ VE KULLANMA İMKANLARI

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ÖzetKırsal turizm; insanların doğal ortamlarda dinlenmek ve değişik kültürlerle bir arada olmak amacıyla bir kırsal alana gidip, orada konaklamaları ve o yöreye özgü etkinlikleri izlemeleri ya da katılmalarıyla gerçekleşen bir turizm türüdür .

Adıyaman, pek çok kültüre merkezlik etmiş olan bir kültür ve turizm sahasıdır Coğrafi özellikleri ve iklimsel faktörleri kırsal turizm çeşitliliğini arttırmaktadır.Adıyaman'ın marka kent ili tescillenmesi, Kâhta'nın 2023 yılına kadar Kültür ve Turizm Bakanlığı tarafından "Kâhta Turizm Kenti" ilan edilmesi; diğer ilçe, belde ve köylerin taşıdığı potansiyel, turizm sektörü kapsamında özellikle de kırsal turizm için eşsiz fırsatlar oluşturmaktadır.

Kırsal alanlar birçok açıdan turistlere çekiciliğe sahip olan Adıyaman da; çiftlik evlerinde konaklama, kamp yapma buna bağlı olarak yörede üretilen ürünlerin pazarlanması, turistlere;, atlı gezi, doğa yürüyüşü yaptırılması ve dağ bisikleti gibi olanaklar sunulmasının yanı sıra bağ bozumunun, yöreye özgü yemeklerin ağırlık kazandığı lezzetlerin tanıtılması, yöre halkın gelenek ve göreneklerinin yaşatılması vb. şekillerde kırsal turizmin çeşitli uygulamaları yapılabilinir.. Kırsal alanların sahip olduğu bu potansiyelin turizm yoluyla değerlendirilmesi geri kalmış kırsal yerleşim birimlerinin kalkınmasına yardımcı olmaktadır.

Adıyaman'ın kırsal bölgelerinde yetişen tarımsal ürünler hasat dönemleri itibariyle ve ürünlerin işlenme sürecinde kırsal turizm yönünden önemli bir potansiyel yaratmaktadır. Örneğin Antep fıstığı yetiştiriciliğinde Adıyaman 3. sırada yer almaktadır. Derim dönemlerinde uygun köyler bu işlem için seçilerek gerekli düzenlemeler yapılabilir. Bağ bozumu dönemi ayrı bir fırsat yaratmaktadır. Özellikle Besni üzümü ülkemizde çok iyi bilinmektedir. Hasadın başlangıcından üzümlerin kurutma aşamasına kadar bir seremoniyle turistlerin bu sürece katılmaları ilgi çekecektir. Üzümler kurutulması yanında ezilerek pekmez yapılır. Pekmez yapılırken odun ateşindeki büyük bakır kazanlarda kaynatılır. Pekmez yapımı veya şire, pestil, sucuk vb. ürünlerin üretim aşaması her anıyla yaşatılabilir. Bu ürünler şire pazarında ziyaretçilere sunulmaktadır

Keywords: Kırsal Turizm, Adıyaman, Turizm Coğrafyası, Ekonomik Coğrafya,

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ADOPTION OF PRECISION AGRICULTURE TECHNOLOGIES IN DEVELOPED AND DEVELOPING COUNTRIES

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Abstract: Precision Agriculture (PA) deals with the fine-tuned management of the agricultural inputs including, seeds, fertilizers, water, pesticides, and energy to create savings on these inputs, increase yield, augment profitability and conserve the environment. PA technologies include soil mapping, variable rate application (tillage, seeding, fertilizing, irrigation, and pesticide application), yield monitoring mapping, automatic guidance, and autonomous vehicles. Many factors affect the adoption of PA technologies including features of the farms, affordability and profitability of equipment, characteristics of the technologies such as complexity and compatibility, personality and family structure of the farmer, legal affairs, and institutions offering support on these technologies. The level of adoption is variable in different countries as well as in different regions in a particular country. The aim of this paper was to review the studies on the adoption of PA in developed and developing countries and compare their adoption rates. The PA adoption has an increasing trend in developed countries, particularly in the US while significant increase is also observed in other developed countries. Also, PA technologies are introduced in some developing countries including Turkey in recent years. In both developed and developing countries, auto guidance is more adopted in the last decade while yield monitoring and variable rate application was more dominant earlier.

Keywords: Precision agriculture (PA), Adoption, Developed countries, Developing countries.

Introduction

Technological developments in agricultural sector yield better management practices resulting in more precision in agricultural operations from tillage to harvesting to reduce inputs, increase profits, and protect environment (Ess & Morgan, 2003; Rains & Thomas, 2009). The term Precision Agriculture (PA) or precision farming comprise these improved management technologies such as soil sensing and mapping, yield monitoring and mapping, satellite-based positioning, remote sensing, field and crop scouting, geographical information systems (GIS), variable rate application, and automatic steering (Ess & Morgan, 2003; Rains & Thomas, 2009) (Table 1).

Table 1: Precision Agriculture (PA) technologies

Data Collection Technologies	Data Process & Decision MakingTechnologies	Application Technologies
Soil sampling and mapping	Geographical info systems (GIS)	Variable rate application
Yield monitoring and mapping	Agricultural mapping software	Section control
Global satellite positioning (GNSS)	Economical analysis	GNSS-based guidance
Remote sensing	Geostatistics	Agricultural robots
Field / crop scouting	Modelling	

Awareness and adoption rate of PA technologies are affected by many factors including characteristics of the farms, personality and family structure of the farmer, features of equipment, characteristics of the technology, legal affairs, social interaction, etc. (Table 2).

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Farmers adopt and use PA technologies for specific benefits. For instance, in England, surveyed farmers reported that they use PA technologies mostly for improving accuracy (%76), reducing input costs (%63), improving soil conditions (%48), improving operator conditions (%36) and reducing greenhouse gas emissions (%17) (DEFRA, 2013). Also, reasons for not using PA included being not cost effective and/or high initial setup costs (47%), being not suitable for type or size of farm (28%), being too complicated to use (27%), and not accurate enough (2%) (DEFRA, 2013). Keskin et al. (2017) reported that the farmers using tractor auto guidance in the Adana province of Turkey had such benefits from this technology as creating straight crop rows (98.2%), flexible working hours (92.7%), time saving (80.0%), fuel saving (80.0%), labor saving (50.9%), agricultural input saving (18.2%) and yield increase (14.5%). In the same study, farmers did not want to use other PA technologies mainly due to not having detailed knowledge (54.5%), satisfaction with the available technology (23.6%), high equipment cost (18.2), and complication of the technology (3.6%) (Keskin et al. 2017).

Table 2: Factors affecting the adoption level of PA technologies

Factor	Explanation	Source
Personality of the farmer	Age, education, gender, personality, computer usage, willingness to take risks	Daberkow and McBride (2003) Edwards-Jones (2006) Lowenberg-DeBoer and Griffin (2006)
Family structure of the farmer	Work status (full time, part time, retired), availability of extra job, job of the spouse	Edwards-Jones (2006)
Features of the farm	Farm size, farm type, indebtedness, soil texture, field variability	Isgin et al. (2008) Paudel et al. (2011)
Social interactions	Local cultures, social milieu, attitude of trusted friends	Edwards-Jones (2006) Kutter at al. (2011)
Sufficiency of classical methods	Sufficiency satisfaction of classical methods used currently by the farmer.	Paudel et al. (2011)
Supporting institutions and firms	Numbers and structures of supporting institutions and firms (dealers, technical supports, consultants)	Edwards-Jones (2006) Fountas et al. (2005)
Legal issues	Rules and laws encouraging new technologies to reduce chemical inputs, to favor environment protection, sustainability	Edwards-Jones (2006)
Economic factors	Cost of equipment, return of investment time, profitability, possibility of renting	Whipker & Akridge (2009) Paudel et al. (2011)
Features of the technology	Availability, amount of time taking to learn the usage of equipment, easiness of usage, availability of technical support, complexity of the system, compatibility among different brands and models	Fountas et al. (2005) Edwards-Jones (2006) Paudel e al. (2011) Kutter et al. (2011)
Advertisement	Exhibitions, fairs, seminars, workshops, demonstration farms, field days	Kutter et al. (2011)
Technical staff	Quality and quantity of the technical staff, higher labor costs, availability of technical staff, closeness of technical staff	Whipker & Akridge (2009) Kutter et al. (2011)
Multidisciplinary cooperation	Availability of cooperation among engineers, agronomists, scientist	Ess (2002)
Decision support systems	Easiness of data processing, easiness and accuracy of decision making	Fountas et al. (2005)

The objective of this article was to review the studies on the adoption of PA technologies in developed and developing countries and compare the similarities and differences in adoption pattern.

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Materials and Methods

In this study; literature was collected on the adoption rate of Precision Agriculture (PA) technologies in different countries. Scientific articles, reports, books and relevant web pages found after the review process were studied and information on the adoption of PA technologies in different countries was compiled.

The countries are divided into two groups as developed countries and developing countries based on United Nations classification (UN, 2014). The data are summarized in tables to make the data more readable and comparable.

Results and Discussion

a) Adoption Level of PA Technologies in Developed Countries

Adoption level of Precision Agriculture (PA) technologies in the US and in other developed countries was summarized in Table 3 and Table 4, respectively. The countries were listed in an alphabetical order in the tables.

The US is a leading country in many innovative technologies. This is valid for the PA technologies as well. Fountas et al. (2005) reported that about 90% of the yield monitors in the world were operated in the US (Table 3). The adoption rate of automatic guidance technology in some states / regions reaches to about 60-80% recently (Table 3) (Erickson & Widmar, 2015; Miller et al., 2017). While yield monitoring technology and variable rate technology was more dominant earlier (Norwood & Fulton, 2009; Schimmelpfennig & Ebel 2011), the auto guidance systems and automatic section control systems caught more popularity in the last decade (Holland et al, 2013; Erickson & Widmar, 2015; Miller et al., 2017).

GNSS-based automatic guidance systems offer many benefits to the farmers including more accurate field works, higher operation speeds, easy operation, working at night, less affection by bad weather, reduced operator fatigue, low setup time, reduced overlapping, reduced skips, working without foam markers, and reduced inputs (fuel, fertilizer, pesticides, seeds, etc) (Grisso et al. 2009). In the near future, auto guidance could be considered a standard feature for new high-powered farm tractors. Furthermore, driverless autonomous tractors are currently being tested in some developed countries particularly in the US.

Along with the US, Australia, Canada, and some European Union countries including Germany, Finland, Denmark and Sweden has some level of adoption for PA technologies (Table 4). Particularly, Leonard (2014) reported that about 80% of the grain growers use automatic guidance in Australia. Also Steele (2017) indicated that 98% of surveyed farmers used GPS guidance in western Canada. Main similarity among these three countries (the US, Australia, Canada) is that the farm sizes are bigger in these countries making the farmers more willing and able to adopt new technologies. Farm size is one of the most crucial factors affecting the PA technologies (Keskin 2013; Keskin & Sekerli, 2016). In general, farmer having at least a few hundred hectares are most likely to adopt high cost new technologies. Fountas et al. (2005) stated that farmers with fields larger than 300 ha tend to be the first to invest in new technologies while Paustian and Theuvsen (2016) reported that.having a farm of less than 100 ha and producing barley were factors that exerted a negative influence on the adoption of PA in Germany. Keskin et al. (2017) reported that majority of the farmers (56.4%) using tractor auto guidance in the Adana province of Turkey had a field size of bigger that 100 ha.

b) Adoption Level of PA Technologies in Developing Countries

Adoption level of Precision Agriculture (PA) technologies in developing countries was presented in Table 5 where the countries were listed in an alphabetical order. Similar observation is valid for the developing countries as well. While yield monitoring technology and variable rate technology was more dominant earlier, the auto guidance systems caught more popularity in the last decade (Table 5).

Argentina, Brasil, South Africa and Turkey are among the ones employing some level of PA technologies. It should be noted that there could be other countries that were not reported in publications and still use PA technologies.

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Table 3: Adoption level of PA technologies in the USA

Country / Region / State	Technology & Its Adoption Level	Source
USA	About 90% of yield monitors in the world were in the US; in 2003, there were around 45.000 combines with yield monitor; about 46% of corn, 36% of soybeans and 15% of wheat was harvested by combines with yield monitor	Fountas et al. (2005)
USA / Ohio	36% of farmers participated in survey used at least one PA technology	Isgin et al. (2008)
USA	28% of US corn planted acres (in 2005), 10% of winter wheat (in 2004), and 22% of soybeans (in 2002) were harvested with a combine with a yield monitor.	Griffin and Erickson (2009)
USA	54% of the farmers used one or more PA technologies; yield monitoring (32%) and auto steering (32%)	Norwood & Fulton (2009)
USA	85% of agricultural dealers used at least one PA technology	Whipker & Akridge (2009)
USA / 12 states	About one-third of the cotton farmers (34%) adopted PA technologies	Paudel et al. (2011)
USA / Corn Belt region	Yield monitoring on over 40% of US grain acres; GPS maps on 24% corn acres; variable-rate technologies (VRT) on 16% of corn acres; GPS maps on 17% corn acres; VRT on 12% of soybean acres; and nationally VRT 12% for corn and 8% for soybeans	Schimmelpfennig & Ebel (2011)
USA / 34 states	Mostly-offered-technologies by surveyed dealerships were GPS guidance systems with manual control (light bar) (65%) and automatic (autosteer) control (61%)	Holland et al (2013)
USA	Three most popular technologies were GPS guidance with auto control / autosteer (83%), GPS-enabled sprayer section control (74%) and GPS guidance with manual control (63%); 82% of the dealers offered PA services	Erickson & Widmar (2015)
USA	Over 60% of agricultural-input dealers offer variable-rate-technology (VRT) services, but USDA indicate despite subsidies and educational efforts, less than 20% of corn acreage is managed using VRT. About 40% of fertilizer and other chemicals are applied with auto guidance.	Lowenberg-DeBoer (2015)
USA	About 25% of peanut farms adopted GPS soil mapping and over 40% used auto steering; variable rate fertilizing had a higher adoption rate in peanut production at over 20% of farms than for many other crops	USDA (2015a)
USA	60% of rice farms adopted yield monitoring technology and about 55% used auto guidance systems	USDA (2015b)
USA	In a survey of nearly 200 strip-till farmers, 79.4% use RTK GPS correction; use of variable-rate fertilizing increased to 36.2% in 2015 from from 31.5% in 2014; use of implement guidance was 19.7%.	Zemlica (2015)
USA / 14 states	In the 2005 survey, 23% of cotton producers used GPS guidance as in 2013 survey, about 31% adopted auto section control and 59% auto guidance systems.	Velandia et al. (2016)
USA	Until 2000s, adoption of different PA technologies varied up to 22% across major field crops. Tractor guidance grew faster than variable-rate application for all major field crops over the last 10 years.	Schimmelpfennig (2016)
USA / Kansas	66% of surveyed farmers used automated guidance and 47% use automated section control	Miller et al (2017)

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Table 4: Adoption level of PA technologies in other developed countries

Country / Region	Technology & Its Adoption Level	Source
Australia	30% of broadacre crops are sown and/or sprayed using GPS guidance. Other PA technologies such as yield mapping and variable rate is less common with <1% of adoption.	McCallum and Sargent (2008)
Australia	About 800 yield monitors were used in the country in the 2000 harvest year.	Mondal and Basu (2009)
Australia	Variable rate technology adoption in 2008–2009 has increased significantly to 20% nationally	Robertson et al. (2012)
Australia	80% of the grain growers use automatic guidance technology	Leonard (2014)
Canada	Based on a survey in 2006, 23.2% of farms use GPS equipment or products, 77.9% use guidance systems, 23.5% use variable rate fertilizer application and 27.4% use variable rate pesticide application	Haak (2011)
Canada / Western	98% of surveyed farmers used GPS guidance, 84% at least one PA technology, 84% had combine with yield monitoring capability, 73% used auto section control, 75% intend to use more PA in the future	Steele (2017)
Europe	70% of all fertilizing and spraying machines are equipped with PA technologies and smart or ISO-Bus enabled equipment.	Armagan (2016)
Europe	Despite the wide range of PA solutions being offered, only 25% of EU farms use technologies with a PA component.	EPRS (2016)
Europe / Denmark Britain, Sweden, Germany	About 400 Danish, 400 British, 300 Swedish and 200 German farmers adopted yield monitors by the year 2000	Fountas et al. (2005)
Europe / England	Ratio of farms using GPS increased from 14% to 22%, soil mapping from 14% to 20%, variable rate application from 13% to 16% and yield mapping from 7% to 11% in 2009 compared to 2012.	DEFRA (2013)
Europe / France	150 000 ha are managed using PA. 50% of the arable crop holdings have a tractor with a console, an essential tool for PA. One in four modulates inputs of fertilizers and crop protection products.	Invivo (2016)
Europe / Germany	Between 6.6% and 11.0% of surveyed farmers used PA mainly for data collection techniques such as GPS-based area measurement and soil sampling	Reichardt et al. (2009)
Europe / Germany, Finland, Denmark	36% of the surveyed farmers had previous experiences with PA technologies	Bligaard (2013)
Europe / Sweden	Nitrogen sensors are used in about 20% of wheat fields primarily for nitrogen fertilizer application	Söderström (2013)
Europe / UK	Around 60% of UK farmers already use some sort of precision agriculture on their farms, although for the most part this simply means using GPS tractor steering	Norris (2015)
Japan	In rice farming, ground vehicles spray about 22% (in 2014) and the proportion of large-scale UAV plant protection has reached 36%.	Liao (2017)

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Table 5: Adoption level of PA technologies in developing countries

Country / Region / State / Province	Technology & Its Adoption Level	Source
Argentina	There were about 560 yield monitors in 2001; about 4% of the grain and oil seed area was harvested by combines with yield monitors.	Mondal and Basu (2009)
Argentina	Yield monitors, positioning systems (GPS), auto guidance, and satellite images are increasingly used; it is the second country after the US with number of yield monitors (1200) and fifth country with yield monitor density of 51 monitors per million hectares (after the US, Denmark, Sweden, and Great Britain).	Bongiovanni & Lowenberg-DeBoer (2005)
Brasil / Sao Paulo state	58% of domestic and 38% of foreign sugar and ethanol companies adopt PA; most preferred technologies are satellite imaging (76%), auto pilot guidance (39%), geo-referenced soil sampling (31%), and variable rate fertilizing and liming (29%).	Silva et al. (2011)
Brasil	Mostly accepted technologies by the survey participants were GPS guidance with manual control (89%), GPS guidance with auto control (56%) and yield maps (56%).	Borghi et al. (2016)
Brasil	Adoption rate of PA is estimated at about 20% with a very diverse distribution. Soil sampling is the most adopted one. Some technologies like GPS guidance have larger adoption than others.	Albuquerque (2017)
China / Heilongjiang province	Tractor auto guidance was the most accepted technology and about 25% of the farmland was managed using PA	Verma (2015)
India	Leaf color chart (LCC) based N management and laser based land leveling are effective tools in rice farming.	Mondal and Basu (2009)
Kazakhstan*	Several auto guidance systems were introduced into agriculture.	Samruk-Kazyna. (2017).
Russia*	PA came to Russia about eight years ago. It is adopted slowly due to the high costs. Some elements of PA such as navigation on combines and cultivators are used.	Anonymous (2013)
South Africa	The number of yield monitors increased to more than 600, variable rate lime applications to 244, manual guidance systems to 200, and auto guidance to 60	Helm (2005)
South Africa	About 15 farmers used yield monitoring system in the 1999–2000 crop season	Mondal and Basu (2009)
Turkey	About 500 combine harvesters (about 3% countrywide) are equipped with yield monitoring systems	Keskin & Sekerli (2016)
Turkey	About 310 combine harvesters are equipped with yield monitors. About 110 automatic steering systems and 25 steering assistance systems were sold to the farmers. Number of variable rate applicators is less than 20.	Akdemir (2016)
Turkey / Adana province	About 110 farmers use GNSS-based auto guidance systems in Adana province.	Keskin et al. (2017)
Turkey	About 60 cotton harvesters (about 6% countrywide) are equipped with yield monitoring systems.	Erzurumlu (2017)

* These countries are classified as “Economies in transition” (UN 2014)

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Conclusions

Precision Agriculture (PA) technologies provide better management practices resulting in more precision in agricultural operations from tillage to harvesting to reduce inputs, increase profits, and protect environment.

Adoption rate of PA technologies is in an increasing trend in some developed and developing countries. The auto guidance systems caught more popularity in the last decade while other PA technologies such as yield monitoring technology and variable rate technology was more dominant earlier in both developed and developing countries.

The US is the only leading developed country in the adoption of PA technologies. Other developed countries adopting PA technologies the most are Australia, Canada and European countries. Regarding the developing countries, countries such as Argentina, Brasil, South Africa and Turkey have an increasing adoption rates in the last decade.

One of the most important factors in favor of the adoption of the PA technologies is farm size. It can be said that the countries with bigger farms such as the US, Australia, Canada, Brasil, and Argentina tend to adopt these technologies in a bigger margin.

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ADSORPTION OF SUNSET YELLOW FCF ONTO MCM-41

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Abstract: MCM-41, one member of the mesoporous molecular sieves M41S family, possesses a high surface area, high pore volume and a regular hexagonal array of cylindrical pores, which is largery used in selective adsorption, chemical sensors and nanotechnology. Recently, MCM-41 has been used to adsorb dye from aqueous solution. Sunset Yellow FCF is used in food, pharmaceutical and cosmetics industries. Many dyes are toxic and carcinogenic and pose a serious hazard to aquatic living organisms. The adsorption of Sunset Yellow FCF food dye from aqueous solutions by MCM-41 was studied through adsorption isotherms. The effects of adsorbent dosage, contact time and temperature were investigated. Langmuir and Freundlich adsorption models were applied in order to describe the experimental isotherms and isotherm constants.

Keywords: MCM-41, Adsorption, Food Dye, Sunset Yellow CFC, Isotherm, Langmuir, Freundlich.

Introduction

Dye wastewaters are discharged by a wide variety of sources, such as food plants, textiles, printing, dyeing and dyestuff manufacturing. There are more than 100,000 commercially available dyes with over 700,000 tons produced annually. It is estimated that more than 70,000 tons of dye are discharged from textile industries in the world every year. They are the important sources of water pollution due to some dyes and their degradation products may be carcinogens and toxic to mammals (Lee et al. 2007; Erdogan and Oguz Erdogan, 2016). Porous adsorbents are of scientific and technological interest because of their ability to interact with atoms, ions and molecules. Since the discovery of M41S family in 1992, mesoporous materials have attracted intense interest due to their large specific surface areas, well-defined pore structures, inert framework and non toxicity (Boukoussa et al. 2017). MCM-41 molecular sieves have been widely studied because they are promising as adsorbents for removal of environmental pollutants, catalysts and catalyst supports (Sun et al. 2016).

The main objects of this study are: (i) to characterization MCM-41, (ii) to study the feasibility of using the MCM-41 for the removal of sunset yellow dye, (ii) to determine the various parameters affecting sorption, such as contact time, amount of adsorbents and temperature, (iii) to determine the applicability of various isotherm models ((i.e., Langmuir and Freundlich) to find out the best-fit isotherm equation, and (iv) to determine thermodynamic and kinetic parameters and explain the nature of adsorption.

Materials and Methods

Adsorbate

The commercial food dye Sunset Yellow FCF ($C_{16}H_{10}N_2Na_2O_7S_2$, molecular weight 452.37 g/mol, C.I. 15985, λmax=482 nm, chemical structure shown in figure 1) was supplied by Sigma-Aldrich. Distilled water was used to prepare all solutions.

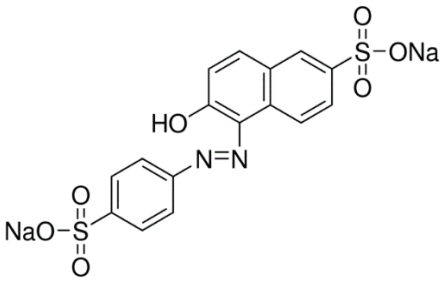

Figure 1. Chemical structure of Sunset Yellow FCF.

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Adsorption equilibrium studies

Adsorption of Sunset Yellow on MCM-41 was studied by batch experiments. Equilibrium adsorption studies were conducted in a set of 50 mL capped volumetric flasks containing different amounts of adsorbent weights in the range of 0.1-0.3 g/L, 50 mL initial concentrations of sunset yellow solutions (10 mg/L). Flasks were shaken in a mechanical shaker (GFL 1086) at 100 rpm and different temperature (30, 40 and 50°C). After adsorption, samples were filtered and then the concentrations of sunset yellow in the supernatant solution was analyzed. All concentrations were measured by using UV spectrophotometer (LaboMed Inc.) at 482 nm. The adsorption efficiency E is calculated using Eq. (1):

$$E=\frac{(C_0-C_e)}{C_0}100 \quad (1)$$

where C_0 and C_e (mg/L) are the liquid-phase concentrations of dye at initial and equilibrium, respectively. The sunset yellow uptake at equilibrium, q_e (mg/g), was calculated using Eq. (2):

$$q_e=\frac{(C_0-C_e)V}{W} \quad (2)$$

where V (L) is the volume of the solution, and W (g) is the mass of adsorbent used. The equilibrium data were simulated using the Freundlich and Langmuir isotherm models.

Adsorption kinetics

Kinetic adsorption experiments were carried out by adding 0.1 g/L adsorbent to 50 mL of 10 mg/L sunset yellow dye aqueous solutions at 30, 40 and 50°C at optimum pH. The uptake of sunset yellow at time t, q_t (mg/g) was calculated by the following equation:

$$q_t=\frac{(C_0-C_t)V}{W} \quad (3)$$

where C_t (mg/L) is the liquid-phase concentration of dye at time t (min).

In order to predict adsorption behavior of sunset yellow FCF on MCM-41, pseudo-first-order and pseudo-second-order kinetics equations which are described as Eqs. (4) and (5), respectively, were applied for modeling experimental data

$$log(q_e-q_t)=log q_e-\frac{k_1 t}{2.303} \quad (4)$$

$$\frac{t}{q_t}=\frac{1}{k_2 q_e^2}+\frac{t}{q_e} \quad (5)$$

where k_1 (1/min) and k_2 (g/mg min) are the adsorption rate constants of the pseudo-first-order and pseudo-second-order, respectively.

Adsorption Thermodynamics

To describe thermodynamics behavior of the adsorption of sunset yellow dye onto MCM-41, thermodynamics parameters including the change in free energy (ΔG°), enthalpy (ΔH°) and entropy (ΔS°) were calculated as per the following equations:

$$\Delta G^\circ = -RTlnKc$$

$$lnK_C = -\frac{\Delta H^\circ}{RT}+\frac{\Delta S^\circ}{R}$$

where R is the universal gas constant (8.314 J/mol K), T is the temperature (K) and $K_C = C_{ads}/C_e$ is the equilibrium constant of the sunset yellow adsorption equilibrium (which is a ratio of C_{ads}, the sunset yellow concentration in the adsorbent, and C_e, the sunset yellow concentration in the adsorbate.

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Results and Discussion

The surface physical properties of MCM-41 were characterized with an automated gas sorption apparatus using N_2 as adsorbate at 77.4 K (Micromeritics TriStar II 3020). Nitrogen adsorption is a standart technique widely used for the determination of porosity of adsorbent. Figure 2 shows the isotherm of the MCM-41. The pore structure of the MCM-41 was calculated by the t-method analysis from the adsorption branch of the nitrogen isotherms (Oguz Erdogan 2016; Erdogan and Oguz Erdogan 2016).

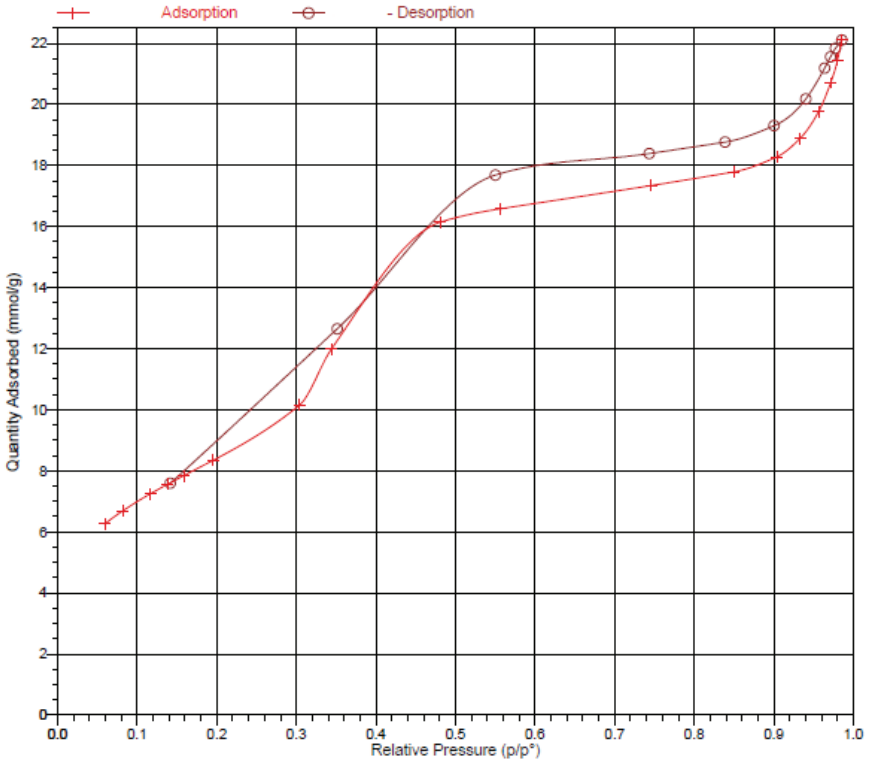

Figure 2. Adsorption-desorption isotherms of the MCM-41.

Table 1 shows the BET and Langmuir surface areas, total pore volume and avarage pore size for the MCM-41. The average pore size of the MCM-41 was 4.32 nm with micropores and mesopores.

Table 1: Textural parameters of the MCM-41.

Properties	MCM-41
Brunauer-Emmett-Teller Surface Area (m^2/g)	689.32
Langmuir Surface Area (m^2/g)	1780
Total Pore Volume (mL/g)	0.598
Average Pore Size (nm)	4.32

Figure 3 showed that the adsorption capacities at equilibrium (q_e) decreased with an increase in adsorbent dose from 0.1 to 0.3 g/L. This is explained as a consequence of partial aggregation, which occurs at high adsorbent amount resulting in decreased active sites. A similar phenomenon was reported by Huang et al., Rubin et al., and Nweke and Okpokwasili.

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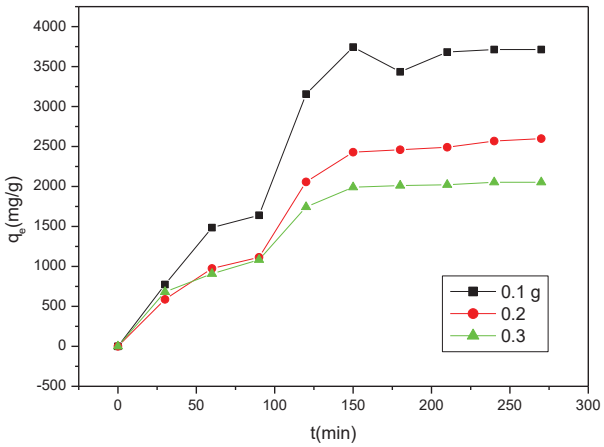

Figure 3. Effects of adsorbent dosage and contact time on the adsorptive uptake of food dye onto the MCM-41 (conditions: C_0=20 mg/L; temperature=40 °C).

The temperature dependence of sunset yellow sorption onto MCM-41 was studied at optimum adsorbent dosage of 0.3 g/L. Figure 4 shows that the food dye adsorption increased with temperature, which may be attributed to the enhanced reaction rate with higher temperature. A possible explanation is that high temperature extends the pore volume and surface area and provides more chances for sunset yellow dye to pass the external boundary layer and penetrate more easily. This corroborates the reports of our previous study (Erdogan and Oguz Erdogan 2016) . Similar behavior has been reported in the literature (Huang et al. 2015; Emami and Azizian 2014).

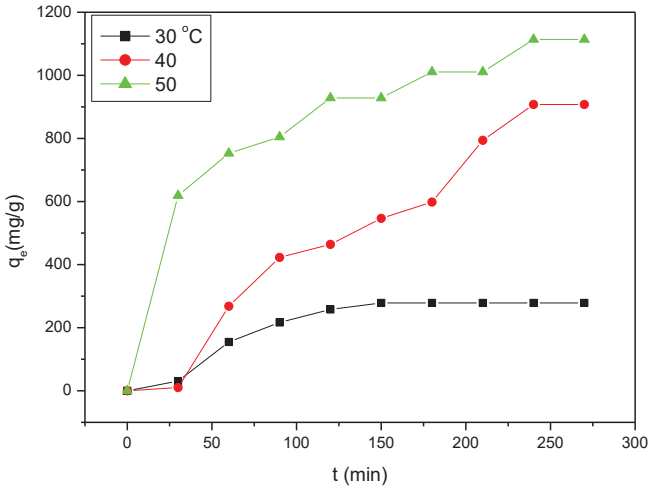

Figure 4. Effect of solution temperature on the adsorption food dye onto the MCM41 (conditions: W=0.03 g/L; C_0=10 mg/L).

Adsorption Isotherms

The equilibrium adsorption isotherms are essential to the practical design and optimization of adsorption process. The adsorption isotherm describes how adsorbates interact with adsorbents. The equilibrium data of food dye adsorption onto MCM-41 was explored using the isotherm model of Langmuir and Freundlich. The parameters obtained of the two isotherm models were calculated and represented in Table 2. The correlation coefficients descended in the order of: Langmuir> Freundlich. The results revealed that the adsorption of food dye on MCM-41 was best described by the Langmuir isotherm, indicating the adsorption was homogeneous and a monolayer was present.

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Table 2: Freundlich and Langmuir isotherm constants for the adsorption sunset yellow onto MCM-41 at 40 °C

Isotherms	Parameters		
Freundlich	K_F $(mg/g)(L/mg)^{1/n}$	n	R^2
	3.74E-8	0.158	0.889
Langmuir	Q_0(mg/g)	K_L (L/mg)	R^2
	518.13	0.016	0.999

Langmuir adsorption isotherm constant related to adsorption capacity, Q_0 were found as 518.13 mg/g. To confirm the favorability of the adsorption, the separation factor R_L was calculated by

$$R_L = \frac{1}{1+K_L C_0}$$

where the adsorption process to be either unfavorable ($R_L > 1$), linear ($R_L = 1$), favorable ($0 < R_L < 1$) or irreversible ($R_L = 0$). Here, the value of R_L was found to be 0.502, which further confirmed that the Langmuir isotherm was favorable for of food dye on the MCM-41. Similar observation was reported for the adsorption of methylene blue dye onto the safflower seed derived activated carbons (Angın et al. 2014).

Conclusion

MCM-41 was used as the mesoporous adsorbent to remove food dye from aqueous solutions at various temperature. The adsorption capacity of MCM-41 for food dye increased while the temperature of solution was increased. The Freundlich and Langmuir isotherm models were used for the mathematical description of the adsorption of food dye onto MCM-41 at various temperatures and the results suggested that the adsorption equilibrium data fitted well to the Langmuir model. This study has revealed that MCM-41 can be used as a highly efficient adsorbent for sunset yellow food dye removal from aqueous solutions.

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AHİLİK KURUMU VE SOSYAL İNOVASYON İLİŞKİSİ

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Özet: Sosyal inovasyon; yönetim alanında güncel kavramlardan biri olan inovasyonun toplumsal boyutudur. Öncelikli olarak toplum odaklı değer üretmeyi amaçlayan sosyal inovasyon; sosyal problemlere ve ihtiyaçlara yenilikçi çözümler üretmektedir. Türklerin sosyo-ekonomik tarihinde önemli dönüşüme neden olan Ahilik kurumu 13. Yüzyıl dan itibaren Anadolu'da faaliyet göstermiştir. İslam inancı ile Türk geleneklerinin bir sentezi niteliğinde olan Ahilik, hoşgörü, sevgi, saygı dayanışma, yardımlaşma, paylaşma, adalet ve erdem gibi kavramları özünde barındıran kendine has toplum tipi ortaya çıkarmıştır. Çalışmada; Ahilik kültüründe toplumsal fayda yaratma çabası sosyal inovasyon kapsamında incelenmiştir. Ahilik geleneğinin günümüz iş dünyasında nasıl uyarlanacağıyla ilgili öneriler sunulmuştur.

Anahtar kavramlar: Sosyal inovasyon, Ahilik, inovasyon kültürü, sosyal girişimcilik

Giriş

Yönetim alanında son yirmi yıldır var olan ve on yıldır da çok moda olan inovasyon, çok hızlı değişen dünya ekonomisinde daha da önemli hale gelmiştir. Önceden sadece işletmelerin yönetimi ve ürün bazında beklenen yenilik, yaratıcılık ve farklılığa artık topluma yönelik bir değer katma boyutu da eklenmiştir. İş dünyasında acımasız rekabet savaşının olduğu bir ortamda teknolojik inovasyon, ürün inovasyonu yeterli olmamakta ve sosyal inovasyon da gerekmektedir.

Değişen pazar koşulları, gelişen teknoloji, sosyal medyanın etkisi, kıyasıya rekabet gibi sebeplerden dolayı insanların beklentileri de değişmektedir. İnsanların bir üründen, bir işletmeden beklentisi ürün faydasının üstüne çıkmaktadır. Gelişen teknoloji ve zorlaşan rekabet koşullarına paralel olarak işletmelerin bir fark yaratması beklenmekte tüketici odaklı olmanın ötesinde aynı zamanda toplumsal fayda yaratması da beklenmektedir.

Sosyal inovasyon; "kâr amacı gütmeden yeni bir işi oluşturan sosyal girişim" kavramından daha işlevsel bir kavram olarak ortaya çıkmaktadır. 13. Yüzyılda Anadolu'da temel amacı toplum faydası olarak faaliyet gösteren Ahilik kurumu bu çerçevede sosyal inovasyona örnek olarak verilebilir. Bu çalışmada en az 700 yıl önce faaliyet göstermiş olan, önemli iş ahlakı değerlerine sahip Ahilik kurumunun sosyal inovasyon yönü incelenmektedir.

13. yüzyılda sosyal bir kurum olan ahilik bireysellik yanında sosyal bir toplum modeli örneği olarak görülmektedir. Günümüz kapitalist toplumlarında tamamen kâr odaklı bireyler ve şirketler olduğundan dolayı giderek sosyal inovasyon (yenilik) denen kavram moda olmaya başlamıştır. Oysaki; ahilik kurumu kâr amacı güden bir esnaf örgütlenmesi olmanın yanında toplumsal faydayı düşünen bir kurum da olmuştur. Ahilik kurumu bu yönüyle incelemeye değer bir konu olmaktadır. Ahilik kurumu 700 yıl önce örgütsel ve toplumsal bir yenilik yaparak sosyal inovasyon örneği sunmuştur.

İnovasyon ve Sosyal İnovasyona Bakış

İnovasyon kavramına bugüne kadar çok çeşitli tanımlar yapılmıştır. İnovasyon ekonomik büyüme, kaliteli bir yaşam ve rekabet için bir anahtardır. İnovasyondan söz edebilmek için bir yenilik ve bu yeniliğin ekonomik bir değer sunması gerekir (Satı,Işık, 2011: 541). İnovasyon yenilikten ziyade yeniliğin etkilerinin toplumu değiştirmesidir. İnovasyon toplumsal, kültürel ve yönetsel alanlarda yeni yöntemlerin uygulanmasıdır. Türkçe'de "yenilik, yenilikçilik" anlamına gelir (Elçi,2008:1).

İnovasyon sadece yeni bir ürün ortaya koymak değildir. İnovasyonun çeşitlerinden söz edilebilir. İnovasyon, yeni bir ürün veya sürecin, yeni bir pazarlama yönteminin ya da yeni bir organizasyonel yöntemin uygulanmasıdır.

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Ürün inovasyonu, süreç inovasyonu, organizasyonel inovasyon, pazarlama inovasyonu; yaptığı etkiye göre yıkıcı inovasyon, artımsal inovasyon, sosyal inovasyon gibi türleri vardır.

Yeni ve farklı bir ürün ortaya koymaya veya mevcut üründe değişiklik yapmaya ürün inovasyonu denir. Bir ürün üretilirken kullanılan yöntemlerin iyileştirilmesi veya değitirilmesine ise süreç inovasyonu denmektedir. Sosyal inovasyon türüne diğer inovasyon çeşitleriyle ilişkili bakılmalıdır. Sosyal yani toplumsal inovasyon, toplumdaki herkese yarar sağlayan yenilik, gelişme ve değişim faaliyetlerinin gerçekleşmesidir. Toplumdaki inovasyonun olabilmesi için diğer inovasyonlar da olmalıdır. Örneğin istihdamı artırmak, bölgesel kalkınmayı sağlamak, hayat boyu öğrenme sosyal inovasyon kapsamındadır. Bu örneklerin olabilmesi hizmet, ürün, süreç, organizasyon inovasyonlarına bağlıdır (Elçi,2008:14)

Toplumdaki sorunlara duyarlı olmak sosyal sorumluluğu ortaya çıkarırken; sosyal sorumluluk geliştikçe sosyal girişimcilik gelişmiş ve son olarak sosyal inovasyon gerekli hale gelmiştir.

Sosyal girişimcilik, kâr amacı olmayan sivil toplum kuruluşlarının yanında kâr amacı güden işletmelerde ya da kamu kesiminde gerçekleşen yenilikçi ve sosyal değer oluşturan faaliyetler (Durak,2016:103) olarak tanımlanabilir. Sosyal değer oluştururken sosyal sorunları farkedip bunlar için çözümler üretme söz konusudur. İşletmenin sosyal değer üretirken aslında kendi itibarının artmasını kullanarak kârın dolaylı şekilde artması da gerçekleşecektir. Sosyal inovasyon kavramı sosyal girişimciliğin daha gelişmiş halidir.

Sosyal inovasyon; inovatif (yenilikçi) hareketlerin ve hizmetlerin ağırlıklı olarak toplumsal amaçla yapılmasını ve kurumların öncelikli hedeflerinin sosyal olmasını gerektirir (Mulgan,2006:146). Torun; çalışmasında sosyal inovasyonun sosyal girişimcilik kavramından daha da öte bir kavram olduğundan söz eder. Sosyal girişimcilik tabiatıyla daha ziyade kâr amacı gütmeyen sivil toplum kuruluşlarının faaliyetidir (Light, 2005). Sosyal inovasyon ise öncelikle topluma yönelik değer yaratan, sosyal sorunlara daha yeterli, etkin ve kalıcı çözümler üretme sürecidir (Philips et al., 2008).

Günümüzde kaliteli mal ve hizmet üretimi rekabet için yeterli olmayıp toplumsal duyarlılığın yüksek olması da beklenmektedir. Toplum için ne yapıldığı, hangi tür bir katkı sağladığı ön plana çıkmaktadır. Gelişen teknoloji ve kızgın rekabet ortamı sadece devletin sorumluluğunda olan eğitim, sağlık, yardımlaşma, sosyal güvenlik gibi sosyal faaliyetlerin yapılmasına sivil toplum kuruluşlarını da katmıştır. Sivil toplum kuruluşlarının sosyal faaliyet yürütmesi toplum için artık yetersiz kalmıştır ve özel sektördeki işletmeler de sosyal inovasyonlar için adım atar hale gelmiştir. Evsizlere ev, düşkünler yurdu, çocuk yuvaları, çevre koruma faaliyetleri, fakir olanlara yardımlar, eğitim faaliyetleri gibi çalışmalar sosyal inovasyonlara örnek verilebilir.

Sosyal inovasyon özellikleri şu şekilde sıralanabilir:

- Sosyal inovasyon uzun soluklu çabalar sonucuu, toplumun kendini iyileştirmesidir (Koç, 2010:210).
- Sosyal inovasyon sosyal girişimciliği gerektirmektedir. Yani sosyal girişimcilikten bağımsız düşünülemez. Sosyal inovasyona sosyal girişim liderleri öncülük etmektedir.
- Sosyal inovasyonlar uzun bir süreci gerektirir. Kısa vadeli düşünülemez.
- Sosyal inovasyonlar geniş halk tabanının ve kamu yönetiminin desteğini gerektirir.
- Sosyal inovasyon faaliyetleri diğer inovasyon türlerinde olduğu gibi bazı riskleri göze almayı gerektirir.
- Sosyal inovasyonun başarılı olması için kalifiye elemanlara ihtiyaç duyulmaktadır.
- Sosyal inovasyonlar rekabet aracı olarak kullanılabilir; işletmeyi bu yönüyle rakiplerinden daha ileri taşıyabilir.
- Sosyal inovasyon pazarlama aracı olarak kullanılabilir.
- Sosyal inovasyon toplumsal problemlere çözüm üretirken, sosyal değişim ve sosyal fayda sağlar.
- Sosyal inovatörler kişisel gelişim, konuşma, dinleme gibi iletişim konusunda daha aktif kişilerdir (Mulgan,2006:150).

- Sosyal inovasyon yeniliğe yatkın ve toplumsal faydayı gözeten bir örgüt kültürü gerektirir. Böyle bir örgüt kültürüne sahip işletme müşteri odaklı olmanın ötesinde toplumun çıkarlarını da düşünmelidir (Yiğit,2014:4)

Ahilik kurumu

"Ahi" sözcük olarak Arapça'da "kardeşim" anlamına gelirken, Türkçe'de eli açık, cömert, kahramanlık, yiğitlik anlamlarına gelmektedir (Bayram,1991:131). 13. Yüzyılda Anadolu'da örgütlenmeye başlayan Ahilik, İslam inancındaki Fütüvvet ile Türk adetlerinin sentezlenmesi ile ortaya çıkan düşünce sistemidir. Fütüvvet Araplarda misafirperverlik, cömertlik, yiğitlik gibi anlamlandırılmaktadır (Demirpolat, Akça, 2004:356). Ahi Evran'ın Kırşehir'de örgütlemeye başladığı Ahilik kurumu dini kurallara göre oluşan Fütüvvetnamelere dayanan (Solak, 2009:3) iş hayatında usta- çırak ilişkilerini düzenleyen, çıraklık eğitimi veren, üretim ve ticaretle uğraşan, aynı zamanda topluma fayda sağlayan bir kurumdur. Özünde bireycilik değil, toplumculuk olan, esnaf örgütlenmesi olmanın ötesinde ahlaki, etik ve sosyal bir kurumdur.

Ahi birliklerinde iki çeşit üye vardı. Yamak, çırak, kalfa ve ustadan oluşan yönetilen grup birinci türü oluştururken, Ahi baba, yiğitbaşı, kethüda da yönetici grubu oluşturmaktaydı (Erdem, 2004:15). Ahilikte eğitim, çocuk yaşta yamakken başlayıp hayat boyu süren bir sürekliliğe dayanırdı. Örgütlenmede iş bölümüne önem verilir, teşkilat elemanları yeteneklerine uygun işte çalışır ve başka iş peşinde koşmazlardı (Durak ve Yücel, 2010:156). Sürekli iş değiştirene iyi gözle bakılmazdı. Ahilik kurumunda uzun süreli istihdam, terfi ve yavaş değerlendirme hakim idi.

Ahilikte insanlar birlik ve beraberlik içinde zengin-fakir ayrımı yapmadan; üretici-tüketici, emek-sermaye, millet ve devletin tüm kurumları arasında iyi ilişkilerin kurulması amaçlanmıştır. Ahilik gönül ile aklı, madde ile manayı özünde harmanlayan hoşgörü, sevgi, merhamet, saygı, kardeşlik, cömertlik, yardımlaşma, adalet, erdem gibi kavramları hayata geçiren ahlaki, dini, sosyal ve kültürel değerler bütünüdür (Durak,2016:110).

Ali Erbaşı (2012) çalışmasında Ahi teşkilatında yönetim fonksiyonlarının uygulanmasını incelemiştir. Buna göre planlama, örgütleme, yöneltme, koordinasyon ve denetim fonksiyonlarının nasıl işlediği açıklanmıştır. Teşkilatta ihtiyaca göre üretim planı yapılır, ihtiyaca göre iş yeri açmaya izin verilirdi. Örgütlenme teşkilatın genel yapısı ve teşkilattaki esnaf işletmelerinin yapısı olarak ikiye ayrılmıştı.

Ahilik kurumu, Anadolu'ya yerleşmek için gelenlere zaviye adında geçici yerleşkeler kurmuş ve yeni evler yaparak Anadolu'da Türklerin yerleşik hayata geçmelerine öncülük etmiştir. Aynı meslek grubuna ait olan esnafları bir bölgede toplayan yeni iş yerleri açmışlardır. Ahi yapılanmasında bedesten, arasta ve uzun çarşı denilen her esnafın kendi adıyla açılan çarşı bulunmaktaydı. Bu yapılanma günümüzdeki esnaf ve sanatkarlar odasına ve sanayi sitelerinin yapılanmasına benzetilebilir.

Ahi teşkilatında denetim iç ve dış denetim olmak üzere iki şekilde yapılmaktadır. Çırağın ustası "ahi kardeşi" olarak bilinir. "Yol kardeşi" ise çırakla aynı mesleği yapan kalfalardır. Hem usta hem de kalfalar iş başı eğitimde denetim yaparlardı (Ekinci, 1991:35). Dış denetimde ise tüm esnaf grupları için belirli üreti ve kalite standartları getirilmiştir. Bu standartlara uymayanlara "pabucun dama atılması" cezası verilirdi. Bu denetim mekanizması cezanın yaptırım gücünün aynı zamanda şeffaflık ilkesine uyduğunu gösterir. Pabucun dama atılması esnaflarda ayıplanmak ve dışlanmaktan kaçınmak için toplumsal duyarlılığı geliştirmiştir. Yani esnaf ayıplanmamak, dışlanmamak ve toplum gözünde küçük düşmemek için standartlara uygun davranırdı. Kalite standartlarına ve kurallara uymayan esnaf öncelikle uyarılır, düzeltmez ise selam kesilerek toplumdan dışlanır, esnaflıktan ihraç edilmeye kadar varan cezalar kesilirdi.

Ahilik kurumu günümüz dünyasında yeni yeni moda olmaya başlayan işletme kavramlarının (sosyal sorumluluk, şeffaflık, iş etiği, kalite yönetimi, sosyal inovasyon) 13. Yüzyılda yaşandığı köklü bir örgüt kültürüne sahip olan; bu değerleri sadece iş hayatında değil tüm hayatlarına yaşam felsefesi olarak uygulayan bir sistemdir.

Ahilik ve Sosyal İnovasyon

Ahilik kurumu incelendiğinde günümüzde kâr amacı olmayan kuruluşların gerçekleştirdiği işlevlere benzer faaliyetler yaptıkları görülmektedir. Ahilik sadece ekonomik bir örgüt olmayıp sosyo-kültürel boyutları da olan toplumsal fayda sağlamaya çalışan toplumun kalkınmasını da amaçlayan bir örgüttür. Ahiliğin temelleri dini ve ahlaki esaslara göre belirlenmiştir. Ahilik kurumunun toplumsal yönünde "Ben" anlayışı yerine "biz" anlayışı

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vardır. Biz anlayışı bilinenden farklılık arzeder. Biz anlayışında Ahilik düşüncesinin belirlediği toplum anlayışında ne bireyin topluma üstünlüğü ne de toplumun bireye üstünlüğü söz konusudur. Yani toplum yararı sağlanırken bireyin hakları incitilmemiştir (Tatar ve Sönmez, 2008:195).

Ahilik kurumuna bir sosyal girişimcilik örneği olarak ta bakılabilir. Sosyal girişimcilik ticari girişim gibi kâr, risk, önderlik, rekabet kavramları yanında sosyal sorunlara duyarlılığı da kapsar (Durak,2016:106). Bu sosyal sorunlara örnekler verilebilir. Ahilik sistemine göre çalışan diğer insanların haklarına, yeniliğe ve yeniliğin sahibine değer veren bir kurumdur (Doğan,2011:80) Günümüzde patent, telif hakkı gibi araçlarla dahi emek tam korunamazken 13. Yüzyılda otokontrol ve maneviyat sistemiyle korunmuştur. Müslüman olmayan bir esnafın yaptığı dokuma kumaşından dolayı ona öncelik verilmiş ve hakları korunmuştur. Ahilik sistemi hem teşkilat içindeki üyeler arasında hem de teşkilat dışında yardımlaşma ve dayanışmayı sağlamıştır. Bir sosyal sorumluluk örneği diyebileceğimiz "orta sandık" sistemini kurmuştur. Bu sosyal sorumluluk örneği aynı zamanda bir sosyal inovasyon örneği durumundadır; çünkü toplumsal bir yenilik getirmiştir. "Orta sandık" sisteminde esnaf kazancının tamamını kendisi almaz, bir kısmını aidat olarak sandığa verir; bu sandıkta biriken para ise zor durumda olan esnafa borç vermek için, kimsesizlere evsizlere yardım için, çevre düzenlemesi ve temizliği için, kimsesizlerin cenaze işlemleri için ya da uzaktan gelen misafirlerin zaviyede ağırlanması için harcanırdı. Sakatlar, hastalar, düşkünler, çalışamayacak durumda olan yaşlılar orta sandıktan faydalanırlardı. Orta sandık bir sosyal politika ve sosyal güvenlik aracı olarak görülebilir. Ahilik kurumunda kâr araç, toplumsal refah ve huzur amaç olmuştur.

Orta sandık sistemi o dönem için çok önemli bir sosyal inovasyon örneğidir. Borçlu esnafı faizci ve tefecilerden koruyan bir sistemdir. Orta sandıktan alınan paralarla ahi zaviyelerinde eğitim verilir, şehir dışından gelen misafirler ağırlanrdı. Tüm bu giderler orta sandıktan karşılanırdı. Günümüzde sosyal sorumluluk kavramı kurumsal işletmeler için bir rekabet aracı iken, yüzyıllar önce ahiler için sosyal sorumluluk bir gönül işi, İslam'ın sadaka gereğini yapmanın verdiği bir huzur örneği olmuştur. Çağdaş batı dünyasında 21. Yüzyılda yeni yeni evsizler için sosyal yardım kampanyaları yapılırken, böyle bir radikal ve sosyal inovasyon yüzyıllar önce Anadolu'da sağlanmıştır.

Ahilik kurumunda görülen iş ahlakı, günümüz deyimiyle iş etiği de bir sosyal inovasyon örneğidir. Kalitesiz üretim yapılmaması, müşterinin ön planda tutulması, kurum içinde ve kurum dışında her varlığa sevgiyle yaklaşılması Yunus Emre'nin "Yaradılanı sev, yaradandan ötürü" sözünün hakim olması iş ortamında sevgiyle sağlanan bir örgüt ikliminde haksızlık yapılmamasını sağlamıştır.

Ahilik sisteminde bir sosyal inovasyon örneği de yardıma ihtiyacı olanlara sahip çıkma ve dayanışma gereğidir. Ahi'nin eli, kapısı ve sofrası olmak üzere üç şeyi açık olmalıdır. Yani cömert, misafirperver olmalı ve aç geleni tok göndermemelidir. Ahi'nin elinin, belinin ve dilinin kapalı olması da hiç kimseye kötü konuşmaması, hırsızlık yapmaması, harama yaklaşmamasıdır.

Ahilik'teki sosyal inovasyon İslam inancındaki fütüvvetnamelerden beslenen ideal bir toplum yapısı kurmak üzere yapılan bir yeniliktir. Ahilik teşkilatının örgütsel ve sosyal inovasyon sistemi ile hem iş ahlakı hem de yoplumsal ahlak sağlanmış, etik kurallar oluşturulmuştur.

Ahilik kurumu Kur'an ve hadislerden beslendiği için hem ekonomik bir örgüt olurken hem de toplum faydasını düşünmüştür. İslam'da yer alan hadislerde geçen "İki günü bir (aynı) olan zarardadır" anlayışına göre Ahilik sürekli eğitim ve gelişme ile yaptığı yeniliklerle artımsal inovasyon yaparak bir sosyal inovasyon örneği oluşturur.

Sosyal inovasyon geniş halk tabanının desteğini gerektirir. Ahilik sistemi öyle bir radikal sosyal inovasyondur ki; tüm Anadolu'da hakim olan ve asırlar boyu etkisini sürdüren sistem olmuştur.

Ahilik felsefesinde temel değerlerden olan "hizmette mükemmellik" anlayışı ve "müşteri velinimettir" prensibi asırlarca Anadolu'da var olan uygulamadır. İç müşteri (çalışanlar) ve dış müşteri (ürün ve hizmeti alanlar) memnuniyeti önemlidir. Bu memnuniyetin sağlanması için kaliteli ürün ve hizmette mükemmellik sağlanmalıdır (Soysal ve Tan, 2013:191). Güler yüzlü ve kaliteli hizmet, dürüstlük, önemli bileşenlerdir. Eğer esnaf müşteriyi kandırırsa veya kalitesiz ürün ve hizmet sunarsa Ahi teşkilatında denetim heyetinin "pabucun dama atılma" cezası verirdi. Bu cezayı alan bir daha esnaflık yapamazdı (Akça,2001:4). Esnafın pabucunun dama atılması kurumsal sosyal sorumluluk ve kurumsal şeffaflık örneğidir, hesap verilebilirlik örneğidir. Böylece toplum kalitesiz üründen korunmuş oluyordu. Bu cezanın toplum içinde yapılması şeffaflık anlamına gelmektedir. Cezanın herkese açık şekilde alenen uygulanması sonucunda ortaya çıkan esnafın ayıplanma ve dışlanma korkusu toplumsal duyarlılığı artırmaktaydı. Bu durum diğer esnaflara örnek olarak caydırıcı etki yapmakta, iş ahlakı konusunda toplumsal duyarlılığı artırmaktadır.

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Ahilik sisteminde hem meslek hem de dini konularda sürekli eğitilmesi ve gelişmesinin sağlanması, hatta bu eğitim için zaviyelerin kurulması bir sosyal inovasyon örneği olurken aynı zamanda örgütsel inovasyon örneğidir. Ahilik teşkilatında doğru düzgün bir insan olma, düzgün meslek sahibi olma ve mesleği mükemmel icra etmek için üyelerin gündüz iş başı eğitim, geceleri ise Ahi zaviyelerinde ahlaki ve sosyal yönden eğitilmesi insan-kâmil olması için olgunlaştırılması sistemin önemli özelliklerinden biridir (Durak ve Yücel,2010)

Günümüzde tüketici hakları, kalite yönetim sistemleri gibi kavramlar asırlar önce Anadolu'da Ahilik kuralları ile sağlanmıştı. Satın alınan ürünün ayıplı olması durumunda ya da tüketicinin kandırılması durumunda mağdur olan tüketicinin en üst Ahilik makamına kadar şikâyet hakkı vardı. Bu durum kurumsal sosyal sorumluluğun var olduğuna işarettir.

Kapitalist sistemin hüküm sürdüğü günümüzde müşteri odaklılık anlayışında, tüketiciye daha fazla tüketim yaptırma hedeflenirken, Ahilik sisteminde ihtiyacı kadar tüketmek, ihtiyaç fazlasını yoksullarla paylaşmak vardır.

Sosyal inovasyon kavramı bencilliğe ve bireyselliğe karşıdır. Ahilik kurumunda esnaf ve toplumda "ben" duygusu değil "biz" duygusu hakimdir. Hatta "biz" duygusundan da öte "diğerkâmlık" vardır. Diğerkâmlık kendi ihtiyacı olduğu halde başkalarını düşünmek, onları öncelikli görmektir; özveri ve fedakarlıktır. Bu özellik küresel dünyada sosyal yardım kampanyalarında dahi görülmeyen, benzeri olmayan bir sosyal inovasyon örneğidir. Günümüzde işletme sahipleri sosyal yardım kampanyalarını genellikle işletme itibarı için, imaj için yaptıklarından dolayı yani kendisi için yaptığından dolayı yine bir çıkar söz konusudur. Ahilikteki diğerkâmlık ise böyle değildir; tam bir sosyal inovasyon örneğidir.

Türk gelenekleri ve İslam inancı ile sentezlenerek oluşan Ahilik adabı Türk halkının milli karakterini şekillendirmiştir. Bugün sosyal antropologların sıradan Türk insanında tespit ettiği özellikler, olağanüstü bir misafirperverlik, zor durumda olanlara yardım etme, fedakârlık ve dayanışma, imece şeklinde ortak çalışma (takım çalıması) yiğitlik (hakkı savunma, hakka riayet etme) fütüvvetnamelerde telkin edilen insan sıfatlarıdır. Bu sıfatlar iş ahlakına işleyen ve toplumsal yapıyı şekillendiren özelliklerdir (Orhaner,2012).

Ahilik sistemine yön veren kurallar ve ahilik öğretisi sadece üyeleri için değil, tüm halk üzerinde toplumsal yapıyı düzenleyici etkiye sahip olmuştur. Ahilik teşkilatı bağış, aş evi (yedirme) masraflar, tamir giderleri, mevlit okutma, ölülerin defin giderleri, misafir ağırlama masrafları ve köprü tamiri, çeşme tamiri gibi çevre düzenleme masrafları, kurslardaki muallim ücreti, okullara kömür verme gibi araçları kullanarak toplumsal yapıyı şekillendirmede etkili olmuş, günümüz sosyal inovasyon örneklerine asırlar önce öncülük etmişlerdir.

Sonuç

Ahilik kurumu dernek ve vakıf gibi hayır kurumu olmanın ötesinde hem ticari bir işletme hem de toplumsal sorumluluğu olan bir kurumdur. Ahilik teşkilatının 13.yüzyılda Anadolu'da yaptığı ticari örgütlenme ve toplumu şekillendiren yenilikçi yapılanmaları sosyal inovasyon olarak değerlendirilebilir. Ahilik kurumu hem bir esnaf örgütlenmesi, hem de toplum yararına faaliyet gösteren bir yapı niteliğindedir. İşletmelerin topluma faydalı olması gerekliliği son zamanlarda yeni yeni önem kazansa da, Türk-İslam senteziyle oluşan ahilik kurumu bunu asırlar önce başararak sosyal inovasyon örneği olmuştur.

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ALÜMİNYUM ALAŞIMLARININ SÜRTÜNME KARIŞTIRMA NOKTA KAYNAĞI

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Özet: Günümüzde alüminyum alaşımlarının kullanımı önemli miktarda artmıştır. Alüminyum alaşımlarının hafif olması, korozyona karşı mukavemeti, kolay işlenebilirliği gibi özellikleri nedeniyle özellikle havacılık, otomotiv, makina imalatı, demiryolu, gemi ve savunma sanayiinde kullanımı artarak devam etmektedir. Alüminyumun oksijene karşı ilgisinin yüksek olmasından dolayı yüzeyde oluşan oksit tabakasının kaynak işleminden önce temizlenmesi gerekir. Dolayısıyla, alüminyum gibi demirdışı metallerin ergitmeli kaynak yöntemleriyle birleştirilmesi çelik kaynağına nazaran daha zordur. Demirdışı metallerin birleştirilmesi esnasında karşılaşılan zorluklar farklı katı hal kaynak metodları ile elimine edilebilmektedir. Sürtünme karıştırma nokta kaynağı, bu katı hal kaynak metodlarından birisidir. Bu metod kullanılarak, endüstride demirdışı metaller ve alaşımlar üzerine kompleks ve yeni tasarımlar geliştirilebilmektedir.
Bu çalışmada, AA5754-H22 ile AA2024-T3 sac levhalar farklı kaynak parametreleri kullanılarak sürtünme karıştırma nokta kaynak metodu ile birleştirilmiştir. Çekme-makaslama deneyi ile kaynak kopma kuvveti belirlenmiş ve kaynak bölgelerinden mikrosertlik ölçümleri yapılmıştır. Uygulanan mekanik testler neticesinde kaynaklı birleştirmelerde kaynak parametrelerinin, kaynak oluşumu ve kopma tipleri üzerindeki etkileri incelenmiştir.

Anahtar Kelimeler: Sürtünme karıştırma nokta kaynağı, Katı hal kaynağı, Alüminyum alaşımı, Kaynak parametreleri, Mekanik özellikler

FRICTION STIR SPOT WELDING OF ALUMINIUM ALLOYS

Abstract: Nowadays, the usage of aluminum alloys has increased significantly. Due to its characteristics such as light weight of aluminum alloys, resistance to corrosion, easy machinability, its use in aerospace, automotive, machine manufacturing, railway, ship and defense industries continues to increase. Due to the high affinity of aluminum for oxygen, the oxide layer formed on the surface must be removed before the welding. Therefore, the joining of non-ferrous metals such as aluminum by fusion welding methods is more difficult than welding of steel. Instead of these fusion welding methods, which are difficulty for the industry, different solid state welding methods have become more effective. The difficulties encountered during the joining of non-ferrous metals can be eliminated by different solid state welding methods. Friction stir spot welding is one of these solid state methods. Complex and new designs for non-ferrous metals and alloys can be developed by using this method.
In this study, AA5754-H22 and AA2024-T3 sheets were joined by FSSW with different welding parameters. The lap-shear tensile load and microhardness measurements were carried out with mechanical tests. The effect of the joining parameters on the joining fracture type and formation of the joining zone were investigated.

Keywords: Friction stir spot welding, Solid state welding, Aluminium alloy, Welding parameters, Mechanical properties.

Giriş

Birçok alanda kullanılan ince kesitli metal malzemelerin kaynağında yaşanan sorunlar, farklı kaynak türlerinin gelişimini sağlamıştır. SKNK yöntemi; Al, farklı iki Al alaşımı, Mg, Al ile Mg ve çelik saclara başarı ile uygulanmaktadır. Bu kaynak yöntemi, sürtünme karıştırma kaynağının (SKK) (Bozkurt, 2011) nokta halinde dikiş üreten bir versiyonudur. Kaynak işleminde kullanılan kaynak takımı, karıştırıcı uç ve omuz olmak üzere iki

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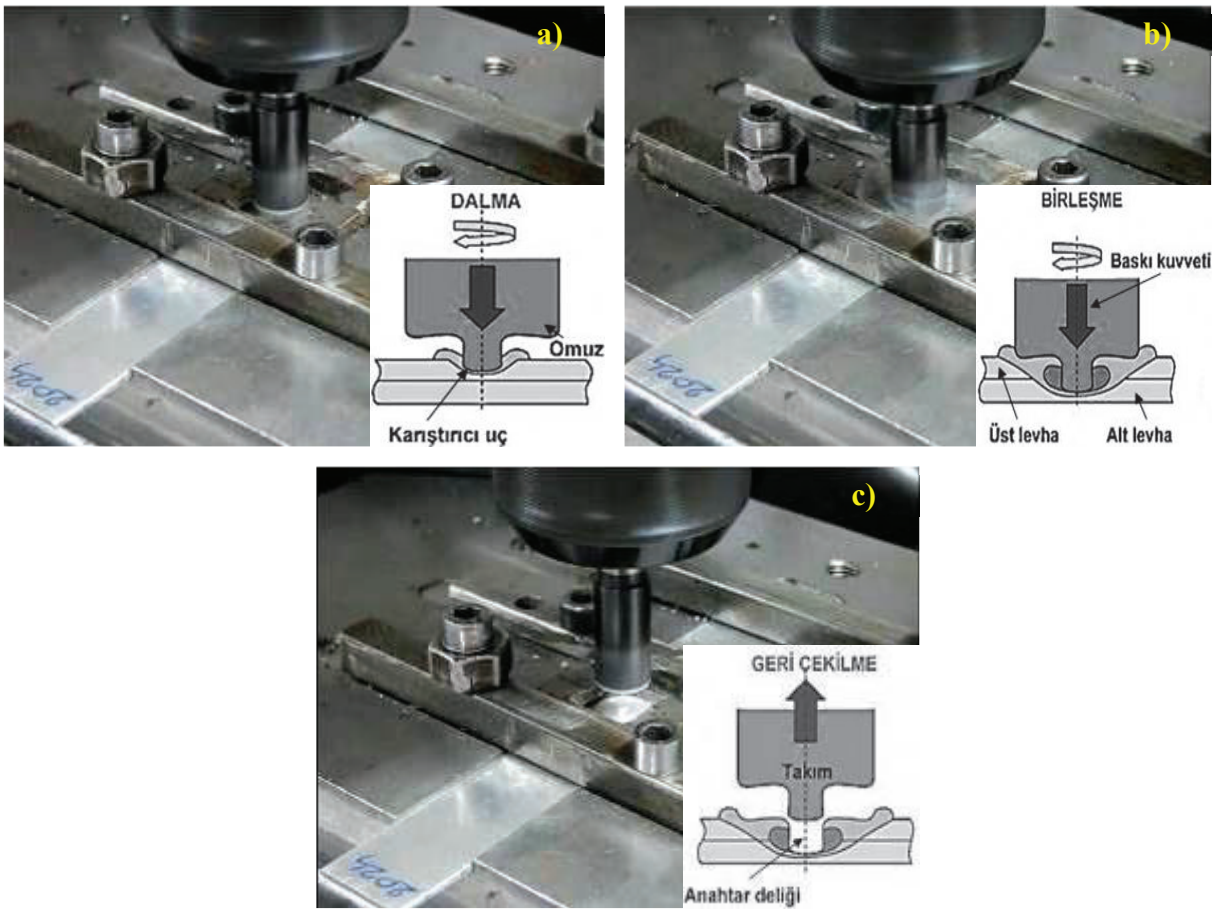
kısımdan oluşmaktadır (Bilici, 2011). Farklı hızlarda dönen kaynak takımının üst üste yerleştirilmiş levhaların belli bir derinliğine kadar dalması ve bu derinlikte belli bir süre dönmesi ile sürtünme ısısı oluşturur (Su, 2005). Kaynak takımının bitişiğinde meydana gelen ısı ve yumuşayan malzeme plastik deformasyona uğrar. Takım dönme süresinin sonunda kaynak takımının geri çekilmesi ile alt ve üst levhalar arasında katı hal birleşme işlemi (SKNK) gerçekleşir. Şekil 1a' da kaynak takımındaki (karıştırıcı uç ve omuz) birleştirilecek levhalara doğru dalma işlemi, Şekil 1b' de kaynak takımının birleşme bölgesinde belirli bir süre dönmesi ile birleşme işlemi ve Şekil 1c' de kaynak takımının geri çekilmesi gösterilmektedir.



Şekil 1. SKNK yöntemi şematik gösterimi; a) Dalma, b) Birleşme, c) Geri çekilme.

SKNK birleştirmesinde takım ucunun biçimi, birleştirilecek malzemenin ısınmasında ve karıştırma hareketinde direkt olarak etkili olmaktadır. Böylece, takımın ucu kaynak dikişi oluşumunu etkilemekte ve kaynağın çekme makaslama kuvvetini tayin etmektedir (Tozaki, 2007). SKNK yöntemi, Al (Wang, 2007), farklı iki Al alaşımı (Lin, 2015), Mg (Yang, 2008), Al ile Mg (Gerlich, 2005) ve çeliklere (Sarkar, 2016) başarı ile uygulanmaktadır.

Bu çalışmada, özellikle havacılık endüstride kullanılan AA2024-T3 ile otomotiv endüstrisinde kullanılan AA5754-H22 farklı iki levha SKNK ile birleştirlmiştir. Birleştirilen levhalardaki kaynaklı bağlantılarının çekme deneyine tabi tutulması ile çekme makaslama kuvveti ve kırılma tipleri belirlenmiştir. Ayrıca, bu iki farklı Al levhanın kaynak merkezinden itibaren ana metale kadar mikrosertlik ölçümleri yapılmıştır.

Malzeme ve Metod

Bu çalışmada kullanılan alüminyum alaşımı levhaların kimyasal bileşimi ve mekanik özellikleri Tablo 1' de gösterilmiştir. AA2024-T3 ve AA5754-H22 alüminyum alaşımı levhalar yapılarındaki alüminyum miktarı veya diğer kimyasal bileşenlerin oranlarının değişiklik göstermesi sonucu farklılıklar göstermektedir. Bu çalışmada 1.5 mm kalınlığındaki AA5754-H22 alüminyum alaşımı ve 1.6 mm kalınlığında AA2024-T3 alüminyum alaşımı levhalar kullanılmıştır. Birleştirilmiş levha ölçüleri 25x100 mm uzunluğundadır. Tüm deney numuneleri için levhaların 25x25 mm ölçülerindeki kısımları SKNK bölgesi olarak standart hale getirilmiştir. Deneylerde kullanılan alüminyum levhaların boyutları Şekil 2' de gösterilmiştir.

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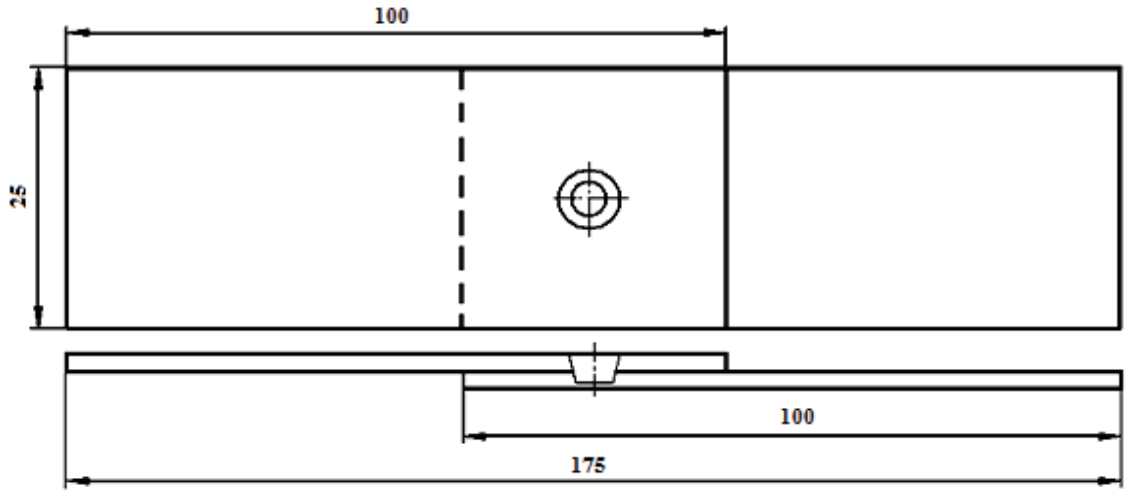
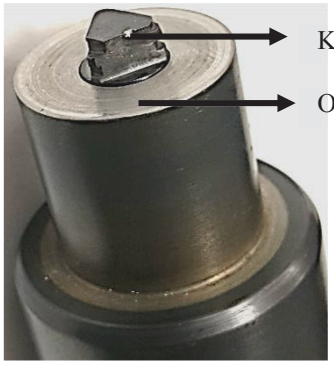
Tablo 1. SKNK deneylerinde kullanılan levhaların kimyasal bileşimi ve mekanik özellikleri.

Malzeme	Mekanik Özellikler		Kimyasal Bileşim (%)								
	Çekme Mukavemeti (MPa)	Uzama (%)	Al	Si	Fe	Cu	Mn	Mg	Zn	Ti	Cr
AA2024-T3	435	17	93.11	0.07	0.14	4.5	0.65	1.5	0.01	0.02	-
AA5754-H22	245	14	95.29	0.25	0.31	0.02	0.38	3.2	0.18	0.12	0.23



Şekil 2. Çalışmada kullanılan SKNK yöntemi ile birleştirilecek alüminyum alaşımı levhaların standartlaştırılmış boyutları.

SKNK işlemi için kullanılan karıştırıcı uçlu takım Şekil 3' de gösterilmiştir. Takımın omuz çapı 14 mm olup 6º konkav omuz açısına sahiptir. Karıştırıcı ucun uzunluğu 2.40 mm olarak belirlenmiştir. Şekil 3' deki karıştırıcı takım ucuna dişli üçgen şekli verilmiştir. Bu tasarım SKNK işlemi neticesinde oluşan birleştirmenin özelliğini etkileyen unsurlardan birisidir. SKNK işlemleri, Taguchi L9 deney tasarımı kullanılarak istenilen sonuca hızlı bir şekilde ulaşmayı sağlaması bakımından literatürde yaygın bir şekilde kullanılmaktadır (Bozkurt, 2013). Dolayısıyla, fazla deney yapmak yerine daha az deney yaparak sonuca ulaşılmış olacaktır. Bu sebeple Tablo 2' de gösterilen kaynak parametrelerinde AA2024-T3 üst levha, AA5754-H22 alt levha (2/5) olduğu pozisyon ve AA5754-H22 üst levha, AA2024-T3 alt levha (5/2) olduğu pozisyonları için Taguchi L9 deney tasarımı kullanılmıştır. Takım dalma hızı 0.35 mm/s olarak sabit tutulmuştur.



Şekil 3. Dişli üçgen şeklinde tasarlanmış kaynak takımı

SKNK ile birleştirilmiş alüminyum alaşımı levhalar çekme-makaslama işlemine tabi tutulmuş ardından; aynı numunelerin kaynak merkezleri eksende olacak şekilde kesme işlemleri gerçekleştirilmiştir. Vickers mikrosertlik (HV) ölçümleri üst ve alt levhadan 1' er mm aralıklarla Şekil 4' de gösterilen düzende ölçülmüştür. Zwick marka Z010 üniversal tip çekme cihazında JIS Z 3136 standardına [11], göre SKNK' lı levhaların çekme-makaslama

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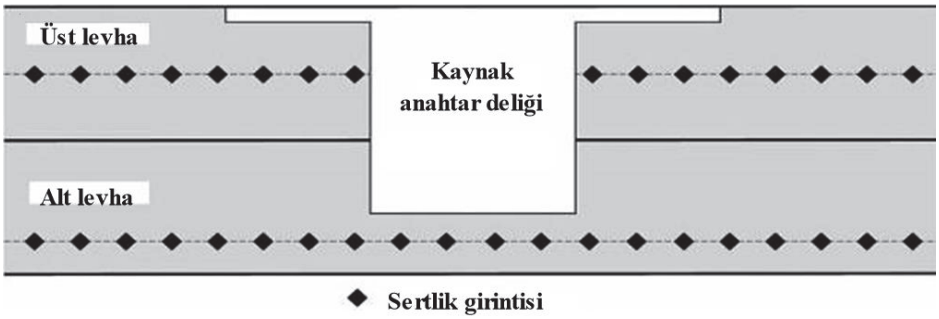
deneyleri yapılmıştır. HV ölçümleri; Schimadzu HMV marka mikrosertlik cihazı ile, 10 s' lik süre ve 200 gr yük kullanılarak yapılmıştır.

Tablo 2. 2/5 ve 5/2 pozisyonları için Taguchi L9 deney tasarımı.

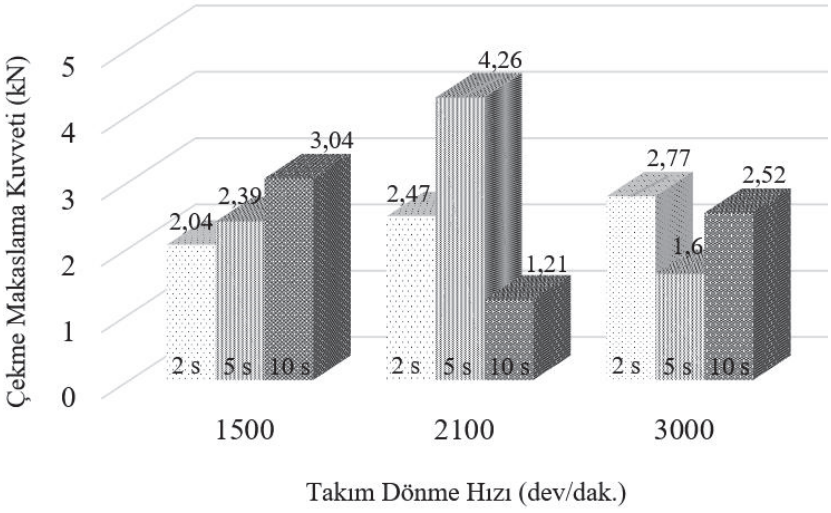
Deney No	SKNK parametreleri			
	Takım dönme hızı (dev/dak.)	Takım eğim açısı (°)	Takım dalma derinliği (mm)	Bekleme süresi (s)
1	1500	0	2.45	0
2	1500	2	2.55	5
3	1500	3	2.65	10
4	2100	0	2.55	0
5	2100	2	2.65	5
6	2100	3	2.45	10
7	3000	0	2.65	0
8	3000	2	2.45	5
9	3000	3	2.55	10



Şekil 4. Vickers mikrosertlik (HV) ölçümlerinin alındığı noktaların şematik olarak gösterimi.

Sonuçlar ve Tartışma

Şekil 5 ve 6' da kaynak takımının 2/5 ve 5/2 olduğu pozisyonlar için SKNK ile birleştirilmiş alüminyum levhaların çekme-makaslama deneyi sonuçları gösterilmektedir.



Şekil 5. AA2024-T3/AA5754-H22 pozisyonunda birleştirme sonrası çekme makaslama kuvveti.

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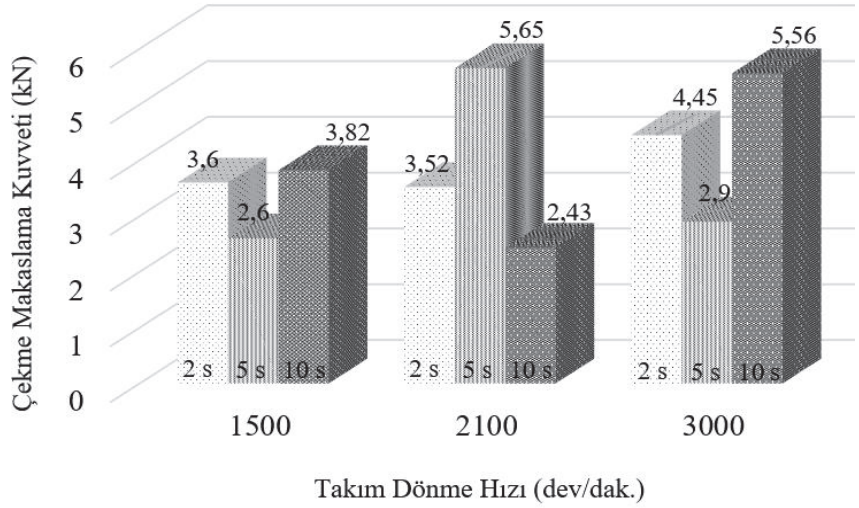
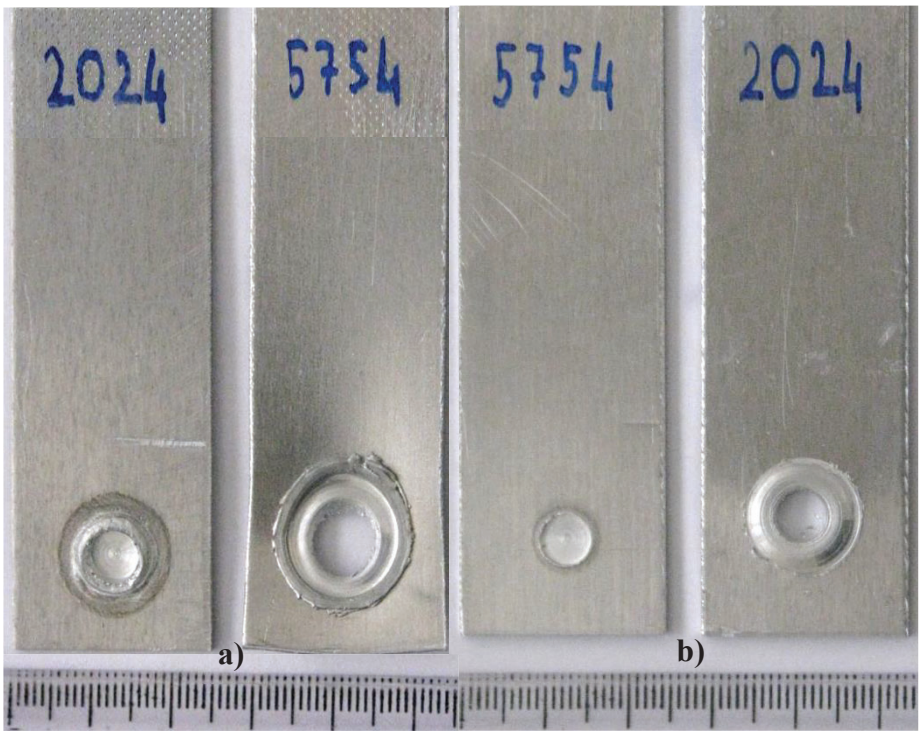


Şekil 6. AA5754-H22/AA2024-T3 pozisyonunda birleştirme sonrası çekme makaslama kuvveti.

Deneysel çalışmanın genelinde 2/5 pozisyonunda SKNK' lı birleştirmelerde en düşük çekme-makaslama kuvveti (1.21 kN), Taguchi deney tasarımındaki 6 nolu SKNK parametrelerinde (takım dönme hızı 2100 dev/dak, takım bekleme süresi 10 s, takım dalma derinliği 2.45 mm ve takım eğim açısı 3º: 2100/10/2.45/3 olarak ayarlandığında) yapılan SKNK' da elde edilmiştir. 5/2 pozisyonu için ise en yüksek çekme-makaslama kuvveti (5.65 kN), Taguchi deney tasarımındaki 5 nolu SKNK parametrelerinde elde edilmiştir. Yapılan değerlendirmeler sonucunda; takım dönme hızının sabit tutularak, takım dalma derinliğinin arttırılması neticesinde belirli düzeyde çekme-makaslama kuvvetinin de arttığı görülür (Bozzi, 2010). Çekme-makaslama deneyleri sonrasında Şekil 7' de gösterilen iki tip kırılma tipi gözlemlenmiştir. Birincisi, Şekil 7b' de gösterilen birleşme kesilmesi, ikincisi ise, Şekil 7a' da gösterilen ve en yüksek kaynak kuvveti değerlerinin tespit edildiği birleşme kırılması (çıkması) (Bozkurt, 2011)] şeklinde gerçekleşen kırılma tipleridir (Bozzi, 2010, Feeney, 2006). Şekil 7b' de çekme deneyi sonrasında, en düşük çekme makaslama kuvveti değeri veren birleşme olduğu sonucuna varılmıştır.



Şekil 7. AA2024-T3 ve AA5754-H22 alüminyum alaşımı levhaların çekme-makaslama testi sonrası üst ve alt levhaların yüzey görünümleri; a) 2100/5/2.65/2 kaynak parametreleri ile alınan en yüksek sonuç, b) 2100/10/2.45/3 kaynak parametreleri ile alınan en düşük sonuç.

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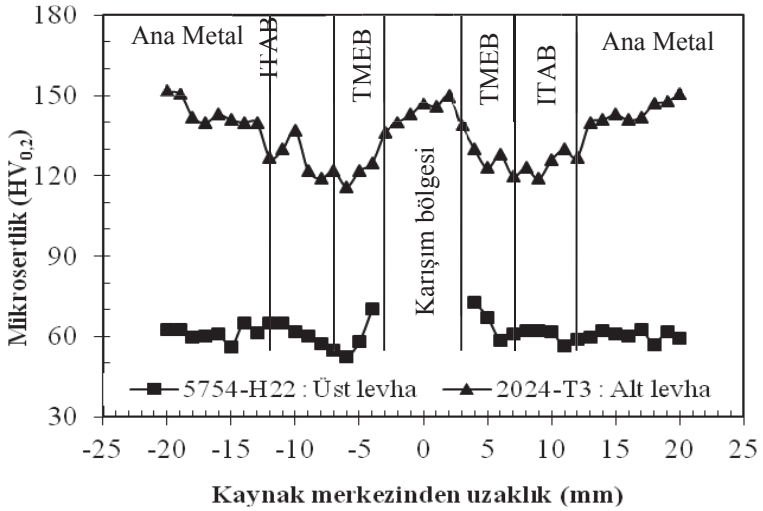
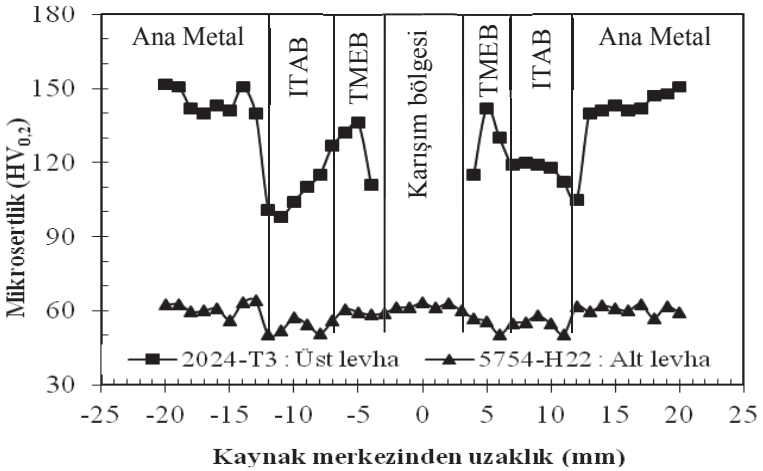
Çekme-makaslama işleminin ardından; maksimum ve minimum değer veren SKNK numuneleri üzerinde mikrosertlik ölçümleri yapılmıştır. Şekil 8' de en yüksek, Şekil 9' da ise en düşük mukavemet değerleri elde edilmiştir. Şekil 8' de gerçekleştirilen maksimum sonuç veren SKNK' lı bağlantının Vickers mikrosertlik ($HV_{0.2}$) ölçümleri sonuçlarında AA2024-T3 ana alüminyum alaşımından alınan ortalama sertliğinin 135.34 $HV_{0.2}$ olduğu, AA5754-H22 ana alüminyum alaşımından alınan ortalama sertliğinin ise 61.09 $HV_{0.2}$ olduğu belirlenmiştir. AA2024-T3 ana alüminyum alaşımı levha alt kısımda iken yapılan SKNK' lı birleştirmelerde AA2024-T3 ana metalden, ısı tesiri altında kalan bölgeye (ITAB) doğru sertlikte bir düşüş, termo-mekanik etkilenen bölgeden (TMEB) (Bilici, 2011) itibaren karışım bölgesine doğru ise artış gözlenmiştir. Şekil 9' da AA2024-T3 alüminyum alaşımı levha üst kısımda iken yapılan SKNK' lı birleştirmelerde ana metalden karışım bölgesine doğru gidildikçe AA2024-T3 alüminyum alaşımının sertlik değerlerinin arttığı gözlenmiştir (Bozkurt, 2012). Takım omzunun ısıtma etkisi sebebiyle meydana gelen yoğun plastik deformasyon sertlik artışına neden olmuştur (Külekçi, 2011). Şekil 9' daki sertliğin Şekil 8' dekinden yüksek olmasının sebebi; takım dalma derinliğinin 2.45' den 2.65'e artış göstermesi neticesinde homojen bir karıştırma ortamının meydana getirilmesi olduğu belirlenmiştir.



Şekil 8. 2100/5/2.65/2 kaynak parametreleri ile gerçekleştirilen 5/2 pozisyonlu mikrosertlik dağılımı.



Şekil 9. 2100/10/2.45/3 kaynak parametreleri ile gerçekleştirilen 2/5 pozisyonlu mikrosertlik dağılımı.

Sonuçlar

5/2 ve 2/5 pozisyonlu alüminyum alaşımı levhalar SKNK ile birleştirilmiş; her iki takım için maksimum ve minimum sonuçlar belirtilerek, dört farklı mikroyapısal bölgenin var olduğu görülmüştür. Bu bölgeler: 1) Karışım bölgesi, 2) TMEB, 3) ITAB ve 4) Ana metaldir.

5/2 pozisyonlu alüminyum alaşımı birleştirmesinde (2.65 mm takım dalma derinliğinde ve 5 s' lik takım bekleme süresinde ve takımın batma derinliği toplam levha kalınlığının % 84,94' ü olduğunda yapılan SKNK' lı birleştirilmelerde) 5.65 kN maksimum çekme-makaslama kuvveti elde edilmiştir. 2/5 pozisyonlu alüminyum

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alaşımı birleştirmesinde (2.45 mm takım dalma derinliğinde ve 10 s' lik takım bekleme süresinde ve takımın batma derinliği toplam levha kalınlığının % 77,7' si olduğunda yapılan SKNK' lı birleştirilmelerde) 1.21 kN minimum çekme-makaslama kuvveti elde edilmiştir.

Takım dalma derinliğinin 2.65 mm' ye artmasıyla çekme-makaslama kuvvetlerinde artış gözlemlenmiştir. Bunun sebebinin, takımın SKNK yapılan alüminyum alaşımı levhalara fazla dalması neticesinde homojen bir karıştırma ortamının meydana getirilmesi olduğu belirlenmiştir. Çekme-makaslama deneyleri sonrasında birleşme kesilmesi ve birleşme kırılması şeklinde gerçekleşen iki tip kırılma tespit edilmiştir. Birleşme kesilmesi ile en düşük, birleşme kırılması ile de en yüksek çekme-makaslama kuvveti elde edilmiştir.

Teşekkür

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AN ERROR ANALYSIS OF AUTOMATIC CONVERSION OF PHONETIC ALPHABET FOR ENGLISH USING SEQUENCE-TO-SEQUENCE MODEL

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Abstract: English words present inconsistency between their spelling and pronunciation, which requires phonetic alphabet for accurate pronunciation. However, each English dictionary not only lists a different set of pronunciation from one another, but also adopts a phonetic alphabet represented with different notation. These differences in pronunciation and phonetic notation confuse English language learners. A recent research on automatic conversion of different pronunciations shows a result with the accuracy between 74.5 ~ 89.6% produced utilizing sequence-to-sequence (seq2seq) model, a popular mechanism used in deep-learning.
This research suggests an error analysis conducted on the results of automatic conversion of different pronunciations. The errors are bidimensional. One dimension is classified into types of segment and suprasegment: consonant, vowel, stress errors. The other describes the types of errors including addition, deletion and alternation. The purposes of the error analysis can be summarized as follows: 1) to survey different phonetic alphabet systems for English and figure out the characteristics of each system, 2) to verify various pronunciation rules and the context information identified in automatically converted data, and finally 3) to suggest a guideline for organizing a training set to be used for learning the seq2seq model in automatic pronunciation conversion.

Keywords: English pronunciation, phonetic alphabet, sequence-to-sequence (seq2seq) model, error analysis

Introduction

The English spelling system does not represent the pronunciations of words: a written word does not necessarily express its vocal sound (Jurafsky, 2000). A phoneme can be expressed with many different letters of the alphabet, which causes difficulties in predicting an accurate pronunciation. Moreover, some letters are not pronounced at all, and mapping a phoneme to a letter can be represented utilizing one-to-many or many-to-one relationship. In other words, each phoneme is represented by more than one written letter or a sequence of letters, and a letter can be mapped to more than one sound. These types of inconsistency between the sound of a word and its spelling make learning English pronunciation difficult. Providing a phonetic alphabet system in a dictionary may help the learners of English to master the pronunciation. Many English dictionaries, however, present a system of their own, in which different phonetic alphabets are used to represent the same sound. Another inconsistency in phonetic alphabets also confuses the learners and becomes a cause to produce pronunciation errors.

This research aims to analyze the errors produced while automatically converting the phonetic alphabets to the notations adopted in other dictionaries (Lee and Choi, 2017). Those dictionaries include four different online English dictionaries: CMU Pronouncing Dictionary (CMUdict), New Oxford American Dictionary (NOAD), Merriam-Webster Collegiate Dictionary (MWCD), and New Oxford Dictionary of English (NODE)[5]. All the

[5] CMUdict: http://www.speech.cs.cmu.edu/cgi-bin/cmudict
NOAD: https://en.oxforddictionaries.com/definition/us/
MWCD : https://www.merriam-webster.com/

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dictionaries provide phonetic alphabets to represent the pronunciations of each entry, but the notations are all varied from one another. Each of the four sets of phonetic alphabets is automatically converted to the rest three notations. The conversion was performed using a sequence2sequence model which outperforms other models when the length of the input sequence is not identical to that of the output. The average accuracy of the conversion is 83.1% and some of the conversion between particular sets exceeds 89%. When the conversion process has completed, conversion errors were collected for an analysis by which various types of errors were identified. This paper, however, focuses on the consonant errors, more specifically those which identified the errors between American and British English in particular. These types of errors are found when the conversion was processed between NOAD and NODE.

Characteristics of Phonetic Alphabets and Dictionaries

This research has initially selected four different online dictionaries: CMUdict, NOAD, MWCD and NODE. CMUdict is developed as an online dictionary for speech processing and has a reputation for its pronunciation representations. MWCD and NODE are traditionally well-known since their paper versions have been widely used. NOAD is selected because it is the American English counterpart of NODE. The pronunciations of these lexicons are transcribed using four different phonetic alphabet systems. CMUdict uses ARPAbet and NODE has adopted International Phonetic Alphabet (IPA). NOAD and MWCD have utilized the systems of their own named as NOAD and MWCD respectively.

CMUdict is originally created for use in speech recognition and lists the most number of entries, 117,413 which includes inflected forms. It transcribes North American pronunciations with utilizing 39 phonemes composed of 23 consonants and 16 vowels. NOAD is constructed based on NODE, but its 24,727 entries present the pronunciations of contemporary American English, represented with 42 phonemes among which there are 24 consonants and 19 vowels. MWCD contains 24,988 entries with American English pronunciations which are transcribed with 45 phonemes, 25 consonants and 20 vowels. NODE includes 24,458 entries whose pronunciations mainly represent British English. The pronunciations are transcribed with the most number of phonemes, 49 which are comprised of 26 consonants and 23 vowels. In addition, all the dictionaries present pronunciation variations for an entry if there is any. The average number of variations ranges from 1.069 to 1.313. However, the variations are often specified with partial transcriptions, providing only the different part of the full transcription. A dictionary entry is listed with its full pronunciation and optionally with the varied phoneme or the syllable(s) which includes the variations.

Automatic Conversion of Phonetic Alphabet for English Using Seq2seq Model

Deep Neural Networks (DNNs) have recently accomplished the state-of-the-art performance on various pattern-recognition tasks including speech and vision. They are remarkably powerful and flexible in resolving complicated problems for not only vision, but also language/speech processing such as machine translation in particular. Among language/speech processing applications adopting DNNs, Recurrent Neural Networks (RNNs) are a popular class since they can process arbitrary sequences of inputs. However, they show a limitation that they work with vectors of fixed dimensionality. In other words, they can achieve the expected performance only when the lengths of source and target are identical while some of language/speech related problems are represented with the sequences whose length is subject to change. Because of the limitation of RNNs, this research adopted a seq2seq model which consists of two RNNs utilizing sequential information.

Seq2seq Model

In the seq2seq model, one RNN computes a sequence of input as an encoder and the other generates the output as a decoder. The encoder RNN maps the various lengths of the input to a fixed-sized vector, and then the decoder RNN generates various lengths of output sequences from the vector (Cho et al., 2014).

NODE: https://en.oxforddictionaries.com/

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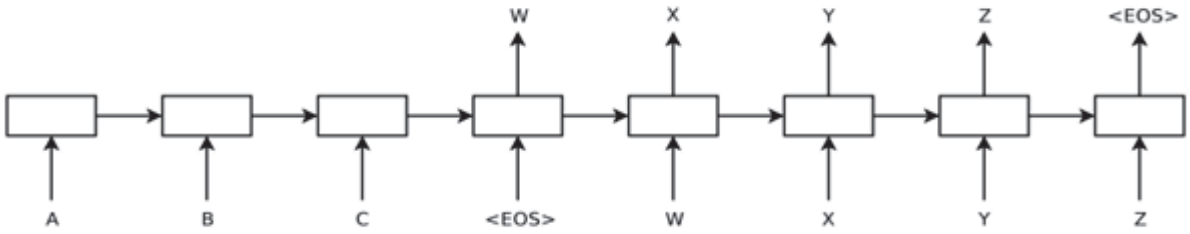

Figure 1. Basic Architecture of a seq2seq model (Sutskever et al., 2014)

The basic architecture depicted in Figure 1 represents the cells of the RNN, by which a sequence is processed. An encoder computes the input, 'ABC', creates a fixed-sized vector from which a decoder produces the output sequence 'WXYZ' stopping when it reaches the end-of-sentence, <EOS>. Each sentence always ends with a special symbol, usually specified with 'EOS' by which all the possible lengths of sequences can be defined in the model. In a language/speech processing system utilizing the model, the probability of 'WXYZ<EOS>' is computed according to the representation of 'ABC' which is also computed by the first RNN.

This research has implemented a seq2seq model on automatic conversion of phonetic alphabets for English. The model is complemented to process different lengths of input and output sequences. As described with Figure 1 above, the model has successfully generated an output sequence whose length is different from that of the input.

Normalization of Dictionary Entries

The pronunciation transcriptions of all the entries were extracted from the four dictionaries. Since those pronunciation transcriptions utilizing phonetic alphabets are varied for the same entries, all of the transcriptions are listed under each entry. If there exist pronunciation variations, they are also listed after they are restored to a full pronunciation sequence.

Table 1: Examples of Pronunciation of MWCD

Entry	Pronunciations before Conversion	Pronunciations after Conversion
acceleration	/ik-ˌse-lə-ˈrā-shən, (ˌ)ak-/	ik-ˌse-lə-ˈrā-shən ˌak-ˌse-lə-ˈrā-shən ak-ˌse-lə-ˈrā-shən
proselytization	/ˌprä-s(ə-)lə-tə-ˈzā-shən, ˌprä-sə-ˌlī-tə-/	ˌprä-slə-tə-ˈzā-shən ˌprä-sə-lə-tə-ˈzā-shən
conference	/ˈkän-f(ə-)rən(t)s, -fərn(t)s/	ˈkän-fə-rənts ˈkän-fə-rəns ˈkän-frənts ˈkän-frəns

The variations in all the dictionaries are presented as shown in the second column of Table 1 under "Pronunciation before Conversion". For example, two pronunciations are mapped to an entry '*conference*'; 1) /ˈkän-f(ə-)rən(t)s/ and 2) / -fərn(t)s/. The first transcription represents a full pronunciation although it includes two options by which a weak vowel known as schwa can be reduced and the voiceless alveolar stop, /t/ can also be omitted. The third column under "Pronunciations after Conversion" displays all the variations restored as full pronunciations which are generated calculating the possible combinations with the given options. Restoring the variations to the corresponding full pronunciation is performed as preprocessing. However, some of the restored sequences are eliminated from the final output list if there is a difference in the total number of syllable[6].

When all the variations are extended to a full pronunciation, an appropriate stress pattern is added to complete the pronunciation. Lexical stress is relative emphasis to a certain syllable, which is caused by phonetic properties such as loudness or vowel length. English has one or more syllables in every word and stress is placed on one or more

[6] This process will be complemented in the next step of the research so that all the restored sequences can make the final output list.

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syllables. Lexical stress in English presents different levels including primary, secondary and tertiary although the position of each level is less predictable. Accordingly, English stress patterns have to be memorized as part of the pronunciation. More importantly, lexical stress in English is contrastive to distinguish parts of speech. Given a pair of identical strings, they convey two different meanings from each other if stress is placed on different syllables. Some words may contain more than one stressed vowel, but exactly one of the stressed vowels is more prominent than the others. Each dictionary presents a unique system to indicate the stress pattern of a word and shows the different number of stress for the same word. Moreover, British and American English have different stress patterns from each other, which also leads to reduction of a vowel. These differences result in dissimilar pronunciations.

Table 2: Stress Systems

Dictionary	insignia	rare	rehab
CMUdict	IH2 N S IH1 G N IY2 AH0	R EH1 R	R IY0 HH AE0 B
NOAD	inˈsignēə	rer	ˈrēˌhab
MWCD	in-ˈsig-nē-ə	ˈrer	ˈrē-ˌhab
NODE	ɪnˈsɪgnɪə	rɛː	ˈriːhab

Table 2 displays the differences in the stress pattern of the dictionaries. The stress is placed before the stressed syllable in NOAD/MWCD/NODE whereas it is indicated after the stressed vowel in CMUdict, using a number, 0~2. There is no special indication in IPA/MWCD/NOAD for no stress while ‘0’ is inserted in CMUdict.

Table 3: Stress Description

Phonetic Alphabet	Primary Stress	Secondary Stress	No Stress
IPA / MWCD / NOAD	[ˈ]	[ˌ]	
ARPAbet	1	2	0
Standardization	*	%	

Different stress systems are standardized in order to train automatic conversion of pronunciations among the dictionaries. Table 3 shows the standardized notation of stress patterns. The primary stress is represented with the asterisk symbol ‘*’ while the secondary is indicated using the percent symbol, ‘%’. Both of them are inserted at the end of a stressed syllable.

When adding a stress pattern to all the entries is completed, non-ASCII codes are mapped to ASCII ones. NOAD, MWCD and NODE contain some of the non-ASCII code to represent phonemes. The mapping process is necessary in order to ease the conversion process. In addition, the dash symbol, ‘-’ is inserted between the phonemes for clear distinction.

Table 4: Sample Input Words for Seq2seq Model

		insignia	rare	rehab
Original Entries	CMUdict	IH2 N S IH1 G N IY2 AH0	R EH1 R	R IY0 HH AE0 B
	NOAD	inˈsignēə	rer	ˈrēˌhab
	MWCD	in-ˈsig-nē-ə	ˈrer	ˈrē-ˌhab
	NODE	ɪnˈsɪgnɪə	rɛː	ˈriːhab
Normalized Entries	CMUdict	IH-%-N-S-IH-*-G-N-IY-%-AH	R-EH-*-R	R-IY-HH-AE-B
	NOAD	I1-N-S-I1-*-G-N-E2-E3	R-E1-R	R-E2-*-H-A1-%-B
	MWCD	I1-N-S-I1-*-G-N-E2-E3	R-E1-*-R	R-E2-*-H-A1-%-B
	NODE	I2-N-S-I2-*-G-N-I2-E3	R-E2:	R-I1:-*-H-A4-B

Table 4 lists normalized word examples to be used as input for training which utilizes a seq2seq model. The stress pattern is now represented with the standardized notation for the entries in all the dictionaries.

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Automatic Conversion with Seq2seg Model and Experimental Results

To train the seq2seq model, 12 models have been constructed since the pronunciations of each dictionary have to be converted to those transcribed in the rest of the dictionaries. Each dictionary is coupled with the rest of the dictionaries, which results in 6 conversion pairs prepared for bidirectional conversion.

Table 5: Size of Training Data

Conversion Pairs	Number of Entries in Training Data
MWCD(MWCD) ⇿ NODE(IPA)	44,086
MWCD(MWCD) ⇿ CMUdict(ARPAbet)	37,471
MWCD(MWCD) ⇿ NOAD(NOAD)	45,549
CMUdict(ARPAbet) ⇿ NODE(IPA)	34,664
CMUdict(ARPAbet) ⇿ NOAD(NOAD)	35,082
NODE(IPA) ⇿ NOAD(NOAD)	44,403

With the normalized entries completed, training data sets are created for all the six pairs. The size of the training data varies for each pair as presented in Table 5. Although each model requires a different setting of parameters for training, all the models have been trained using the optimized parameters set for the two models. When the training is completed, a test data set is created with 1,000 entries, all of which are commonly listed in the four dictionaries. With this testing data, the conversion performances are evaluated.

Table 6: Accuracy of Conversion Results

Conversion	Accuracy	Conversion	Accuracy
NOAD(NOAD) → MWCD(MWCD)	89.6	MWCD(MWCD) → CMUdict(ARPAbet)	82.0
CMUdict(ARPAbet) → MWCD(MWCD)	88.9	NOAD(NOAD) → CMUdict(ARPAbet)	81.5
MWCD(MWCD) → NOAD(NOAD)	87.8	MWCD(MWCD) → NODE(IPA)	81.3
CMUdict(ARPAbet) → NOAD(NOAD)	87.6	CMUdict(ARPAbet) → NODE(IPA)	79.7
NODE(IPA) → MWCD(MWCD)	83.8	NOAD(NOAD) → NODE(IPA)	77.9
NODE(IPA) → NOAD(NOAD)	82.1	NODE(IPA) → CMUdict(ARPAbet)	74.5

Table 6 presents the accuracy of automatic conversion performed on each pair of the models. The highest accuracy is 89.6% produced when NOAD(NOAD) is converted to MWCD(MWCD). The result seems natural since both dictionaries transcribe the pronunciation of American English. On the other hand, the conversion from NODE(IPA) to CMUdict(ARPAbet) shows the lowest performance resulting in the accuracy of 74.5%. The low performance seems attributed to the fact that NODE transcribes British English whereas CMUdict provides the pronunciation of American English. This can be confirmed by the other two results with low accuracy produced by the conversion from NOAD(NOAD) to NODE(IPA) and from CMUdict(ARPAbet) to NODE(IPA). All of the three models convert British English from/to American English.

Error Analysis of Automatic Conversion

This research focuses on the results produced while converting NOAD to NODE and vice versa. Since they transcribe the pronunciation of American and British English respectively, the results are considered as useful sources to detect the meaningful conversion errors. The conversion result is analyzed and classified according to the type of errors. Three prominent types include stress, vowel, and consonant. This research, however, focuses on consonant related errors. American and British English present differences in a set of consonants transcribing the same word.

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Table 7: Pronunciation Variations of Consonants

British English	American English
/(ɒ)/	/ɒ/
/τ/	/P/
/Σ/	/Z/
/ζ/	/σ/
/σ/	/Σ/
/Δ/	/T/

Table 7 lists up the pronunciation variations in some of the consonants between British and American English (Hosseinzadeh, et al., 2015). One of the most prominent differences is the rhotic /r/. In American English, the letter 'r' is mostly pronounced except the cases in some dialects. However, it is not pronounced in British English when it occurs in the coda position. For example, a word, *park* is pronounced as /park/ in American English while it is dropped in British English as in /pak/.

Table 8: Errors on Converting /r/ #1

		To NOAD	
		O	/r/
From NODE	No /r/ *in* Testing Data	Correct: 441 Incorrect: 20	Correct: 191 Incorrect: 23
	No /r/ *in* Training Data	None	7,165

The process of converting NODE to NOAD has produced 441 correct cases and 20 incorrect cases of not inserting /r/ as Table 8 has presented. The conversion is incorrect because the rhotic /r/ in British English has to be realized as /r/ in American English, but it failed as in /ˌaftəˈnōon/ which is meant to be /ˌaftərˈnōon/. Similarly, 23 errors have been detected when /r/ should not be inserted in NOAD since /r/ is neither rhotic nor included in the words listed in NODE.

Table 9: Errors on Converting /r/ #2

Entry	NODE (IPA)	NOAD (NOAD) reference	NOAD (NOAD) model	Description
yoga	ˈjəʊgə	ˈyōgə	ˈyōgər	/r/ insertion error
sigma	ˈsɪgmə	ˈsigmə	ˈsigmər	/r/ insertion error
forerunner	ˈfɔːrʌnə	ˈfôrˌrənər	ˈfôˌrənər	/r/ deletion error
joker	ˈdʒəʊkə	ˈjōkər	ˈjōkə	/r/ deletion error
altogether	ɔːltəˈgɛðə	ˌôltəˈgeTHər	ˌôltəˈgeTHər	correct (/r/ insertion)
benefactor	ˈbɛnɪfaktə	ˈbenəˌfaktər	ˈbenəˌfaktər	correct (/r/ insertion)

Table 9 displays more examples of the results produced by converting /r/. For example, a word, *yoga* should be converted to /ˈyōgə/ rather than /ˈyōgər/ in which the inserted /r/ causes an error. In the training set, there are 7,165 cases in which British rhotic /r/ is correctly restored in NOAD. Table 8 also presents the correctly converted examples such as *altogether*: the last phoneme /r/ in NOAD has been successfully restored.

Another prominent pronunciation variation is mapping /t/ in British English and /d/[7] in American English. The voiceless alveolar stop, /t/ in British English often pronounced as a voiced alveolar flap in American English usually when it occurs in an intervocalic position or the phoneme is represented by a double 't' in its spelling.

[7] This is supposed to be the voiced alveolar flap /P/, but NOAD uses /d/ to represent it.

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Table 10: Errors on Converting /t/ #1

		To NOAD	
		/t/	/d/
From NODE	/t/ *in* Testing Data	Correct: 213 Incorrect: 2	Correct: 55 Incorrect: 4
	/t/ *in* Training Data	12,292	3,246

As the result is shown in Table 10, the conversion of /t/ has generated only a couple of errors; British /t/ is supposed to be realized as /d/, but /t/ is produced instead. Another small number of errors are produced when /t/ is converted to /d/ rather than /t/ which is the intended result.

Table 11: Errors on Converting /t/ #2

Entry	NODE (IPA)	NOAD (NOAD) reference	NOAD (NOAD) model	Description
prophetess	ˌprɒfiˈtɛs	ˈpräfədəs	ˈpräfətəs	/d/→/t/ error
ghettoize	ˈgɛtəʊʌɪz	ˈgedōˌīz	ˈgetōˌīz	/d/→/t/ error
aglitter	əˈglɪtə	əˈglɪtə	əˈglɪdə	/t/→/d/ error
footlights	ˈfʊtlʌɪts	ˈfoo̲tˌlīts	ˈfoo̲dˌlīts	/t/→/d/ error
bottom	ˈbɒtəm	ˈbädəm	ˈbädəm	correct (/t/→/d/)
waiter	ˈweɪtə	ˈwādər	ˈwādər	correct (/t/→/d/)

Table 11 presents a set of examples in which both correct and incorrect conversion examples are listed. The voiceless alveolar stop is trained to be converted to the flap, but it stays in the pronunciation of a word such as *prophetess* of NOAD causing an error. On the other hand, /t/ is converted to /d/ in *footlights* when it should not.

Table 12: Errors on Converting /t/ #3

		To NOAD	
		/t/	O
From NODE	/t/ *in* Testing Data	Correct: 213 Incorrect: None	Correct: None Incorrect: 1
	/t/ *in* Training Data	12,292	717

Table 12 shows an interesting result of converting /t/. NODE /t/ has been successfully converted to /t/ in NOAD, without generating an error. When the British /t/ is converted to null in NOAD, only a single error has produced. However, no correct conversion has occurred either.

Table 13: Errors on Converting /t/ #4

Entry	NODE (IPA)	NOAD (NOAD) reference	NOAD (NOAD) model	Description
antler	ˈantlə	ˈantlər	ˈanlər	/t/ deletion error
costly	ˈkɒstli	ˈkôslē	ˈkôslē	correct (/t/ deletion)
frantic	ˈfrantɪk	ˈfranik	ˈfranik	correct (/t/ deletion)
hunter	ˈhʌntə	ˈhənər	ˈhənər	correct (/t/ deletion)

More examples are provided in Table 13. It lists the single error on converting /t/ to null as in *antler* in which /t/ is supposed to remain as is. In many other cases, the voiceless alveolar stop in British English becomes silent in some American English words as in *hunter*, which is not an error. This type of examples is included in the training data, but no such case has been found in the testing data.

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Table 14: Errors on Converting /N/ #1

		To NOAD	
		/NG/	/n/
From NODE	/N/ *in* Testing Data	Correct: 11 Incorrect: 1	Correct: None Incorrect: 1
	/N/ *in* Training Data	2,028	49

The next case is converting the velar nasal stop /N/ in British English to the alveolar nasal /n/ in American English. As Table 14 suggests, this is a rather rare case. Although the training data set contains 2,028 correct conversions of /N/ to /NG/, only 11 correct conversions are identified. Converting /N/ to /n/ has been trained with 49 conversion cases, but no such cases have been found in the testing process.

Table 15: Errors on Converting /N/ #2

Entry	NODE (IPA)	NOAD (NOAD) reference	NOAD (NOAD) model	Description
conclave	ˈkɒŋkleɪv	ˈkänˌklāv	ˈkä NGˌklāv	/n/→/NG/ error
congresswoman	ˈkɒŋgrɛsˌwʊmən	ˈkäNGgrəsˌwoomən	ˈkängrəsˌwoomən	/NG/→/n/ error
exceedingly	ɪkˈsiːdɪŋl	ikˈsēdiNGlē	ikˈsēdiNGlē	correct (/ŋ/→/NG/)
spanking	ˈspaŋkɪŋ	ˈspaNGkiNG	ˈspaNGkiNG	correct (/ŋ/→/NG/)
concrete	ˈkɒŋkriːt	ˈkänˌkrēt	ˈkänˌkrēt	correct (/ŋ/→/n/)
increase	ˈɪŋkriːs	inˈkrēs	inˈkrēs	correct (/ŋ/→/n/)

Table 15 includes a pair of errors where /N/ is incorrectly realized as /NG/ instead of /n/ as in *conclave*, and as /n/ when it is intended for /NG/ as in *congresswoman*. It also lists several examples of correctly converted /N/ to /NG/ such as *exceedingly* and to /n/ as in *increase*.

Table 16: Errors on Converting /p/ #1

		To NOAD	
		/p/	O
From NODE	No /p/ *in* Testing Data	Correct: None Incorrect: 1	Correct: None Incorrect: None
	No /p/ *in* Training Data	64	None

In American English, the voiceless bilabial stop /p/ is mostly pronounced when it appears in its spelling as in *assumption*. However, it is silent in British English. The training data set lists 64 cases of correct conversion in which the silent /p/ of NODE has been restored to /p/. However, the testing set does not include a single case of the conversion as shown in Table 16.

Table 17. Error on Converting /p/ #2

Entry	NODE (IPA)	NOAD (NOAD) reference	NOAD (NOAD) model	Description
sometime	ˈsʌmtʌɪm	ˈsəmˌtīm	ˈsəmˌptīm	/p/ insertion error

Table 17 presents an example of incorrectly converted /p/ as in an entry, *sometime*. The voiceless bilabial stop is inserted in NOAD when it should not.

Table 18. Examples of Converting /p/ in Training Data

Entry	NODE (IPA)	NOAD (NOAD)
assumption	əˈsʌmʃn əˈsʌmʃən əˈsʌmpʃn əˈsʌmpʃən	əˈsəmSHn əˈsəmSHən əˈsəmpSHn əˈsəmpSHən
humpback	ˈhʌmbak ˈhʌmpbak	ˈhəmpˌbak
symptom	ˈsɪmtəm ˈsɪmptəm	ˈsimtəm ˈsimptəm

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Table 18 lists up the cases of correct conversion of /p/ included in the training data. With examining the training data, the cause for the error in *sometime* is detected as shown in Table 17. For example, when an entry has pronunciation variations as in *assumption*, it generated 16 possible cases for the training. Some of the data such as /əˈsʌmʃn/ and əˈsəmpSHən/ has causes the error in *sometime*; even when there is no /p/ in the source data, /p/ is inserted in the target data. In other words, the accuracy of the seq2seq model decreases when there are more than one training data for an input sequence.

Conclusion

This research has presented automatic conversions of phonetic alphabets for English utilizing a seq2seq model. Examining the conversion results helps verifying the differences in pronunciations between British and American English. One of the most noticeable distinctions is pronouncing /r/ and /t/ which represent the typical pronunciations of the two dialects of English.

A seq2seq model was implemented for this research since it is known for its good performance in successfully generating an output sequence whose length is different from that of the input. However, some of the errors suggest that the quality of the training data determines the accuracy of the performance. The model has performed well on the input which a single output is mapped to, but it requires further adjustment on creating a training data set for the cases in which multiple outputs are expected. In other words, high performance can be guaranteed only when accurate training data is prepared or a very large volume of data is provided. In the following step of the research, the data presented in Table 7 will be analyzed and discussed. In addition, the errors on vowel will be identified for further analysis and discussion.

Acknowledgements

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AN EXAMPLE OF IMMIGRATION'S IMPACT ON THE LINGUISTIC LANDSCAPE OF THE CITY: ARABIC SIGNS IN ŞANLIURFA

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Abstract: There are 395.823 Syrian immigrants in Şanlıurfa province. Also, the number of Syrians in the city is 113.568. This shows that the Syrian refugees are social, cultural and economic impact in the city. One of these effects is change the linguistic landscape in the city. Really, the signs in the city has changed significantly as a result of intense and sudden migrations. So that, this change has seen at many levels of life (transportation services, educational institutions, workplaces, walls of buildings, pillars, hospitals, etc) in the city. Therefore, the emergence, dimension, properties, distribution of this new situation have been investigated in this study. Also, problems arising from this change and suggestions have been examined.

Keywords: Linguistic landscape, the impact of international migration, Şanlıurfa, adaptation to the city, materials of visibility, Arabic signboards.

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AN EXPERIMENTAL AND COMPUTATIONAL STUDY ON THE SYNTHESIS OF 1-(2-PHENYL-2-(2-PHENYLHYDRAZINEYLIDENE)ETHYL)-1H-IMIDAZOLE

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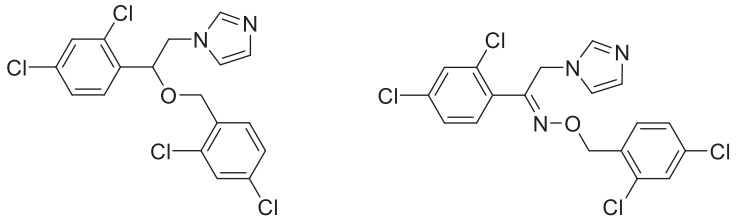
Abstract: In this study, an alternative, microwave assisted synthetic method for the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole is described. The results show that the proposed method is efficient and time and energy saving. In the second part of our study, some DFT (Density Functional Theory) calculations with B3LYP (Becke three-parameter hybrid functional combined with Lee–Yang–Parr correlation functional) have been performed on the synthesized molecules and computational results have been compared with the experimentally obtained data. All DFT calculations were performed at the B3LYP/6-31G(d), 6-31G(d,p), 6-311G(d,p) and 6-311+G(2d,p) levels of theory. NMR calculations were carried out using GIAO (Gauge-Independent Atomic Orbital) and CSGT (Continuous Set of Gauge Transformations) methods. Additionally MEP (Molecular Electrostatic Potential) maps, FMOs (Frontier Molecular Orbitals), some global reactivity descriptors and Mulliken atomic charges were computationally determined with the same basis sets.

Keywords: Computational Chemistry, Microwave Synthesis, DFT, Phenyl hydrazone.

Introduction

In recent years, fungal infections have become an important complication. Up to now, there has been an increase in the number of antifungal drugs available with various structures. However, their clinical usage has been limited by the emergence of drug resistance, high risk of toxicity, insufficient antifungal activity and undesirable side effects. Miconazole, oxiconazole (Figure 1) and related compounds are the best known antifungal azole drugs.



miconazole oxiconazole

Figure 1. Molecular structures of miconazole and oxiconazole

In this study we have worked on the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole. However, in literature there are several methods for the synthesis of this compound, these methods requires long reaction times (Soltani Rad et al., 2010; Zampieri et al., 2009, Yousefi et al., 2012). In this study, microwave assisted alternative method was used for this synthesis.

In the second part of our study, some DFT (Density Functional Theory) calculation have been performed. For this purpose, single point energy calculations, geometry optimizations, frequency analysis, NMR spectral analysis, molecular electrostatic potential map calculations, frontier molecular orbital calculations, determination of some global reactivity descriptors and Mulliken atomic charge calculations have been performed. Comparison of the computationally obtained data and the experimental results show that there is good agreement between them. All DFT calculations were carried out at the B3LYP/6-31G(d), B3LYP/6-31G(d,p), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) levels of theory.

Materials and Methods

Experimental

The synthetic pathway for the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole is given in Figure 2.

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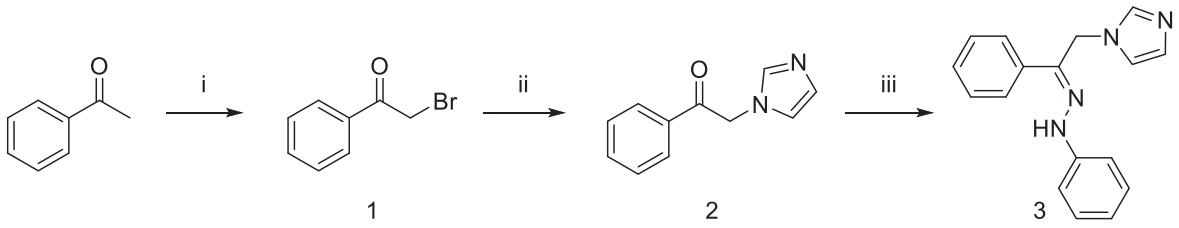

(i) Br_2, dioxane:ether, 0°C → r.t., 12h
(ii) imidazole, MeOH, dioxane:ether, 0°C → r.t., 18h
(iii) $PhNHNH_2$, EtOH, AcOH, MW, 1h

Figure 2. Synthetic pathway.

Steps (i) and (ii) reactions were carried out according to the literature (Cowper et al., 1943; Özel Güven et al., 2007). In the step (iii), ketone (1 eq.), phenylhydrazine (1.5 eq.) and a few drops of acetic acid was dissolved in ethanol and the mixture was irradiated for 1 hour. After cooling of the mixture, product was isolated from crude mixture.

Theoretical calculations

In the second part of our study, we have done some DFT calculations on compound 3. Single point energy calculations, geometry optimizations, frequency analysis, NMR spectral analysis, molecular electrostatic potential map calculations, frontier molecular orbital calculations, determination of some global reactivity descriptors and Mulliken atomic charge calculations have been performed. Comparison of the computationally obtained data and the experimental results show that there is good agreement between them. All DFT calculations were carried out at the B3LYP/6-31G(d), B3LYP/6-31G(d,p), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) levels of theory. All theoretical calculations have been performed using Gaussian 09, Rev. D.01 Program Package (Frisch et al. 2013) and GaussView5 (Dennington et al. 2009) was used for the visualization of the computational results.

Optimized Structure Analysis

Geometric parameters such as bond lengths, bond angles and dihedral angles were determined theoretically at the B3LYP/6-31G(d), 6-31G(d,p), 6-311G(d,p), 6-311+G(2d,p) levels of theory. Geometric parameters obtained at the 6-311+G(2d,p) level of theory are given in Table 1.

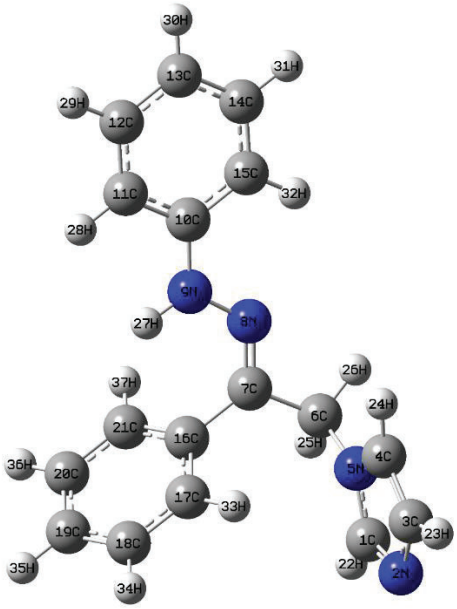

Table 1: Geometric parameters of the compound 3 obtained at the 6-311+G(2d,p) level of theory.

Atoms	Bond Length	Atoms	Bond Angles	Atoms	Dihedral Angles

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C(21)-H(37)	1.0840	H(37)-C(21)-C(20)	119.8	C(19)-C(20)-C(21)-C(16)	0.1
C(20)-H(36)	1.0840	H(37)-C(21)-C(16)	119.5	C(19)-C(20)-C(21)-H(37)	179.6
C(20)-C(21)	1.3900	C(20)-C(21)-C(16)	120.6	H(36)-C(20)-C(21)-C(16)	-179.6
C(19)-H(35)	1.0830	H(36)-C(20)-C(21)	119.8	H(36)-C(20)-C(21)-H(37)	-0.2
C(19)-C(20)	1.3910	H(36)-C(20)-C(19)	120.2	C(18)-C(19)-C(20)-C(21)	0.0
C(18)-H(34)	1.0830	C(21)-C(20)-C(19)	120.1	C(18)-C(19)-C(20)-H(36)	179.7
C(18)-C(19)	1.3910	H(35)-C(19)-C(20)	120.1	H(35)-C(19)-C(20)-C(21)	-179.9
C(17)-H(33)	1.0830	H(35)-C(19)-C(18)	120.1	H(35)-C(19)-C(20)-H(36)	-0.2
C(17)-C(18)	1.3910	C(20)-C(19)-C(18)	119.8	C(17)-C(18)-C(19)-C(20)	-0.1
C(16)-C(21)	1.4010	H(34)-C(18)-C(19)	120.1	C(17)-C(18)-C(19)-H(35)	179.8
C(16)-C(17)	1.3990	H(34)-C(18)-C(17)	119.5	H(34)-C(18)-C(19)-C(20)	-179.9
C(15)-H(32)	1.0800	C(19)-C(18)-C(17)	120.3	H(34)-C(18)-C(19)-H(35)	0.0
C(14)-H(31)	1.0840	H(33)-C(17)-C(18)	119.8	C(16)-C(17)-C(18)-C(19)	0.0
C(14)-C(15)	1.3890	H(33)-C(17)-C(16)	119.9	C(16)-C(17)-C(18)-H(34)	179.9
C(13)-H(30)	1.0830	C(18)-C(17)-C(16)	120.4	H(33)-C(17)-C(18)-C(19)	179.9
C(13)-C(14)	1.3920	C(21)-C(16)-C(17)	118.8	H(33)-C(17)-C(18)-H(34)	-0.2
C(12)-H(29)	1.0840	C(21)-C(16)-C(7)	119.8	C(7)-C(16)-C(21)-C(20)	179.3
C(12)-C(13)	1.3920	C(17)-C(16)-C(7)	121.4	C(7)-C(16)-C(21)-H(37)	-0.2
C(11)-H(28)	1.0850	H(32)-C(15)-C(14)	120.9	C(17)-C(16)-C(21)-C(20)	-0.2
C(11)-C(12)	1.3870	H(32)-C(15)-C(10)	119.5	C(17)-C(16)-C(21)-H(37)	-179.6
C(10)-C(15)	1.3980	C(14)-C(15)-C(10)	119.6	C(7)-C(16)-C(17)-C(18)	-179.4
C(10)-C(11)	1.4000	H(31)-C(14)-C(15)	119.0	C(7)-C(16)-C(17)-H(33)	0.7
N(9)-H(27)	1.0140	H(31)-C(14)-C(13)	119.9	C(21)-C(16)-C(17)-C(18)	0.1
N(9)-C(10)	1.3950	C(15)-C(14)-C(13)	121.1	C(21)-C(16)-C(17)-H(33)	-179.8
N(8)-N(9)	1.3410	H(30)-C(13)-C(14)	120.5	C(13)-C(14)-C(15)-C(10)	-0.1
C(7)-C(16)	1.4930	H(30)-C(13)-C(12)	120.5	C(13)-C(14)-C(15)-H(32)	179.9
C(7)-N(8)	1.2870	C(14)-C(13)-C(12)	119.0	H(31)-C(14)-C(15)-C(10)	180.0
C(6)-H(26)	1.0910	H(29)-C(12)-C(13)	120.1	H(31)-C(14)-C(15)-H(32)	-0.1
C(6)-H(25)	1.0930	H(29)-C(12)-C(11)	119.3	C(12)-C(13)-C(14)-C(15)	0.0
C(6)-C(7)	1.5110	C(13)-C(12)-C(11)	120.6	C(12)-C(13)-C(14)-H(31)	180.0
N(5)-C(6)	1.4610	H(28)-C(11)-C(12)	120.0	H(30)-C(13)-C(14)-C(15)	-180.0
C(4)-H(24)	1.0770	H(28)-C(11)-C(10)	119.7	H(30)-C(13)-C(14)-H(31)	0.0
C(4)-N(5)	1.3790	C(12)-C(11)-C(10)	120.2	C(11)-C(12)-C(13)-C(14)	0.0
C(3)-H(23)	1.0790	C(15)-C(10)-C(11)	119.4	C(11)-C(12)-C(13)-H(30)	-180.0
C(3)-C(4)	1.3690	C(15)-C(10)-N(9)	122.2	H(29)-C(12)-C(13)-C(14)	179.9
N(2)-C(3)	1.3750	C(11)-C(10)-N(9)	118.4	H(29)-C(12)-C(13)-H(30)	-0.1
C(1)-H(22)	1.0790	H(27)-N(9)-C(10)	118.5	C(10)-C(11)-C(12)-C(13)	-0.1
C(1)-N(5)	1.3640	H(27)-N(9)-N(8)	119.5	C(10)-C(11)-C(12)-H(29)	-180.0
C(1)-N(2)	1.3130	C(10)-N(9)-N(8)	121.7	H(28)-C(11)-C(12)-C(13)	179.9
		N(9)-N(8)-C(7)	120.1	H(28)-C(11)-C(12)-H(29)	0.0
		C(16)-C(7)-N(8)	124.7	N(9)-C(10)-C(15)-C(14)	179.5
		C(16)-C(7)-C(6)	119.5	N(9)-C(10)-C(15)-H(32)	-0.5
		N(8)-C(7)-C(6)	115.7	C(11)-C(10)-C(15)-C(14)	0.1
		H(26)-C(6)-H(25)	108.3	C(11)-C(10)-C(15)-H(32)	-179.9
		H(26)-C(6)-C(7)	108.2	N(9)-C(10)-C(11)-C(12)	-179.4
		H(26)-C(6)-N(5)	109.5	N(9)-C(10)-C(11)-H(28)	0.7
		H(25)-C(6)-C(7)	110.5	C(15)-C(10)-C(11)-C(12)	0.0
		H(25)-C(6)-N(5)	106.6	C(15)-C(10)-C(11)-H(28)	-179.9
		C(7)-C(6)-N(5)	113.6	N(8)-N(9)-C(10)-C(11)	-175.6
		C(6)-N(5)-C(4)	126.5	N(8)-N(9)-C(10)-C(15)	5.0
		C(6)-N(5)-C(1)	127.0	H(27)-N(9)-C(10)-C(11)	-2.1
		C(4)-N(5)-C(1)	106.5	H(27)-N(9)-C(10)-C(15)	178.5
		H(24)-C(4)-N(5)	121.9	C(7)-N(8)-N(9)-C(10)	177.8
		H(24)-C(4)-C(3)	132.4	C(7)-N(8)-N(9)-H(27)	4.4
		N(5)-C(4)-C(3)	105.7	C(6)-C(7)-C(16)-C(17)	71.1
		H(23)-C(3)-C(4)	127.9	C(6)-C(7)-C(16)-C(21)	-108.4
		H(23)-C(3)-N(2)	121.6	N(8)-C(7)-C(16)-C(17)	-110.7
		C(4)-C(3)-N(2)	110.5	N(8)-C(7)-C(16)-C(21)	69.9

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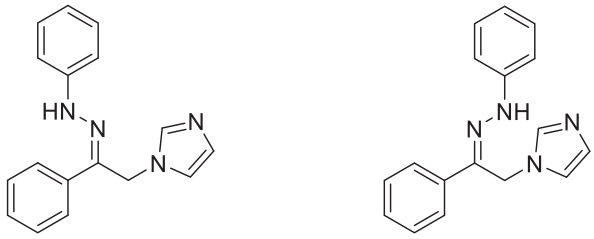
		C(3)-N(2)-C(1)	105.2	C(6)-C(7)-N(8)-N(9)	-180.0
		H(22)-C(1)-N(5)	121.9	C(16)-C(7)-N(8)-N(9)	1.7
		H(22)-C(1)-N(2)	125.9	N(5)-C(6)-C(7)-N(8)	114.3
		N(5)-C(1)-N(2)	112.2	N(5)-C(6)-C(7)-C(16)	-67.3
				H(25)-C(6)-C(7)-N(8)	-126.0
				H(25)-C(6)-C(7)-C(16)	52.4
				H(26)-C(6)-C(7)-N(8)	-7.5
				H(26)-C(6)-C(7)-C(16)	170.9
				C(1)-N(5)-C(6)-C(7)	112.3
				C(1)-N(5)-C(6)-H(25)	-9.6
				C(1)-N(5)-C(6)-H(26)	-126.6
				C(4)-N(5)-C(6)-C(7)	-65.2
				C(4)-N(5)-C(6)-H(25)	173.0
				C(4)-N(5)-C(6)-H(26)	56.0
				C(3)-C(4)-N(5)-C(1)	0.2
				C(3)-C(4)-N(5)-C(6)	178.0
				H(24)-C(4)-N(5)-C(1)	179.9
				H(24)-C(4)-N(5)-C(6)	-2.2
				N(2)-C(3)-C(4)-N(5)	-0.1
				N(2)-C(3)-C(4)-H(24)	-179.8
				H(23)-C(3)-C(4)-N(5)	179.4
				H(23)-C(3)-C(4)-H(24)	-0.3
				C(1)-N(2)-C(3)-C(4)	0.0
				C(1)-N(2)-C(3)-H(23)	-179.6
				N(2)-C(1)-N(5)-C(4)	-0.2
				N(2)-C(1)-N(5)-C(6)	-178.0
				H(22)-C(1)-N(5)-C(4)	179.8
				H(22)-C(1)-N(5)-C(6)	1.9
				N(5)-C(1)-N(2)-C(3)	0.2
				H(22)-C(1)-N(2)-C(3)	-179.8

Single Point Energies

Figure 3 shows the (E)- and (Z)-isomers of the compound 3 and Table 2 shows the energies of both isomers.



(E)-isomer (Z)-isomer

Figure 3. (E)- and (Z)-isomers of the compound 3.

Table 2: Calculated energies for the (E)- and (Z)-isomer of the compound 3.

Isomer	Opt1	Opt2	Opt3	Opt4
Z	-876.40559959	-876.43252775	-876.62182693	-876.65516616
E	-876.40698356	-876.43386777	-876.62359502	-876.65714360
Energ.Dif. (hartree)	0.00138397	0.00134002	0.00176809	0.00197744
Energ.Dif. (eV)	0.037659756	0.036463815	0.048112197	0.053808908839
Opt1: B3LYP/6-31G(d); Opt2: B3LYP/6-31G(d,p); Opt3: B3LYP/6-311G(d,p); Opt4: B3LYP/6-311+G(2d,p)				

Frequency Analysis

Calculated IR spectra of the compounds 2 and 3 at the B3LYP/6-311+G(2d,p) level of theory are given in Fig. 4.

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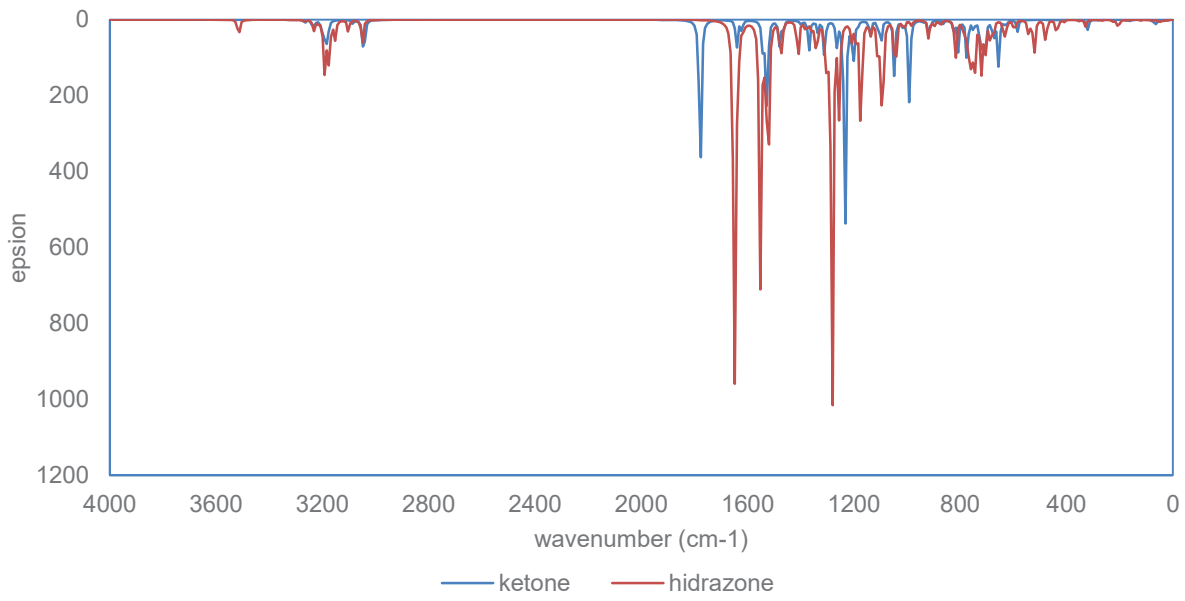

Figure 4. Calculated IR spectra for the compound 2 and 3 at the 6-311+G(2d,p) level of theory.

NMR Spectral Analysis

NMR chemical shifts were calculated at the B3LYP/6-31G(d), B3LYP/6-31G(d,p), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) levels of theory using both CSGT (Continuous Set of Gauge Transformations) and GIAO (Gauge-Independent Atomic Orbital) models are given in Table 3.

Table 3: Experimental and calculated NMR chemical shifts for compound 3.

	exp[a]	csgt1	csgt2	csgt3	csgt4	giao1	giao2	giao3	giao4
22-H	7.82-6.82	3.58	4.42	6.07	6.89	6.75	7.04	7.10	7.21
23-H	7.82-6.82	4.03	4.78	6.09	7.12	6.97	7.25	7.33	7.44
24-H	7.82-6.82	4.10	4.89	6.21	7.11	6.81	7.15	7.19	7.28
25-H	5.45	2.58	2.98	3.73	4.60	4.55	4.63	4.73	4.82
26-H	5.45	2.58	2.98	3.73	4.60	4.55	4.63	4.73	4.82
27-H	10.25	4.09	5.11	6.13	7.05	6.69	7.29	7.08	7.30
28-H	7.82-6.82	3.95	4.53	5.79	6.85	6.64	6.89	7.03	7.16
29-H	7.82-6.82	4.46	5.00	6.15	7.14	7.04	7.22	7.34	7.40
30-H	7.82-6.82	4.07	4.61	5.71	6.71	6.64	6.83	6.91	7.04
31-H	7.82-6.82	4.46	5.00	6.15	7.14	7.04	7.22	7.34	7.40
32-H	7.82-6.82	3.95	4.53	5.79	6.85	6.64	6.89	7.03	7.16
33-H	7.82-6.82	4.05	4.56	5.76	6.62	6.54	6.73	6.83	6.90
34-H	7.82-6.82	4.75	5.31	6.45	7.35	7.24	7.43	7.55	7.63
35-H	7.82-6.82	4.75	5.30	6.43	7.36	7.24	7.43	7.55	7.65
36-H	7.82-6.82	4.75	5.31	6.45	7.35	7.24	7.43	7.55	7.63
37-H	7.82-6.82	4.05	4.56	5.76	6.62	6.54	6.73	6.83	6.90

[a] Soltani Rad et al., 2010.

Molecular Electrostatic Potential Maps

Molecular electrostatic potential (MEP) maps were calculated at the B3LYP/6-31G(d), B3LYP/6-31G(d,p), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) levels of theory. MEP map for the compound 3 calculated at the B3LYP/6-311+G(2d,p) level of theory is given in Figure 5.

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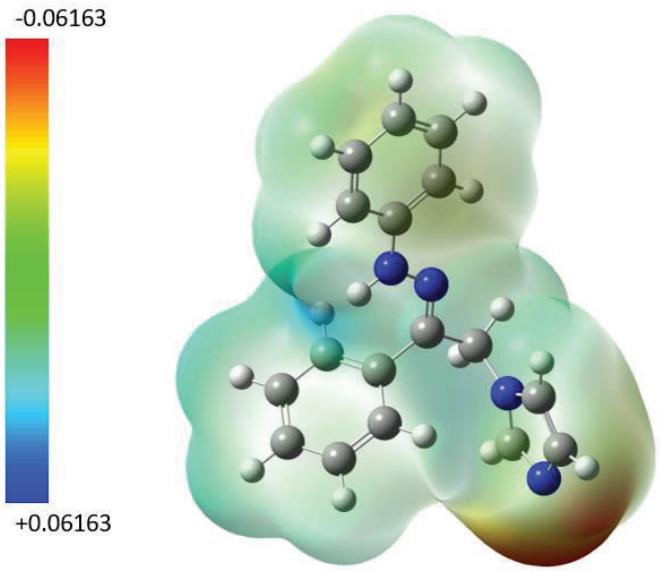

Figure 5. Molecular electrostatic potential map of the compound 3 calculated at the B3LYP/6-311+G(2d,p) level of theory.

Frontier molecular orbitals and global reactivity descriptors

Ionization potential (I), electron affinity (A), electronegativity (χ), chemical hardness (η), chemical softness (S), electronic potential (μ) and electrophilicity index (ω) values were determined (Koopmans, 1933; Mulliken, 1934; Pearson, 1963; Pearson, 1968; Pearson, 1999; Parr and Pearson, 1983, Parr et al., 1999; Chattaraj et al. 2006) and given for the compound 3 in Table 4.

Table 4: Global reactivity descriptors for compound 3.

	eV			
	6-31G(d)	6-31G(d,p)	6-311G(d,p)	6-311+G(2d,p)
LUMO	-0.94581	-0.95526	-1.19043	-1.28736
HOMO	-5.35977	-5.36814	-5.60736	-5.69970
HOMO-LUMO Gap	4.41396	4.41288	4.41693	4.41234
I	5.35977	5.36814	5.60736	5.69970
A	0.94581	0.95526	1.19043	1.28736
χ	3.15279	3.16170	3.39890	3.49353
η	2.20698	2.20644	2.20847	2.20617
S	0.22655	0.22661	0.22640	0.22664
μ	-3.15279	-3.16170	-3.39890	-3.49353
ω	2.25197	2.26527	2.61550	2.76605

Results and Discussion

In this study, we have worked on a new, microwave assisted synthetic method for the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole. In the synthesis of compound 1 and compound 2, literature methods were used (Cowper 1943, Güven et al. 2007). For the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole, microwave assisted synthetic method was used. In the synthesis of compound 3, it is possible to obtained both (E)- and (Z)- isomers, but the (E)-isomer is the major one. It is not surprising to obtain only (E)-isomer because of its more stable molecular structure than the (Z)-isomer. The DFT calculations also support this experimental result. As seen in Table 2, the energy for the (E)-isomer is relatively small than the energy of the (Z)-isomer. In the NMR calculations, it can be seen that the best basis sets for estimating the chemical shifts are CSGT4 (B3LYP/6-311+G(2d,p) CSGT) and GIAO2 (B3LYP/6-31G(d,p) GIAO).

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Conclusion

In conclusion, in this study we have worked on a new microwave assisted synthetic method for the synthesis of 1-(2-phenyl-2-(2-phenylhydrazineylidene)ethyl)-1H-imidazole. In the second part of our study, some DFT calculations have been performed on the synthesized molecules. The results show that especially in some certain cases, the computationally obtained data supports the experimental results well.

Acknowledgements

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AN INVESTIGATION ON VIBRATIONAL ANALYSIS OF CANTILEVER BEAMS BASED ON FIBER BREAKS IN UNIDIRECTIONAL FIBER COMPOSITES

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Abstract: In this study, strength losses due to fiber breaks in unidirectional cantilever beam composites were investigated by vibration analysis. The fibers in a continuous Fiber Reinforced Plastic (FRP) composites have the largest percentage of FRP composites determined. Particularly the number of fibers in the continuous fiber used significantly affects the strength of the FRP composite produced. Because the continuous fiber used can be damaged during production or in composite manufacturing. For this reason, in this study, strength losses due to fiber breaks in FRP cantilever beam composites are investigated by mechanical vibration analysis. Finite element analysis (FEA) model is used for fiber breaks in composites. Damaged Fibers that transfer mechanical loads completely to the resin cause the loss of strength in FRP composites.

Keywords: Composite, FRP, Continuous Fiber, breaking, damage, vibration, FEA

Introduction

Composite materials have a wide range of applications because they have low density and high strength values. The areas of use of composite materials are frequently used in industrial and defense industries such as space, ship, commercial and passenger cars. Fiber reinforced composites (FRP) are important in composite materials. FRP composite materials are formed by combining the matrix and the fibers. The fibers carry the load and provide rigidity, while the matrix transmits the load to the fibers. Although these properties of composite materials are appreciated, they also tend to have defects that cause significant structural damage to the integrity of these materials. The mechanical properties of FRP materials depend on the type of fiber used. For this reason, any errors in the fiber can change the strength properties of the composite material. It is used as a sensor in carbon fiber composite materials having a fragile and conductive structure. Due to this feature, it has been observed that the electrical conductivity changes due to the fracture of the continuous carbon fibers in the composite structure (Chen & Liu, 2008; Wang & Chung, 1996; Wen, Xia, & Choy, 2011; Xia & Curtin, 2008). It has also been experimentally demonstrated that continuous carbon fibers are damaged by filament winding method by about 43% due to pretension applied to the fiber during production. (Genç & Akkus, 2017).

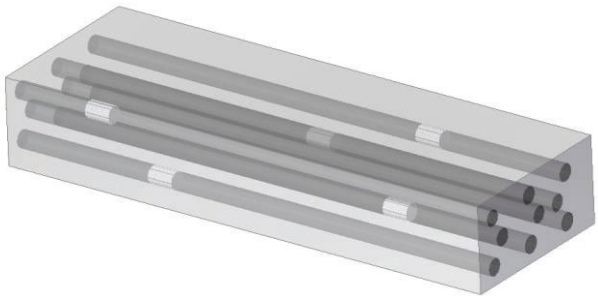

Figure 1. Fiber breaking in FRP composites 3D model

Fiber damage to FRP materials during production is important as the structure changes its mechanical properties. Because the fiber used to determine the mechanical properties of FRP materials has very great role. Especially in continuous fiber reinforced composites (CFRP), If some of the filaments in the fiber are breaking off during the production, the loads on the broken fiber are transferred to the resin (Fig.1). Thus, due to the resin having less mechanical properties, loss of strength occurs in that region of the composite. In this study, the effects of filaments breakage in the FRP composites were investigated by numerical analysis. Vibration modes have been studied on GFRP composites produced by one-way glass fiber by performing dynamic research in this study.

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Materials and Methods

In FRP composite materials, it is important to reveal the loss of strength due to filaments breakage in fiber For this reason, 30x10x300 mm cantilever beam was used to investigate the effect of fiber breakage in FRP composite structures (Fig.2). In order to better understand the strength effect of fiber breakage, fibers are modeled unidirectionally in FRP composite cantilever beam. The mechanical properties of the cantilever beam due to fiber breakage will be investigated by FEA (Finite Element Analysis).

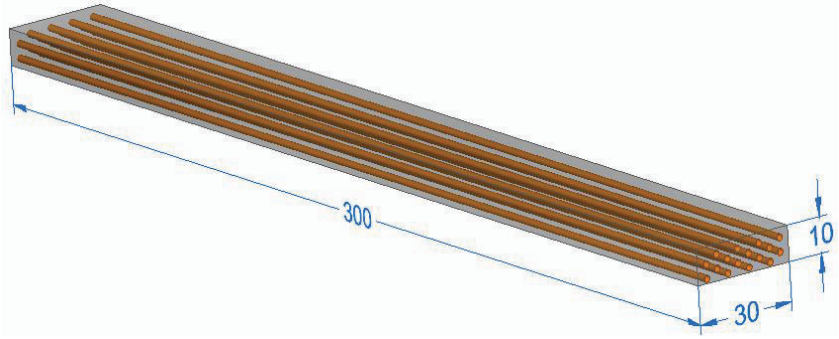

Figure 2. GFRP cantilever beam dimensions and 3D model of fiber orientation.

a) Material Model

In fiber reinforced composites, the mechanical properties of the composite vary depending on the type of fiber used, direction and mixture ratio because the fibers exhibit high strength and rigidity properties in the long axis direction. In such materials, the mechanical properties of the fiber direction (direction 1) are different from the mechanical values of the fiber direction 2 and 3 directions (Fig 3). For this reason, FRP composites are orthotropic material models (Huang, 2009; Sendikası, 09.01.2013).

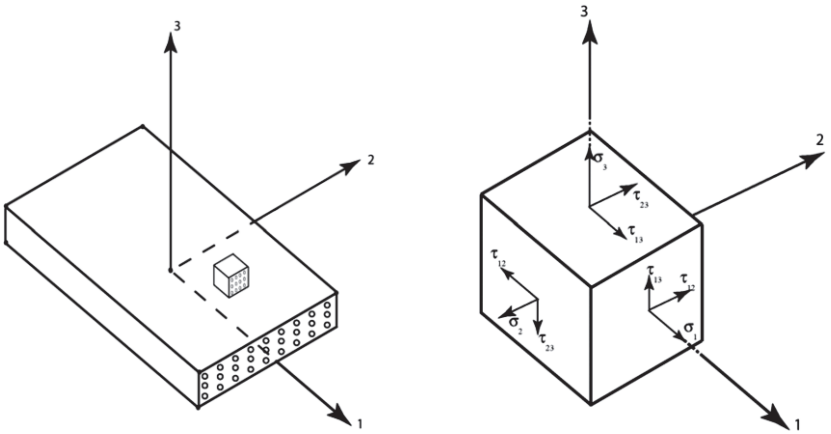

Figure 3. Orthotropic material model of FRP composites

In the composite material model, the cantilever beam are modeled epoxy and glass fiber reinforced, and the mechanical properties of the materials are given in Table 1. GFRP composites are modeled on a 60% glass fiber and 40% epoxy mixture ratio.

Table 1: Mechanical properties of materials used in composites.

Material	Properties	Symbol	Value	
Glass Fiber	Elasticity Modulus	E_1^f	76	GPa
	Density	d^f	2,56	g/cm^3
	Poisson's ratio	$\upsilon_{12}{}^f$	0,22	
Epoxy Resin	Elasticity Modulus	E^m	4	GPa
	Density	d^m	1,3	g/cm^3
	Poisson's ratio	υ^m	0,4	

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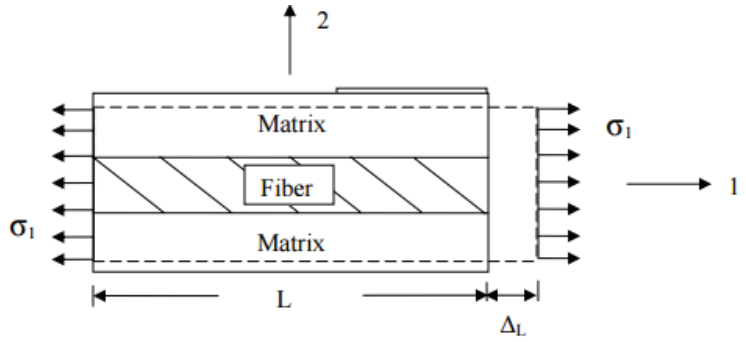

Figure 4. Unit volume element loaded in 1 direction (Facca, Kortschot, & Yan, 2006).

Composite mixture ratio was used in determining the mechanical properties of GFRP composite materials. Accordingly, as shown in Figure 4, it is necessary to determine the constants of the fiber-reinforced composite materials in the macrostructure. The mechanical properties of such materials vary depending on the rate of incorporation of the fiber and matrix in the unit cell. The mechanical properties are determined by Equation 2.1-2.3 using the fiber volume ratio (V^f) and matrix volume ratio (V^m) in the unit cell.

$$V^f + V^m = 1 \quad (0.1)$$

$$E_1 = E^m V^m + E_1^f V^f \quad (0.2)$$

$$\upsilon_{12} = V^m \upsilon^m + V^f \upsilon^f \quad (0.3)$$

Material properties of the CFRP cantilever beam according to the glass fiber mixture ratio of 60% are as given in Table 2. This obtained data is valid if there is no break in the glass fibers in the cantilever beam.

Table 2. Material properties of undamaged GFRP composite

V^f	V^m	E_1^f GPa	E^m GPa	${\upsilon_{12}}^f$	υ^m	d^f g/cm³	d^m g/cm³	E_1 GPa	υ_{12}	d g/cm³
0,6	0,4	76	4	0,22	0,4	2,56	1,3	47,2	0,292	2,056

b) FEA Analysis

The NX / Nastran Advanced Simulation program was used for FEA analysis of GFRP composite material. In the FEA model, CQUAD4 four node element type in 2D shell mesh were used. And this model consists of a total of 90 elements and 124 nodes. The results of the modal analysis of the GFRP cantilever beam are given in Table 3 and the mode shapes are shown in Figure 5.

Table 3. Vibration results of GFRP cantilever beam

Mod 1 (Hz)	**85,98**
Mod 2 (Hz)	**530,54**
Mod 3 (Hz)	**1451,47**
Mod 4 (Hz)	**2755,14**

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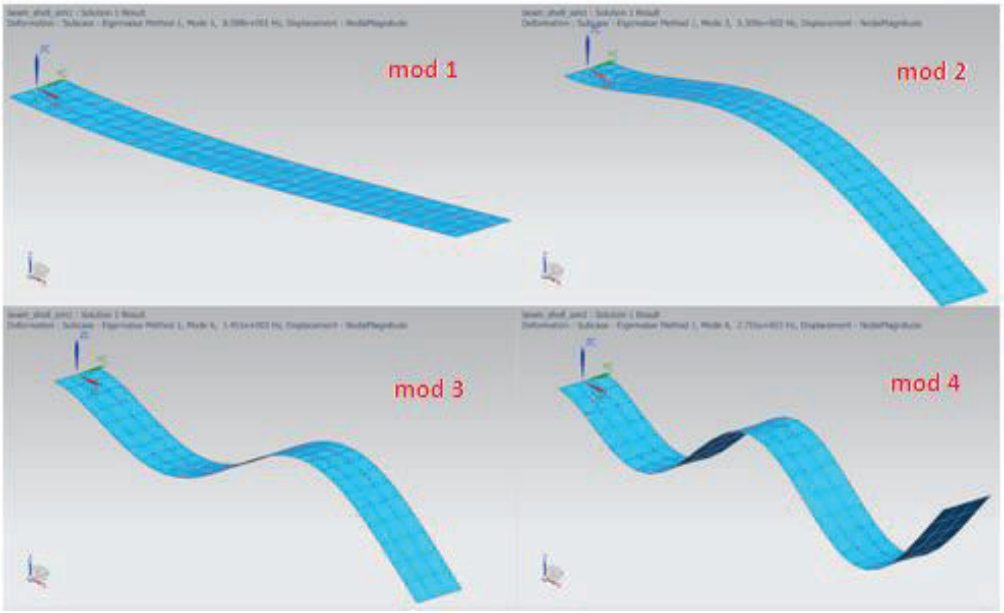

Figure 5. Mode shapes of GFRP cantilever beam

c) *Vibration analysis based on Fiber Breaking*

Since the fibers have a fragile structure, the fibers are of great importance in terms of the strength performance of the composite product. In FRP composites,It is accepted that the fibers do not carry the load in the regions where the fiber breakage occurs and all the load in that region carries the resin (Takehana, Akkus, Hidaka, & Kawahara, 1998). For this reason, damage to the fiber in GFRP composite materials affects the strength of the composite structure (Figure 6).



Figure 6. Model of the structure of damaged and undamaged fibers in FRP composites

Vibration analysis was performed to see the effect of fiber breaks in FEA analysis by modeling GFRP composites unidirectional. Vibration analyzes were performed to see the effect of fiber breaks on unidirectional modeled GFRP composites in FEA analysis. If the fibers in the composite beam are broken, the material properties of the beam change due to the variation of the mixture ratio in the cross section (Equation 2.1-2.3). Therefore, the modulus of elasticity of the composite varies depending on the mixture ratio as in Equation 2.2 (Figure 7). And also, the natural frequency values of the GFRP cantilever beam vibration analysis are given in Table 4 for four modes.

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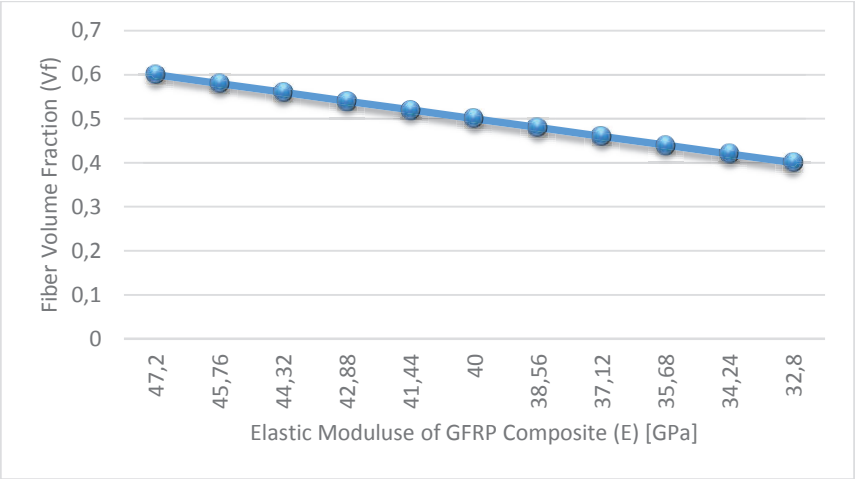

Figure 7. Change in elastic modulus of composite depending on fiber breakage.

Table 4. Vibration Analysis Results of Damaged GFRP Composite

Vf	Vm	$\overline{E_1}$	Mod 1	Mod 2	Mod 3	Mod 4
		GPa	Hz	Hz	Hz	Hz
0,6	0,4	47,2	85,99	538,93	1509,17	2957,44
0,54	0,46	42,88	81,96	513,68	1438,45	2818,85
0,5	0,5	40	79,16	496,13	1389,31	2722,54
0,44	0,56	35,68	74,76	468,57	1312,14	2571,33
0,4	0,6	32,8	71,68	449,26	1258,07	2465,37

Results and Discussion

The effect of fiber breaks on vibration analysis on GFRP cantilever beam was investigated. In the analysis, the damaged and undamaged states of the fibers were compared. In the study, it was assumed that the fibers were damaged according to the falling ratio of the fibers contained in the composite. In this case, vibration analysis was performed by changing the damage ratio of the glass fiber in the beam by the mixture ratio. This change was analyzed according to each mode value as shown in Fig 8. According to the result of approximately 30% reduction of fiber-to-fiber mixture ratio, while the elastic modulus of the composite decreases by 30%, the natural frequency values of the beam decrease by around 17%.

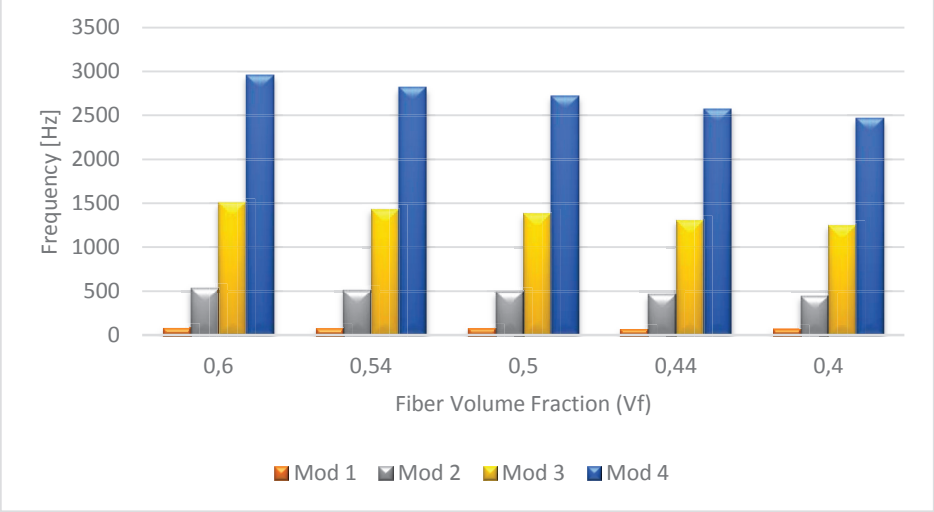

Figure 8. Vibration results due to fiber break in GFRP composites.

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Conclusion

GFRP composite materials are widely used in today's industrial world. The strength performances of these materials vary depending on the type of fiber used and the amount of fiber. Due to the fracture of the fibers in the GFRP composites, the FEA analysis showed that the fibers exhibited loss of strength by not carrying the load in the regions where they existed. Because broken glass fibers transfer the load to the resin in the damaged area. For this reason, the breakage of fibers in fiber during production of FRP composites decreases the strength by affecting the produced product. This can lead to more serious problems for fiber types with more fragile structure such as carbon fiber.

Acknowledgements

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ANTIMICROBIAL PROPERTIES of WOOD WATER OBTAINED by A HIGH FREQUENCY VACUUM DRYING METHOD

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Abstract: The objective of this study was to determine the antimicrobial activity properties of the wood water released from specimens during the drying process. The specimens were dried using a high-frequency vacuum (HfV) drying method. Wood specimens from white oak (*Quercus alba* L.), walnut (*Juglans regia* L.), and Eastern beech (*Fagus orientalis* L.) were dried inside a drying kiln with settings of 7.56 MHz frequency, 39.19λ wavelength, and 0.5 to 0.97 mBar vacuum. The moisture content (%) of the white oak, walnut, and Eastern beech specimens prior to kiln drying were 70% to 75%, 80% to 90% and 75% to 80%. Drying days of wood specimens were 16, 10, and 8, respectively. The antibacterial and antifungal activities of the wood water samples were determined using the microdilution method. According to the antimicrobial test results, the best antimicrobial properties were found in the white oak's drying water, with only 6.3 mg/mL of K. *pneumoniae* bacteria.

Keywords: Antibacterial activity; antifungal activity; wood water; high-frequency vacuum (HfV) drying

Introduction

Drying is the process to reduce water of wood to make wood material ready for lots of areas of usage. And, also drying is important for potential use of obtained water while drying process (Altınok et al. 2009). Drying methods are classified into two; natural and technical. In the past, wood materials were dried naturally using the sun's radiation and air flow; however, technical methods of drying are currently employed. Technical drying includes many different methods, which have come about through the advances in technology. The most common industrial drying methods for solid wood materials are classical, condensation, and vacuum drying. In addition, high-temperature, high-frequency, and microwave drying methods are less commonly applied. The first industrial radio-frequency vacuum (RfV) driers were developed by the Russian Academy of Sciences in the 1960s. High-frequency vacuum (HfV) driers were developed by Koppelman in the USA in 1967 (Resch, 2006). Currently, the HfV combined drying method prevails because of its many advantages in comparison with classical drying methods. Classical drying methods are insufficient for drying thick lumber without any deformation and also take longer without achieving the desired quality level (Güler et al. 2012).

Wood properties, such as combustibility, color, density, smell, feel/sense, compressive strength resistance, and dehumidifying capability, vary depending on the amount of extractives present in the material (Tutuş et al. 2010). Wood extractives evaporate while drying process because there is an open drying system either natural or technical drying is used. However, HfV is a completely closed drying system that does not require a chimney or additional humidifying equipment. Therefore, the water released from the drying process is generally purer because there is not any mixture. Therefore, utilization of obtained water which is rich in terms of extractives becomes meaningful (Güler et al. 2012). The released wood water can be further processed and utilized in cosmetic goods such as perfume and creams because of its pleasant aroma.

Turkey has an abundance of flora in terms of plant diversity. Turkey is located on the border of three phytogeographical regions and is a bridge between South Africa's and Southeast Asia's flora. In addition, species endemism is high in Turkey because Anatolia is the origin and differentiation center of many kinds and section. These can be assumed as some of the reasons of this abundance. There are approximately 9000 natural plant species and 30% of these are endemic, but still not enough benefited from the richness of this plant (Tan, 1992). Plants' antimicrobial activities and properties are important for human health and have been investigated since 1926 (Vonderbank, 1949; İlçim et al. 1998). According to the World Health Organization's research, the number of medicinal plants for therapeutic purpose is around 20,000 (Dığrak et al. 1999). Increased incidence of drug resistance which has become a global issue in recent years is reported because of the adaptations of certain bacteria species to antibiotic strains (Kalaycıoğlu and Öner, 1994). This problem has a great importance in developing

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countries because of an excess in the number of reported infectious diseases (Abascal and Yarnell, 2002). This is why the use of medical plants as an alternative to synthetic medicine (e.g. penicillin) is recommended and plants are being introduced as antimicrobials (Solanki, 2010). Currently, medical plants are utilized because they exhibit less adverse effects and microbial resistance than synthetic medicines that are already in use. However, medical plants may provide a slower recovery rate (Seyyednejad and Motamedi, 2010). Results of some research studies show that the antimicrobial agents obtained from natural resources, i.e., plants, highly succeed in protection of food safety (Alzoreky and Nakahara, 2003). According to the literature, antimicrobial activity occurs in the presence of secondary metabolites inside of a plant, such as alkaloids, flavonoids, tannins, and terpenoids. Secondary metabolites which are not directly related to the basic vital function of the plant are produced in woody plants. Furthermore, these secondary metabolites consist of herbivores and pathogens to provide protection from abiotic surrounding stresses, e.g., UV radiation (Toroğlu and Çenet, 2006). Secondary metabolites are a diverse group that includes many compounds. Phenolic compounds are extremely important because of their role in anti-carcinogenic and antimicrobial effects. Also, it is known that phenolic compounds exhibit a potent antioxidant effect by quenching free radical activity. Free radicals can cause damage to tissues and DNA by attacking the nucleic acids, somatic cells, and weakening the immune system (Zhao et al. 1999; Bouwmeester, 2003).

In light of this information, the aim of this study is to determine the antibacterial and antifungal properties of water obtained using the HfV drying method. And, also remark the utilization possibility of obtained water in different sectors.

Materials and Methods

Three tree species, i.e., white oak (*Quercus alba* L.), walnut (*Juglans regia* L.), and Eastern beech (*Fagus orientalis* L.), were used in this study. White oak was grown in small plantations on the stream beds and slopes in Thrace, Marmara, and Northwest Anatolia regions of Turkey. Oak logs were 15 to 21 cm thick, 30 cm wide, and 300 to 350 cm length and had 70% to 75% inlet moisture. Walnut logs were generally grown in the East Anatolia region of Turkey (Adıyaman, Muş, Bitlis, and Bingöl environments). Walnut logs were in the form of gunstock and rifle butt and had dimensions of 7 to 7.5 cm thick, 16 to 20 cm wide and 45 to 90 cm length, as well as 80% to 90% inlet moisture. Eastern beech logs had various dimensions and 75% to 80% inlet moisture.

In this study, following bacteria, yeast and fungi were used to investigate antimicrobial activity. *Staphylococcus aureus* (6538P), *Klebsiella pneumoniae* (CCM 2318), *Escherichia coli* (ATCC 11230), *Pseudomonas aeruginosa* (ATCC 27853), *Proteus vulgaris* (ATCC 6897), *Bacillus cereus* (CCM 99), *MRSA* (ATCC 33592), *Salmonella typhimurium* (ATCC 14028) were bacteria. *Candida albicans* (ATCC 10239) was yeast. *Aspergillus niger* van Tiegh (TA 47-3), *Aspergillus flavus* Link (TA 41-17), *Aspergillus ochraceus*, K. Wilh (MUCL 39534), and *Fusarium proliferatum* (Matsushima) Nirenberg (TA-18-2) were fungi.

This study was conducted in two stages. In the first stage, water released from the wood logs and collected in a barrel using the HfV drying method as shown in Fig. 1. A 25-m3 drying kiln (King Dryer, HF+V 5025, Düzce, Turkey,) was used for the drying processes, with the parameters of 7.65 MHz frequency, 39.19λ wavelength, and 0.5 to 0.97 mBar vacuum.

After the drying process, the moisture content (%) of the oak, walnut, and beech logs were between 8.0% and 15%, 8.0% and 15%, and 7.0% and 8.0%, respectively. The drying durations of the oak, walnut, and beech logs were 15 to 17 (avg. 16) days, 8 to 11 (avg. 10) days, and 7 to 9 (avg. 8) days, respectively. The obtained wood water was kept fresh (not ex-stock) and was protected from direct sunlight.

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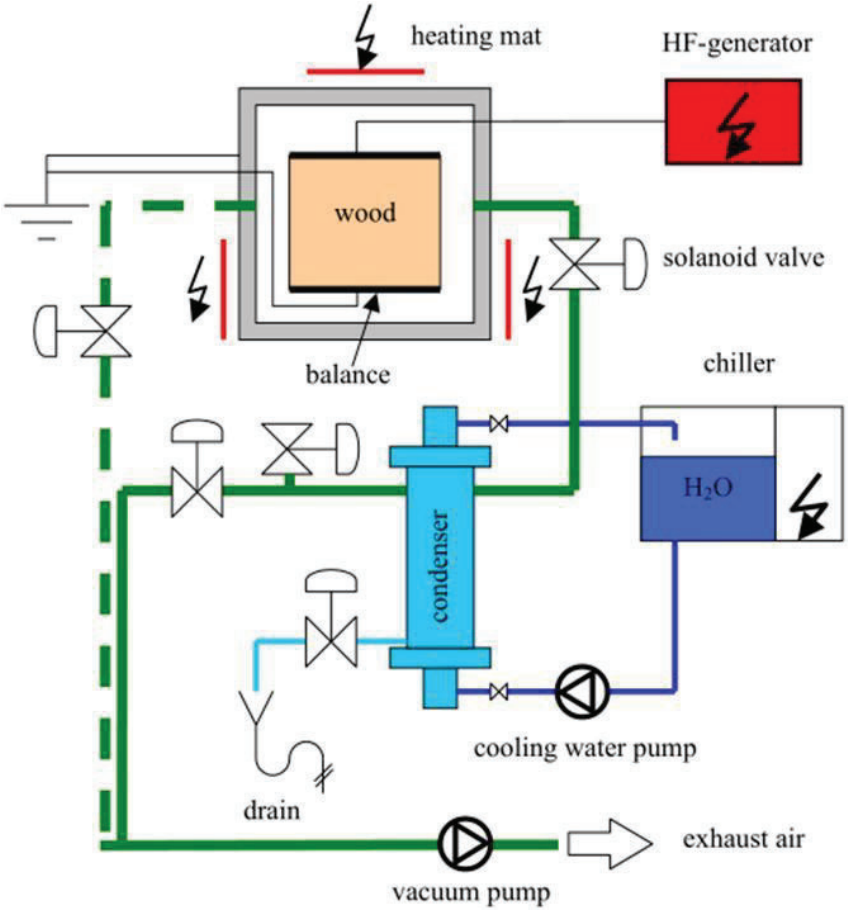

Figure 1: Schematic of the high-frequency current vacuum dryer (Korkut, 2011; Resch and Hansmann, 2002).

In the second stage of this study, the microdilution method was used to determine the antimicrobial activity. Bacteria suspensions were prepared according to the normal saline and MacFarland 0.5 standards for antibacterial activity. Also, trueness of the measurements was confirmed at a 0.5 absorbance value read from the spectrophotometer's indicator at 600 nm. Fungus inoculum activity was adjusted at a 0.5 absorbance value read at 450 nm. Bacteria and fungus were subjected to incubation on nutrient agar slant at 37°C for 24 h and Malt agar slant at 28°C for 72 to 96 h, respectively. Inoculum suspensions were prepared with fresh cultures and studied in three series on well-plates for each microorganism. Sabouraud Dekstroz Broth (Oxoid Ltd., Hampshire, England) and Nutrient Broth (Merck KGaA., Darmstadt, Germany) were used as the medium for the fungus and bacteria, respectively. At first, 100 µL of medium was pipetted into all wells, expect the first one. And after, 150 µL of medium and 50 µL of extract were pipetted into the first well and dilutions were serially made by taking 100 µL of the extract solution out from the previous wells (from 2nd to the 11th well). The final extraction concentration in the wells was prepared between 0.05 mg/mL and 25 mg/mL when the dilution processes were completed. Exactly 20 µL of inoculum suspension was grafted into all wells after the dilution process except negative control. All of the microplates were incubated at 37 °C for 24 to 48 h for bacteria and 28 °C for 72 h for fungi. After the incubation period, concentration which had higher value and was prior to the growth realized concentration was recorded as the minimum inhibitory concentration (MIC) values (CLSI, 1997; Walsh, 2008). The MIC values were expressed as the static activity of microorganisms, or in other words, expressed as the concentration value where the growth of microorganisms is inhibited. However, the bactericidal and fungicidal terms express the concentration value which kills the microorganism. In this method, 20 µL was extracted from each well plates' wells (no growth ones) and then cultivated by applying to petri plates of Sabouraud Dekstroz Agar for fungus and Nutrient Agar for bacteria.

The values of growth unrealized concentrations denoted the minimum bactericidal concentration (MBC) for bacteria and the minimum fungicidal concentration (MFC) for fungus after the incubation process under the above-stated conditions (CLSI, 1997).

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Results and Discussion

MIC values which inhibit the growth of the microorganism and MBC and MFC values which represent the values of bactericidal and fungicidal activity were presented in Table 1.

Table 1: MIC and MBC/MFC Values (mg/mL) of Wood Water Samples.

Microorganisms	Oak (*Quercus alba* L.)		Beech (*Fagus orientalis* L.)		Walnut (Juglans regia L.)	
	MIC	MBC	MIC	MBC	MIC	MBC
P. aureginosa	6.3	12.5	12.5	12.5	12.5	25
S. aureus	6.3	12.5	12.5	12.5	6.3	12.5
K. pneumoniae	1.6	6.3	6.3	12.5	12.5	>25
P. vulgaris	12.5	>25	12.5	>25	12.5	>25
B. cereus	12.5	>25	12.5	25	25	>25
E. coli	25	25	12.5	>25	25	>25
MRSA*	12.5	25	12.5	>25	12.5	25
S. typhimurium	6.3	>25	25	>25	25	25
C. albicans	12.5	25	25	>25	12.5	25
A. flavus	6.3	12.5	25	>25	25	>25
A. niger	12.5	>25	25	>25	25	>25
A. ochraceus	12.5	>25	12.5	>25	12.5	25
F. proliferatum	12.5	>25	25	>25	12.5	25

**Methicillin-resistant Staphylococcus aureus, MIC-minimum inhibitory concentration, MBC-minimum bactericidal concentration, MFC- minimum fungicidal concentration*

The best antimicrobial activity was observed in oak (*Quercus alba* L.) wood water with *K. pneumoniae*. It was observed that the oak wood water had no MBC activity with *P. vulgaris, B. cereus, S. typhimurium, A. niger, A. ochraceus, and F. proliferatum*, although MIC values were between 6.3 and 12.5 mg/mL (MBC > 25). The MBC values remained between 12.5 and 25 mg/mL despite MIC values were 6.3 to 12.5 mg/mL as for against other bacteria.

The MBC value of beech wood water with *P. aureginosa, S. Aureus, K. pneumoniae*, and *B. cereus* remained between 12.5 and 25 mg/mL despite MIC values between 6.3 to 12.5 mg/mL. The MBC activity was observed in beech (*Fagus orientalis* L.) wood water samples with *P. vulgaris, E. coli, MRSA, S. typhimurium, C. albicans, A. niger, A. ochraceus, A. flavus*, and *F. proliferatum*.

The MBC activity against six of the bacteria strains was observed in walnut (*Juglans regia* L.) wood water; however, the MBC values were observed between 12.5 and 25 mg/mL for all others.

Conclusion

According to the results of this study, minimal MIC values were determined in oak wood water obtained from oak (*Quercus alba* L.) log against *K. pneumonia* bacteria. The wood water from oak and walnut exhibited antimicrobial activity on seven species of bacteria, while beech wood water exhibited antimicrobial activity on four species of bacteria.

The HfV technical drying method was used in this study. The HfV method required only 1.5 to 9 days for drying the samples (Güler et al. 2012). And, this causes an increase in obtained drying water due to short cycling.

Beside this, there are lots of advantages of HfV method. These can be summarized as follows; heating source for drying process is electricity which does not release toxic gas to the environment, provides opportunity to dry thick logs, capability of uniform and selective drying (less humid regions consume less power while much humid regions consume much power), provides energy efficiency between 40% to 50%, low operational costs such as operating, maintenance and repair, etc., lower temperature requirement avoids defect formation such as cracking, warping, fiber breakage and etc. thanks to vacuuming (Dığrak et al. 1999), stowing the batch inside a vacuum kiln without wood lath/slat means close packing or efficient use of kiln volume and cost effectiveness too.

Results obtained from this study show that wood water samples have antibacterial activity. Therefore, results from this study imply the necessity for the evaluation of wood water as a reusable and value-added commodity for the

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plant-derived medicine industry in Turkey.

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ASSESSMENT OF THE ANTIMICROBIAL, ANTIOXIDANT AND CYTOTOXIC ACTIVITIES OF THE WILD EDIBLE MUSHROOM PLEUROTUS ERYNGII FROM HAKKARI, TURKEY

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Abstract: Mushroom is an important source of natural compounds with acknowledged bioactivity. Pleurotus eryngii, in particular, is widely recognized for its organoleptic quality and favorable healthy effects, being commercially produced in great extent. The present study is just for evaluating the antioxidant capacity (scavenging DPPH radicals, reducing power, Total antioxidant activity by β-carotene-linoleic acid metod, Chelating effect on ferrous ions, superoxide anion radical scavenging activity), antimicrobial effects (by using the disc diffusion method) and insufficiently studied cytotoxic activity (using PC-3 cell lines) of Pleurotus eryngii by using various solvent systems. For this reason; obtained extracts of the mushroom applying hexane, ethylacetate and methanol respectively were tested with in its biologic activities.

As a result, The highest total antioxidant activity by β-carotene-linoleic acid metod was identified in methanol extract (63.62 mg /ml). The highest DPPH scavenging activity was obtained from ethyl acetate extract with 88.81 mg/ml. EDTA is used as standard in methal chelating activity. The highest metal chelating activity of Pleurotus eryngii identified in hexane (88,1 mg /ml) and ethylacetate (88.84 mg /ml) extracts. Additionally, in most of studied tests antioxidant activity of the mushroom increased with increasing concentration.

On the other hand, the highest antimicrobial activity was obtained against Pseudomonas aeruginosa ATCC 27853 (11 mm) in ethyl acetate extract. However, the best antimicrobial activities were observed in hexane and methanol extracts for other tested microorganism. It was not determined any antimicrobial activity against Escherichia coli ATCC 25922. It has been found that the potential of cytotoxic activity is depended on concentration and solvent type of extracts. Ethyl acetate extract showed significant inhibitory value at the concentrations of 530 µg/ml (86.20 %) against PC-3 cell lines. Using methanol extract, the maximum inhibiton was observed at concentration of 680 µg/ml with value of 51.86 %.

Overall, the mushroom used as a daily nutrient could be a source for new drug developments and a kind of treatment in cancer therapies, and also, organic extracts of Pleurotus eryngii may contain substances that stimulate bioactivity.

Keywords: Pleurotus eryngii, Antimicrobial, Antioxidant, Cytotoxic effect

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ASYMPTOTİCALLY $\alpha_f^p(I)$-LACUNARY EQUİVALENT SEQUENCES SPACES

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Abstract: In this study, we define $\alpha_f^p(I)$- lacunary equivalence with order α, and asymptotically $\alpha_f(I)$-lacunary statistical equivalence with order α,which is a natural combination of the defintion for asymptotically equivalent, Ideal convergence, Statistically limit, Lacunary sequence, Modulus function and a sequence of positive real numbers p=(p_k) and give some relations about these concepts.

Keywords: Asymptotically equivalence, Ideal convergence, Lacunary sequence, Modulus function, Statistically limit.

MSC (2010): 40A05,40A35,40A99,40G15

Introduction

Let s, ℓ_∞,c denote the spaces of all real sequences, bounded, and convergent sequences,respectively. Any subspace of s is called a sequence space. A lacunary sequence is an increasing sequence θ=(k_r) such that k_0=0, $h_r = k_r - k_{r-1} \to \infty$ as r→∞ .The intervals determined by θ will be denoted by $I_r=(k_{r-1},k_r]$ and $q_r = k_r/k_{r-1}$ .These notations will be used troughout the paper. The sequence space of lacunary strongly convergent sequences N_θ was defined by Freedman et al.(1978), as follows:

N_θ ={x=(x_i)∈s: $lim_r h_r \sum_{i\in I_r}|x_i - L|$=0 for some L}.

The notion of modulus function was introduced by Nakano (1953). We recall that a modulus f is a function from [0,∞) to [0,∞)such that (i) f(x) =0 if and only if x=0 ,(ii) f(x+y) ≤ f(x)+f(y) for x,y≥0, (iii) f is increasing and (iv) f is continuous from the right at 0. Hence f must be continuous everywhere on [0,∞). Bhardwaj & Dhawan (2015),Kolk (1993), Maddox (1986), Öztürk and Bilgin (1994), Pehlivan and Fisher (1994), Ruckle (1973), and others used a modulus function to construct sequence spaces. Marouf (1993), presented definitions for asymptotically equivalent sequences and asymptotic regular matrices. Patterson (2003), extended these concepts by presenting an asymptotically statistical equivalent analog of these definitions and natural regularity conditions for nonnegative summability matrices . Subsequently, many authors have shown their interest to solve different problems arising in this area (see (Basarir and Altundag,2008). (Basarir and Altundag,2011), (Bilgin,2011), and (Patterson and Savas,2006)). The concept of I-convergence was introduced by Kostyrko et al. (2000/2001) in a metric space. Later it was further studied by Bilgin (2015),,Dass et al. (2011), Dems (2004-2005), Kumar and Sharma (2012), Savaş and Gumus (2013), and many others. In this paper we introduce the concepts asymptotically $\alpha_f^p(I)$ -lacunary equivalence with order α, and asymptotically $\alpha_f(I)$ -lacunary statistical equivalence with order α,which is a natural combination of the defintion for asymptotically equivalent, Ideal convergence, Statistically limit, Lacunary sequence, Modulus function and a sequence of positive real numbers p=(p_k) and also some inclusion theorems are proved.

Materials and Methods

Now we recall some definitions of sequence spaces

Definition 2.1. Two nonnegative sequences [x]and [y] are said to be asymptotically equivalent if : $lim_k \frac{x_k}{y_k}$=1,(denoted by x∽y).

Definition 2.2. Two nonnegative sequences [x] and [y] are said to be asymptotically statistical equivalent of multiple L provided that for every ε > 0, $lim_n \frac{1}{n}|\{k\le n:|\frac{x_k}{y_k}-L|\ge\varepsilon\}|$=0,(denoted by $x \overset{S}{\approx} y$) and simply asymptotically statistical equivalent, if L=1.

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Definition 2.3. Let θ be a lacunary sequence; the two nonnegative sequences [x] and [y] are said to be asymptotically lacunary statistical equivalent of multiple L provided that for every ε > 0,

$lim_r \frac{1}{h_r}|\{ k\in I_r : |\frac{x_k}{y_k}-L|\geq\varepsilon\}|=0$,(denoted by $x \overset{S_\theta}{\approx} y$) and simply asymptotically lacunary statistical equivalent, if L=1.

Definition 2.4. Let f be any modulus; the two nonnegative sequences [x] and [y]are said to be f-asymptotically equivalent of multiple L provided that,

$lim_k f(|\frac{x_k}{y_k}-L|)=0$ (denoted by $x \overset{f}{\approx} y$)and simply strong f-asymptotically equivalent, if L=1.

Definition 2.5. Let f be any modulus, θ=(k_r) be a lacunary sequence, p=(p_k) be a sequence of positive real numbers and 0 < α ≤1; the two nonnegative sequences [x] and [y] are said to be strong α_f^p-asymptotically lacunary equivalent of order α, to multiple L provided that

$\lim_r \frac{1}{h_r^\alpha} \sum_{k\in I_r} [f(\frac{x_k}{y_k}-L|)]^{p_k}$,(denoted by $x \overset{N_\theta,\alpha_f^p}{\approx} y$) and simply strong α_f^p-asymptotically lacunary equivalent, if L=1.

Definition 2.6. Let f be any modulus, θ=(k_r) be a lacunary sequence, and 0 < α ≤1; the two nonnegative sequences [x] and [y] are said to be asymptotically α_f -lacunary statistical equivalent of order α, to multiple L provided that for every ε > 0,

$lim_r \frac{1}{h_r^\alpha}|\{ k\in I_r : f(|\frac{x_k}{y_k}-L|)\geq\varepsilon\}|=0$,(denoted by $x \overset{S_\theta,\alpha_f}{\approx} y$) and simply asymptotically α_f -lacunary statistical equivalent, if L=1.

For any non-empty set X, let P(X) denote the power set of X.

Definition 2.7. A family I⊆P(X)is said to be an ideal in X if

(i) ∅∈I;

(ii) A,B∈I imply A∪B∈I and

(iii) A∈I,B⊂A imply B∈I.

Definition 2.8. A non-empty family F⊆P(X)is said to be a filter in X if

(i) ∅∉F;

(ii) A,B∈F imply A∩B∈F and

(iii) A∈F,B⊃A imply B∈F.

An ideal I is said to be non-trivial if I≠{∅}and X∉I.A non-trivial ideal I is called admissible if it contains all the singleton sets. Moreover, if I is a non-trivial ideal on X, then F=F(I)={X-A:A∈I} is a filter on X and conversely. The filterF(I) is called the filter associated with the ideal I.

Definition 2.9. Let I⊂P(N) be a non-trivial ideal in N and (X,ρ) be a metric space. A sequence [x] in X is said to be I-convergent to ξ if for each ε > 0 , the set {k∈N:ρ(x_k,ξ)≥ε}∈I.

In this case, we write I-$lim_k x_k$=ξ.

Definition 2.10. A sequence [x] of numbers is said to be I-statistical convergent or S(I)-convergent to L, if for every ε > 0 and δ > 0, we have {n∈N;(1/n)|{k≤n:| x_k −L|≥ε}|≥δ}∈I.

In this case, we write x_k→L (S(I)) or S(I) -$llim_k x_k$=L.

Definition 2.11. Let I⊂P(N) be a non-trivial ideal in N and θ=(k_r) be a lacunary sequence. The two nonnegative sequences [x] and [y] are said to be asymptotically lacunary statistical equivalent of multiple L with respect to the ideal I provided that for each ε > 0 and γ > 0, {r∈N; $\frac{1}{h_r}|\{ k\in I_r : |\frac{x_k}{y_k}-L|\geq\varepsilon\}| \geq\gamma\}$ ∈ I, denoted by $x \overset{I(S_\theta)}{\approx} y$ and simply asymptotically lacunary statistical equivalent with respect to the ideal I, if L=1.

Definition 2.12. Let I⊂P(N) be a non-trivial ideal in N and θ=(k_r) be a lacunary sequence. The two non-negative sequences [x] and [y] are said to be strongly asymptotically lacunary equivalent of multiple L with respect to the ideal I provided that for ε > 0 {r∈N; $\frac{1}{h_r}\sum_{k\in I_r}\frac{x_k}{y_k}-L|\geq\varepsilon\}$ ∈I, denoted by $x \overset{I(N_\theta)}{\approx} y$ and simply strongly asymptotically lacunary equivalent with respect to the ideal I, if L=1.

Definition 2.13. Let I⊂P(N) be a non-trivial ideal in N and f be a modulus function. The two non-negative sequences [x] and [y] are said to be f - asymptotically equivalent of multiple L with respect to the ideal I provided that for each ε > 0 {k∈N; f(|$\frac{x_k}{y_k}$-L|)≥ε } ∈I

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denoted by $x \underset{\approx}{I(f)} y$ and simply f-asymptotically equivalent with respect to the ideal I, if L=1.

Results and Discussion

We now consider our main results. We begin with the following definitions.

Definition 3.1. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, and $p = (p_k)$ be a sequence of positive real numbers and $0 < \alpha \leq 1$;. Two number sequences [x] and [y] are said to be strongly (f,p)-asymptotically equivalent of multiple L with respect to the ideal I provided that for each $\varepsilon > 0$,

$\{n\in N; \frac{1}{n^{\alpha}}\sum_{k=1}^{n}[f(|\frac{x_k}{y_k}-L|)]^{p_k} \geq \varepsilon\} \in I$ denoted by $x \underset{\approx}{w,\alpha_f^p(I)} y$ and simply strongly $\alpha_f^p(I)$- asymptotically equivalent with respect to the ideal I, if L=1.

If we take α=1,we write $x \underset{\approx}{\alpha_f^p(I)} y$ instead of $x \underset{\approx}{w,\alpha_f^p(I)} y$.

If we take f(x)=x for x≥0 , we write $x \underset{\approx}{w,\alpha^p(I)} y$ instead of $x \underset{\approx}{w,\alpha_f^p(I)} y$.

If we take p_k=1 for all k∈N, we write $x \underset{\approx}{w,\alpha_f(I)} y$ instead of $x \underset{\approx}{w,\alpha_f^p(I)} y$

Definition 3.2. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function , θ=(k_r) be a lacunary sequence, and $p = p_k$) be a sequence of positive real numbers and $0 < \alpha \leq 1$. Two number sequences [x] and [y] are said to be strongly (f,p)-asymptotically lacunary equivalent of multiple L with respect to the ideal I provided that for each $\varepsilon > 0$,

$\{r\in N; \frac{1}{h_r^{\alpha}}\sum_{k\in I_r}[f(|\frac{x_k}{y_k}-L|)]^{p_k} \geq \varepsilon\} \in I$ denoted by $x \underset{\approx}{N_\theta,\alpha_f^p(I)} y$ and simply strongly $\alpha_f^p(I)$- asymptotically lacunary equivalent with respect to the ideal I, if L=1.

If we take α=1 , we write $x \underset{\approx}{N_{\theta,f}^{p}(I)} y$ instead of $x \underset{\approx}{N_\theta,\alpha_f^p(I)} y$. Hence $x \underset{\approx}{N_{\theta,f}^{p}(I)} y$ is the same as the $x \underset{\approx}{I(N_\theta^{f,p})} y$ of Bilgin (2011),

Note that,we take p_k=1 for all k∈N, we write $x \underset{\approx}{N_{\theta,f}(I)} y$ instead of $x \underset{\approx}{N_\theta,\alpha_f^p(I)} y$. Hence $x \underset{\approx}{N_{\theta,f}(I)} y$ is the same as the $x \underset{\approx}{I(N_\theta^f)} y$ of Kumar and Sharma (2012). Also if we put f(x)=x for x≥0 , we write $x \underset{\approx}{N_{\theta,}^{p}(I)} y$ instead of $x \underset{\approx}{N_{\theta,f}^{p}(I)} y$. Hence $x \underset{\approx}{N_{\theta,}^{p}(I)} y$ is the same as the $x \underset{\approx}{N_\theta^{L(p)}(I)} y$ of Savaş and Gumus (2013).

Definition 3.3. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function , θ=(k_r) be a lacunary sequence, and p=(p_k) be a sequence of positive real numbers and $0<\alpha\leq 1$. the two nonnegative sequences [x] and [y] are said to be asymptotically α_f (I)- -lacunary statistical equivalent of order α, to multiple L with respect to the ideal I provided that for every ε>0,and γ>0,

$\{r\in N; \frac{1}{h_r^{\alpha}}|\{ k\in I_r : f(|\frac{x_k}{y_k}-L|)\geq\varepsilon\}| \geq\gamma\} \in I$ (denoted by $x \underset{\approx}{S_\theta,\alpha_f(I)} y$)

If we take α=1 , we write $x \underset{\approx}{S_{\theta,f}(I)} y$ instead of $x \underset{\approx}{S_\theta,\alpha_f(I)} y$.

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If we put f(x)=x for x≥0, we write $x \underset{\approx}{S_{\theta,f}(I)} y$ instead of $x \underset{\approx}{S_{\theta,\alpha_f}(I)} y$.

If we take α=1 , we write $x \underset{\approx}{S_{\theta}(I)} y$ instead of $x \underset{\approx}{S_{\theta,\alpha}(I)} y$.

We now prove some inclusion theorems.

Theorem 3.1. Let I⊂P(N) be a non-trivial ideal in N , f be any modulus, $\theta = (k_r)$ be a lacunary sequence, $p=(p_k)$ be a sequence of positive real numbers and $0 < \alpha \le \beta \le 1$ then

(i) if $x \underset{\approx}{w,\alpha_f^p(I)} y$ implies $x \underset{\approx}{w,\beta_f^p(I)} y$

(ii) if $x \underset{\approx}{N_\theta,\alpha_f^p(I)} y$ implies $x \underset{\approx}{N_\theta,\beta_f^p(I)} y$

(iii) if $x \underset{\approx}{S_\theta,\alpha_f(I)} y$ implies $x \underset{\approx}{S_\theta,\beta_f(I)} y$.

Proof.(i-iii) Let $0<\alpha\le\beta\le 1$, $x \underset{\approx}{w,\alpha_f^p(I)} y$, $x \underset{\approx}{N_\theta,\alpha_f^p(I)} y$ and $x \underset{\approx}{S_\theta,\alpha_f(I)} y$. It is easily that $\frac{1}{n^\beta} \le \frac{1}{n^\alpha}$ for all n. Since $h_r = k_r - k_{r-1} \to \infty$,we can actually choose r, so that $h_r^\alpha \le h_r^\beta$ and $\frac{1}{h_r^\beta} \le \frac{1}{h_r^\alpha}$. Hence

$$\frac{1}{n^\beta}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k} \le \frac{1}{n^\alpha}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$$\frac{1}{h_r^\beta}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k} \le \frac{1}{h_r^\alpha}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k} \text{ and}$$

$$\frac{1}{h_r^\beta}\ \left|\left\{k\in I_r : f\left(\left|\frac{x_k}{y_k}-L\right|\right)\ge\varepsilon\right\}\right| \le \frac{1}{h_r^\alpha}\ \left|\left\{k\in I_r : f\left(\left|\frac{x_k}{y_k}-L\right|\right)\ge\varepsilon\right\}\right|$$

Thus,

$$\left\{n\in N : \frac{1}{n^\beta}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\ge\varepsilon\right\} \subseteq \left\{n\in N;\ \frac{1}{n^\alpha}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\ \right\}\in I$$

$$\left\{k\in I_r ; \frac{1}{h_r^\beta}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\ge\varepsilon\right\} \subseteq \left\{k\in I_r ; \frac{1}{h_r^\alpha}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\ge\varepsilon\right\}\in I$$

$$\left\{n\in N ; \frac{1}{h_r^\beta}\ \left|\left\{k\in I_r : f\left(\left|\frac{x_k}{y_k}-L\right|\right)\ge\varepsilon\right\}\right|\ge\gamma\right\} \subseteq \left\{n\in N ; \frac{1}{h_r^\alpha}\ \left|\left\{k\in I_r : f\left(\left|\frac{x_k}{y_k}-L\right|\right)\ge\varepsilon\right\}\right|\ge\gamma\right\}\in I.$$

Therefore respecticely $x \underset{\approx}{w,\beta_f^p(I)} y$, $x \underset{\approx}{N_\theta,\beta_f^p(I)} y$ and $x \underset{\approx}{S_\theta,\beta_f(I)} y$.

Setting β=1, in Theorem 1 gives the following result .

Corollary. Let f be any modulus, $\theta=(k_r)$ be a lacunary sequence, $p=(p_k)$ be a sequence of positive real numbers and $0 < \alpha \le 1$, then

(i) if $x \underset{\approx}{w,\alpha_f^p} y$ implies $x \underset{\approx}{w_f^p(I)} y$

(ii) if $x \underset{\approx}{N_\theta,\alpha_f^p} y$ implies $x \underset{\approx}{N_{\theta f}^p(I)} y$

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(iii) if x $\underset{\approx}{S_{\theta},\alpha_f}$ y implies x $\underset{\approx}{S_{\theta f}(I)}$ y.

We have this section with the following Theorem to show that the relation between α_f^p(I)- lacunary equivalence with order α and strong α_f^p(I)- lacunary equivalence with order α.

Theorem 3.2. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, θ=(k_r) be a lacunary sequence,0<α≤1 and

0<h=$\inf_k p_k \le p_k \le \sup_k p_k = H<\infty$, if $\lim_{t\to\infty}\frac{f(t)}{t}=\beta>0$, then x $\underset{\approx}{w,\alpha_f^p(I)}$ y implies x $\underset{\approx}{w,\alpha^p(I)}$ y

Proof. If $\lim_{t\to\infty}\frac{f(t)}{t}=\beta>0$, then f(t) ≥βt for all t>0.Let x $\underset{\approx}{w,\alpha_f^p(I)}$ y,clearly

$$\frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k} \ge \frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[\beta\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$$\ge \min\{\beta^h,\beta^H\}\frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[\left|\frac{x_k}{y_k}-L\right|\right]^{p_k}$$

it follows that for each ε>0, we have

$$\{n\in N;\ \frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[\left|\frac{x_k}{y_k}-L\right|\right]^{p_k}\ge\varepsilon\}\subseteq\{n\in N;\ \frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\ge\min\{\beta^h,\beta^H\}\}\in I.$$

Since x $\underset{\approx}{w,\alpha_f^p(I)}$ y, it follows that the later set belongs to I, and therefore, the theorem is proved.

Theorem 3.3. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, θ=(k_r) be a lacunary sequence,0<α≤1 and 0<h=$\inf_k p_k \le p_k \le \sup_k p_k = H<\infty$, then

if $\lim_{t\to\infty}\frac{f(t)}{t}=\beta>0$, then x $\underset{\approx}{N_{\theta},\alpha_f^p(I)}$ y implies x $\underset{\approx}{N_{\theta},\alpha^p(I)}$ y.

Proof. The proof of Theorem 3.2 is very similar to the Theorem 3.1.Then we omit it.

The next theorem shows the relationship between the strong α_f^p(I)- lacunary equivalence with order α and the strong α_f^p(I)- equivalence with order α.

Theorem 3.4. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, θ=(k_r) be a lacunary sequence,0<α≤1 and p = (p_k) be a sequence of positive real numbers , then

(i) if $\sup_r \frac{1}{k_{r-1}^{\alpha}}\sum_{m=1}^{r}(k_m-k_{m-1})^{\alpha}$ =B(say)<∞ then x $\underset{\approx}{N_{\theta},\alpha_f^p(I)}$ y implies x $\underset{\approx}{w,\alpha_f^p(I)}$ y

(ii) if $\sup_r \frac{k_r}{h_r^{\alpha}}$ =C(say)<∞ then x $\underset{\approx}{w,\alpha_f^p(I)}$ y implies x $\underset{\approx}{N_{\theta},\alpha_f^p(I)}$ y .

Proof.(i). Now suppose that x $\underset{\approx}{N_{\theta},\alpha_f^p(I)}$ y and ε>0.Let A={r∈N; $\frac{1}{h_r^{\alpha}}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}<\varepsilon\}$,

Hence,for all j∈A, we have $H_j=\frac{1}{h_j^{\alpha}}\sum_{k\in I_j}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}<\varepsilon$. Choose n is any integer with $k_r\ge n>k_{r-1}\}$ where r∈A. Now write

$$\frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\le\frac{1}{k_{r-1}^{\alpha}}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

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$$\leq B\frac{1}{h_m^{\alpha}}\sum_{k\in I_m}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$\{n\in N;\ \frac{1}{n^{\alpha}}\sum_{k=1}^{n}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\geq\varepsilon\}\subseteq\{r\in N;\ \frac{1}{h_r^{\alpha}}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\geq\varepsilon/B\}\in I.$

which yields that $x\overset{w,\alpha_f^p(I)}{\approx}y$.

(ii). Let $x\overset{w,\alpha_f^p(I)}{\approx}y$.

$$\frac{1}{h_r^{\alpha}}\sum_{k\in I_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}=\frac{1}{h_r^{\alpha}}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}-\frac{1}{h_r^{\alpha}}\sum_{k=1}^{k_{r-1}}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$$\leq\frac{1}{h_r^{\alpha}}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$$=\frac{k_r}{h_r^{\alpha}k_r}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$$<C\frac{1}{k_r}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}$$

$\{r\in N;\ \frac{1}{h_r^{\alpha}}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\geq\varepsilon\}\subseteq\{r\in N;\ \frac{1}{k_r}\sum_{k=1}^{k_r}\left[f\left(\left|\frac{x_k}{y_k}-L\right|\right)\right]^{p_k}\geq\varepsilon/C\}\in I.$

which yields that $x\overset{N_\theta,\alpha_f^p(I)}{\approx}y$.

Now we give relation between asymptotically α- lacunary statistical equivalence and strong α_f^p (I)-lacunary equivalence with order α.Also we give relation between asymptotically α_f - lacunary statistical equivalence and strong α_f^p(I)- lacunary equivalence with order α.The Proofs will not be given.

Theorem 3.5. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, θ=(k_r) be a lacunary sequence,0<α≤1 and $0<h=\inf_k p_k\leq p_k\leq\sup_k p_k=H<\infty$, then $x\overset{N_\theta,\alpha_f^p(I)}{\approx}y$ implies $x\overset{S_\theta,\alpha(I)}{\approx}y$.

Theorem 3.6. Let I⊂P(N) be a non-trivial ideal in N , f be a modulus function, θ=(k_r) be a lacunary sequence,0<α≤1 and $0<h=\inf_k p_k\leq p_k\leq\sup_k p_k=H<\infty$, then $x\overset{N_\theta,\alpha_f^p(I)}{\approx}y$ implies $x\overset{S_\theta,\alpha_f(I)}{\approx}y$,

Let p_k=p for all k , t_k=t for all k and 0<p≤t. Then it follows following Theorem.

Theorem 3.7. Let f be any modulus, θ=(k_r) be a lacunary sequence, p=(p_k) be a sequence of positive real numbers,and 0 < α ≤ 1 then $x\overset{N_\theta,\alpha_f^t(I)}{\approx}y$ implies $x\overset{N_\theta,\alpha_f^p(I)}{\approx}y$,

Conclusion

The relations we have achieved are generally parallel to the literature. However, some of the relations in the literature have not been found

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AŞILAMA MODİFİKASYON YÖNTEMİNİN TEKSTİL YÜZEYLERİNE UYGULANMASI - (DERLEME)

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Özet: Teknik tekstiller, endüstri veya medikal kullanımlar için (taşıma, koruyucu giysiler v.b.) üretilen tekstil ürünleridir. Teknik tekstil ürünlerinde kullanılacak tekstil ürünleri doğal yapısı itibariyle gerekli özellikleri (anti statiklik, optic v.b.) karşılama bakımından zayıf kalabilmektedir. Bu nedenle, bu ürünlerin yüzey özelliklerini fiziksel veya kimyasal yöntemlerle değiştirmek/geliştirmek gerekir.Bu değiştirme/geliştirme prosesi yüzey modifikasyonu olarak tanımlanabilir.

Tekstil yüzeylerinin aşılanması, tekstil ürünlerinin yüzeyini değiştirmek ve böylece yeni veya geliştirilmiş işlevsel özellikler kazandırmak için çeşitli yollar sunan nispeten yeni bir teknolojidir. Dört ana aşılama tekniği (kimyasal aşılama polimerizasyonu, radyasyona bağlı aşılama, plazma kaynaklı aşılama ve ışık kaynaklı aşılama) vardır. Bu çalışmada, tekstil yüzeylerinin üzerine kimyasal ve plazma aşılama teknikleri incelenmiştir. Bu tekniklerin tekstil yüzeyine verdiği özellikler ve aşılanmış yüzeyin uygulama alanları incelenmiştir.

Anahtar Kelimeler: Aşılama, Modifikasyon, Plazma, Teknik Tekstil.

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APPLICATION OF GRAFTING MODIFICATION METHOD TO TEXTILE SURFACES – (REVIEW)

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Abstract: Technical textiles are textile products that are manufactured for industrial and medical usages (transportation, protective clothes etc.). The textile products to be used in technical textile products can remain weak to meet the required features (anti-static, optic) because of their natural structure. For this reason, it is necessary to change/improve the surface features of these products physical and chemical. This changing/improvement process can be defines as surface modification.

Grafting textile surfaces is relatively a new technology that offers various ways for changing the surfaces of textile products so that they can gain new or improved functions. There are four main vaccination techniques (chemical grafting polymerization, radiation-induced grafting, plasma-induced grafting and light-induced grafting). This study examines the chemical and plasma vaccination techniques on textile surfaces. The features these techniques provide to the textile surfaces and the usage areas of the grafted surface have been analyzed.

Keywords: Grafting, Modification, Plasma, Technical Textile.

Giriş

Modifikasyon, bir materyalde meydana gelen sınırlı değişiklik olarak tanımlanabilir. Yüzey modifikasyonu, materyallerin temel özelliklerinin değiştirilmeden, yüzeylerinde fiziksel ve/veya kimyasal değişimler meydana gelmesini sağlamaktadır (Karahan, 2007).

Bir tekstil materyalinin yüzey bileşimi ve yapısı, ürünün belirli bir uygulamadaki performansında önemli rol oynar. Tekstil yüzeylerinin modifikasyonu temas edeceği yüzey ile yakından ilgilidir. Örneğin, insan derisine temas eden bir giysisinin yüzeyi, vücudun nemini emmek için modifiye edilebilirken, dış yüzey ise suyu geçirmemek için modifiye edilebilir. Bu yüzden tekstil ürününün kullanım yerine göre yüzey özelliklerini değiştirmek gerekir. Doğal ve sentetik polimerlerin aşılanması, yüzeyi değiştirmek ve yeni veya geliştirilmiş fonksiyonel özellikler kazandırmak için çeşitli yollar sunan nispeten yeni bir teknolojidir (Wei, 2009, Castner, 2002, Celik, 2004).

Bu çalışmada, tekstil ürünlerinin yüzey özelliklerinin geliştirmek amacıyla uygulanan aşılama yöntemi üzerinde durulmuştur. Aşılamanın tanımı verilmiş ve aşılama çeşitlerinden olan plazma ve kimyasal aşılama üzerinde durulmuştur.

Tekstil Ürünlerine Yüzey Aşılama Teknikleri

Aşı kopolimerizasyonu, bir polimere çeşitli fonksiyonel gruplar kazandırmak için cazip bir yöntemdir. Tekstil yüzeylerinin aşılanmasında başlıca dört farklı teknikten yararlanılabilir. Bu teknikler: başlatıcı kullanımı içeren kimyasal aşılama polimerizasyonu, yüksek enerjili radyasyon içeren aşılama, radyofrekans veya mikrodalga plazmadan oluşan aşılama ve morötesi ışın kaynağı kullanmayı içeren ışık kaynaklı aşılamadır. Bu dört yöntem de aynı şeyi amaçlamaktadır: Aşılama yapılacak substratın makromolekülleri içerisinde serbest radikal alanlar oluşturmaktır. Ardından bu radikal alanlar aşılama çözeltisinde bulunan monomerler ile kopolimerleşme reaksiyonu verirler. Monomer konsantrasyonu, işlem süresi, katalizör türü, katalizör konsantrasyonu ve enerji çeşidi gibi parametreler aşılama verimliliğini önemli ölçüde etkileyebilir ve maksimum verim için optimize edilmelidir (Bhattacharya and Misra, 2004, Liu, Shen, Chen, Luo, Su, Wu and Wan, 2016, Uyama, Kato and Ikada, 1998, Wei, 2009).

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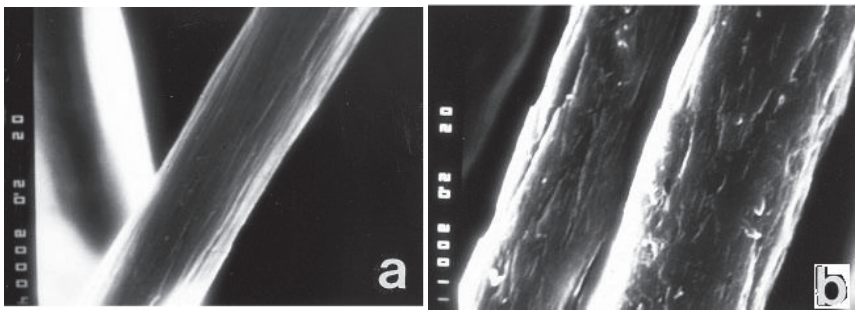
Kimyasal Aşılama Tekniği

Kimyasal aşılama işleminde, ilk ve en önemli adım, farklı monomerlerle kopolimerizasyon reaksiyonları başlatmak için kullanılacak olan tekstil yüzeyinde radikaller oluşturmaktır. Kimyasal aşılama prosesinde, başlatıcının rolü, aşılama sürecinin yolunu belirlediğinden çok önemlidir. Potasyum permanganate, Amonyum peroksidisülfat, benzoil peroksit, yarı iletken bazlı fotokatalist, 2,2'-azobis-(2-methylpropionamideine), amonyum persülfat ve hidrojen peroksit gibi çeşitli başlatıcılar kullanılabilir (Bhattacharya and Misra, 2004, Wei, 2009).

Tekstil ürünleri üzerinde yapılan kimyasal aşılama tekniği çalışmaları ile, yüksek hidrofillik, daha yüksek termal stabilite ile çekmenin azalması, su-yağ iticilik, kimyasal direnç ve boyanabilirliğin artması gibi özelliklerin kazandırılabildiği gözlenmiştir (Celik and Sacak, 1996, Celik, 2004, Deo and Gotmare, 2009, Louati, Elachari, Ghenaim, and Caze, 1999, Ojah and Dolui, 2007, Tsukada, Shiozaki, Freddi and Crighton, 1997).

Polietilen tereftalan (PET) lifleri, yüksek kristalin oranı ve reaktif fonksiyonel gruplara sahip olmadığı için boyanmaları zor liflerdendir. Boyanabilirliği arttırmak amacıyla vinil monomerleri PET liflerine aşılanmıştır. Yapılan testler sonucunda, liflerin boyanma özelliklerinde gelişim görülmüş ve bunun yanında antistatik ve güç tutuşurluk özelliğinde de artış sağlanmıştır (Celik and Sacak, 1996). Başka bir çalışmada ise ham pamuk elyafına akrilonitril monomerleri aşılanmıştır. Çalışma neticesinde pamuk liflerinin beyazlığında ve hidrofilitesinde artış gözlenmiştir (Deo and Gotmare, 1999). Bu çalışma sonucunda aşılama ile ham pamuk liflerinde elde edilen özellikler sayesinde ağartma gibi ön terbiye prosesleri daha az su ve kimyasal tüketimi ile gerçekleştirilebilir. Bu nedenle aşılama prosesinin çevre üzerinde ki olumlu etkisinden söz edilebilir. Başka bir çalışmada, akrilik lifleri metakrilamit vinil monomerleri ile aşılanmıştır. Çalışma neticesinde lifin homojen görünümü değişmiş (Şekil 1) ve aşılama verimi monomer konsantrasyonu ile artmıştır. Aynı zamanda aşılama sonucunda lifin ısıl stabilitesi, nem içeriği ve su emiciliğinin geliştiği gözlenmiştir (Celik, 2004).

Doğal bir lif olan yün liflerinin, benzil metakrilat ile aşılanmasıyla kopma mukavemeti artmış ancak kopma uzaması azalmıştır. Aynı zamanda aşılanan yünün termal stabilitesi yükselmiştir (Tsukada, Shiozaki, Freddi, and Crighton, 1997).



Şekil 1. a) İşlem görmemiş akrilik elyafı, b) %155 oranında aşılanmış akrilik elyafı (Celik, 2004).

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Plazma Aşılama Tekniği

Plazma, maddenin dördüncü hali olup, toplam yükü nötr olan iyonize gaz olarak tanımlanabilmektedir (Özdoğan, 2006). Gaz çeşidi, uygulanan güç, basınç ve uygulama zamanı gibi parametrelerle çok çeşitli yüzey efektleri elde edilebilir. Plazma uygulamaları ile tekstil materyallerinin, mekaniksel, elektriksel, ıslanma ve boyama-baskı gibi özellikleri geliştirilebilir (Yip, Chan, Sin and Lau, 2002).

Plazma tekniği ile aşılama, farklı monomerlerle kopolimerizasyon reaksiyonlarını başlatmak için aktifleştirilmiş bölgelerin (iyonlar, radikaller gibi) oluşturulması prensibine dayanır (Wei, 2009). Plazma işlemi tekstil yüzeyinde, sadece birkaç nanometre kalınlıkta olur ancak büyük kimyasal ve fiziksel değişiklikler yapar. Elyaf yüzeyinde aşındırma, temizleme, yüzey aktivasyonunu (bağ kopması), aşılamayı ve kaplamayı sağlar. Plazma uygulaması ile su iticilik - emicilik, antibakteriyel yüzeylerin dayanıklılığı, antistatik özellik, kaplamanın sağlamlığı, konfor, yüzey temizleme, boyama ve baskı gibi pek çok özellik iyileştirilebilir (Dinçmen, Hauser and Gürsoy, 2017, Ramamoorthy, El-Shafei and Hauser, 2013, Sarmadi, 2013).

Plazma uygulamasının avantajları şöyle sıralanabilir:

- Tüm organik ve organometalik bileşiklere uygulanabilmesi.
- Maddenin temel özelliklilerini değiştirmeden yüzeyde modifikasyon sağlaması.
- Yoğun enerjiye ihtiyaç duymaması.
- Uygun gaz veya kimyasal seçimi ile sonsuz sayıda kimyasal modifikasyonun mümkün olması.
- Su kullanım miktarındaki azalma ile atık su miktarını ve atık su arıtma maliyetini azaltması.
- Geleneksel kimyasallarla elde edilemeyen üstün özelliklere sahip; gözeneksiz, düzgün ve ince filmlerin hemen hemen her alt tabaka üzerine biriktirilebilmesi (Sarmadi, 2013, Sparavigna, 2008).

Yapılan bir çalışmada, plazma destekli vinil monomerleri %100 pamuklu kumaşa aşılanarak su itici özellik kazandırılmıştır (Abidi and Hequet, 2004). Plazma gazı olarak Argon (Ar), Nitrojen (N_2) ve Oksijen (O_2) kullanılmıştır. Çalışma neticesinde elde edilen numunelere uygulanan ıslatma testinde, su ile kumaş arasındaki kontakt açısının 119 °'ye kadar yükseldiği gözlenmiştir. Polimerlere hidrofobiklik kazandırılması için yapılan başka bir çalışmada da poliakrilonitril membranlara aşılama uygulanmıştır. Tuzlu suyun arıtılması için membran damıtma tekniği önemli ve gelecek vadeden bir yöntemdir ve bu membranların hidrofobik yapıda olmaları gerekir. Bu amaçla, hidrofilik poliakrilonitril membrana plazma destekli aşılama ile hidrofobik karakter kazandırılmıştır (Liu, Shen, Chen, Luo, Su, Wu, and Wan, 2016).

Pamuk elyafı en hızlı yanan liflerden biridir. Bu da güç tutuşurluk özelliği istenen ürünlerde pamuk elyafının kullanımını zorlaştırır. Bunun için Tsafack ve Levalois-Grützmacher pamuklu kumaşlar üzerine plazma desteğiyle fosfor içeren akrilik monomerler aşılamışlardır. Çalışma neticesinde elde edilen LOI değerlerinin, işlem görmemiş kumaşta %19 civarında iken bu monomerlerle işlem yapılan pamuklarda %29,5 değerlerine kadar yükseldiği gözlenmiştir (Tsafack and Levalois-Grützmacher, 2006).

Sonuç

Aşılama tekniği çevreye duyarlı bir metot olduğu için son zamanlarda ilgi çeken bir yöntemdir. Aşılama yönteminde monomer konsantrasyonu, işlem süresi, katalizör türü, katalizörün konsantrasyonu ve radyasyon dozu aşılama verimini önemli ölçüde etkiler.
Bu çalışmada en çok kullanılan iki aşılama tekniğinden bahsedilmiştir. Bunlar; kimyasal ve plazma destekli aşılama yöntemleridir. Kimyasal aşılama tekniğinde başlatıcı olarak, potasyum permanganate, Amonyum

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peroksidisülfat, benzoil peroksit gibi kimyasallardan yararlanılırken plazma tekniğinde ise Argon (Ar), Nitrojen (N_2) ve Oksijen (O_2) gibi gazlar başlatıcı görevi görür. Plazma tekniği ıslak kimyasal yöntemlere göre substrat yüzeyinde daha az penetrasyon sağladığından, yüzeyde istenen özelliklerin korunmasını sağlar. Aynı zamanda plazma yönteminin kullanımı ile yaş kimyasal metotlarda çıkan zehirli atığın önüne geçilir.

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ATIK ZİRKONYA TOZLARI İLE ÜRETİLEN YARI SİNTERLİ KOMPAKTLARIN MEKANİK ÖZELLİKLERİ

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Özet: Bu çalışmada diş implant üretiminde açığa çıkan zirkonya bazlı atık tozların geri kazanımı ve atık tozlardan üretilen yarı sinterli kompaktların sertlik ve aşınma özellikleri incelenmesi amaçlanmıştır. Bu amaçla toz metalürjisi üretim tekniği ile farklı basınç (200, 300, 400, 550 ve 600 MPa) ve yarı sinter sıcaklıklarında (950, 1050, 1150 ve 1250 °C) zirkonya bloklar üretildi. Üretilen blokların mekanik özellikleri sertlik ve aşınma testleri ile belirlendi. Ayrıca üretilen kompaktlar tarama elektron mikroskobu (SEM), x-ışını kırınım analizi (XRD) ve enerji dağılımlı x-ışınları spektroskopisi (EDX) ile incelendi. Yapılan incelemeler sonucu artan presleme basıncı ile kompaktların yoğunluğunun arttığı buna karşın bloklarda kırılma ve çatlamalara yol açtığı tespit edildi. Artan presleme basıncının neden olduğu çatlak oluşumlarının zirkonya kompaktların sertlik ve aşınma özelliklerini olumsuz etkilediği belirlendi. Ayrıca artan yarı sinter sıcaklığı ile sertlik ve aşınma direncinin arttığı tespit edildi.

Anahtar kelimeler: Zirkonya, yarı sinter, sertlik, aşınma.

MECHANICAL PROPERTIES OF PRE-SINTERED COMPACTS PRODUCED BY WASTE ZIRCONIA POWDERS

Abstract: This study aims to determine the optimum parameters for production of zirconia block from dental zirconia waste powders. For this purpose, zirconia blocks obtained by uniaxial pressing of waste powders under different pressures (200, 300, 400, 550 and 600 MPa) were pre-sintered at different temperatures (950, 1050, 1150 and 1250 °C) for 2 h. Mechanical properties of Zirconia compacts were determined with hardness and wear tests. The phase structure and chemical composition of zirconia blocks were determined by SEM-EDX and XRD analysis. The density and hardness of zirconia blocks increased depending on increasing pressing pressure and pre-sintering temperature. Also, it has been found that high pressing pressures cause cracks in the blocks. It was determined that these cracks adversely affected the hardness and wear properties of zirconia blocks. It was also found that increasing the pre-sintering temperature increased the hardness and wear resistance.

Keywords: Zirconia, pre-sintering, hardness, wear.

Giriş

Zirkonya seramikleri (ZrO_2), diş hekimliği ve diş implantolojisinde yaygın bir biyomalzeme haline gelmektedir. Yittria (Y_2O_3) ile stabilize edilen zirkonya, bu uygulamalar için en iyi özelliklere sahiptir (Ramesh ve ark., 2012). Yttria stabilize zirkonya yüksek termal direnç, düşük termal iletkenlik, kimyasal denge ve yüksek kırılma mukavemeti ile karakterize dilmektedir (Jeong Oh ve ark., 2010, Jin Kim ve ark., 2013). Bunun yanı sıra arka protezler için uygun olan mükemmel biyo uyumluluk ve mekanik özelliklere sahip, yüksek performanslı bir dental malzemedir (Cales, 1998).

Dental amaçlı kullanılan ve ülkemizde ithal edilen zirkonya esaslı bu disklerin maliyeti oldukça yüksektir ve disklerin CAD/CAM işlenmesinde disklerin büyük bölümü atıl duruma gelmektedir. Buda ekonomik kayıpları oldukça arttırmaktadır. Bu çalışma atık zirkonya disklerin toz metalurjüsi süreçleri ile tekrardan ekonomiye kazanılması amaçlamaktadır. Bu amaçla işlenmiş zirkonya diskler öğütülerek tekrardan toz haline getirilmiş, eleme işleminden geçirilen tozlar tozlar toz metalurjisi üretim süreçleri ile tekrardan zirkonya kompaktlar haline getirilmiştir. Üretim sürecinde elenmiş tozlar farklı basınçlarda preslenmiş, preslenen ham kompaktlar zirkonya yarı mamul üretimi için yarı-sinterleme işlemine tabi tutulmuştur. Üretilen yarı mamul disklere çeşitli test ve analizler uygulanarak disklerin sertlik ve aşınma dayanımları ile yapısal özellikleri karakterize edilmiştir.

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Materyal ve Metot

Bu çalışmada Marka Dental Diş Laboratuvarından temin edilen ve Şekil 1'de görülen disklerin işlenmesi sonucu açığa çıkan zirkonya bazlı (ZrO_2-Y_2O_3-HfO_2) seramik tozlar kullanılmıştır. Tozların XRF analizleri ile elde edilen elemental ve oksit kompozisyon değerleri Tablo 1 ve Tablo 2'de verilmiştir.



Şekil 1. İşlenmiş zirkonya disk.

Tablo 1: Zirkonya bazlı tozların kimyasal kompozisyonu.

Element	Y	Hf	Ni	P	Si	O	Zr
Ağırlıkça %	3,9950	1,3856	0,0409	0,0217	0,0151	31,1236	Kalan

Tablo 2: Zirkonya bazlı tozların oksit bileşenli kompozisyonu.

Oksit bileşen	ZrO2	Y2O3	HfO2	Ni0	P2O5	SiO
Ağırlıkça %	92,5717	5,5192	1,7667	0,0563	0,0523	0,0335

Zirkonya bazlı kompaktların üretiminde disklerin işlenmesi sonucu açığa çıkan tozlar doğrudan kullanılmayıp öğütme ve eleme gibi ön işlemleri uygulanmıştır. İşleme sırasında açığa çıkan tozlar farklı boyutlarda katı parçacıkları da içerdiğinden, toz boyut farklılıklarını minimize etmek ve açığa çıkan küçük katı parçacıkların geri kazanımını da sağlamak amacıyla CNC işleme sonunda açığa çıkan tozlar Şekil 2'de görülen yüksek enerjili bilyeli öğütme değirmeninde (Fritsch Pullevrisette 6, Almanya) 8 mm çaplı paslanmaz çelik bilye kullanılarak 200 rpm dönme hızında 30 dakika süreyle öğütme işlemine tabi tutuldu Öğütme işleminin ardından tozlar önce 100 mesh daha sonra 400 mesh paslanmaz çelikten üretilmiş eleklerde (Şekil 3) elenerek 30 µm boyutunun altındaki partiküllerin ayrıştırılması sağlanmış ve deneysel çalışmada bu tozlar kullanılmıştır.

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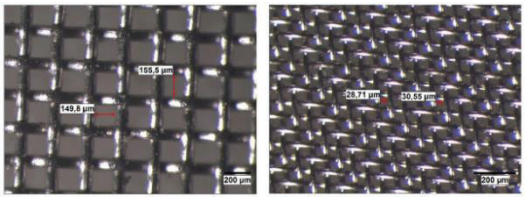
Şekil 2. Bilyeli öğütücü.



Şekil 3. Eleme işleminde kullanılan a) 100 ve b) 400 mesh elekler.

Öğütme ve eleme safhalarından sonra elde edilen tozlar, toz metalurjisi üretim basamakları uygulanarak zirkonya bazlı kompaktlar elde edilmiştir. Üretilecek zirkonya blokların optimum presleme basıncını belirlenmek amacıyla, elenmiş tozlar 200, 300, 400, 550 ve 600 MPa olmak üzere 5 farklı presleme basıncı uygulanarak, 25x25x10 mm3 boyutlarında tek eksenli olarak preslendi. Zirkonyum ham kompaktların yarı sinterleme sıcaklığının kompakt özelliklerine etkisini belirlemek amacıyla her presleme basıncındaki kompaktlarıdan numune alınarak 950, 1050, 1150, 1250 °C sıcaklıklarda 1 saat süreyle Ar gazı atmosferi altında yarı sinterleme işlemine tabi tutuldu. Yarı sinterleme prosesi, numunelerin 5 °C/min hızla sinterleme sıcaklığına kadar ısıtılması bu sıcaklıkta 1 saat bekletilmesi ve ardından 5 °C/min hızla soğutulması aşamalarından oluşmaktadır.

Üretinlen yarı sinterlenmiş zirkonya kompaktlara SEM, EDX ve XRD analizleri ile mekanik özellikleri belirlemek amacıyla sertlik ve aşınma testleri uygulandı. Sertlik Testleri Brinnel sertlik ölçme cihazında HBW 2,5/6,25 standardında yapılırken aşınma testleri 6 mm çaplı AISI52100 çeliğinden imal çelik bilye kullanılarak 5N yük altında, 500 m mesafede ve 10 mm strok mesafesinde bilyeli ileri geri hareketli (Reciprocating) UTS Tribometer T20 aşınma cihazında gerçekleştirildi.

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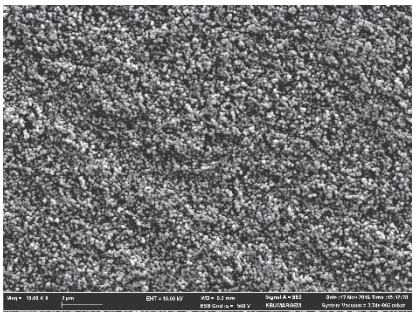
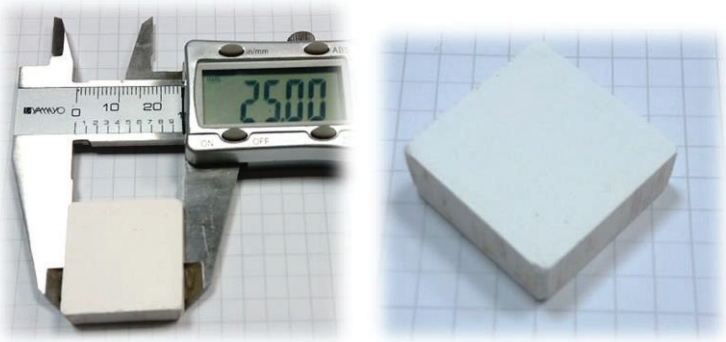
Sonuçlar ve Tartışma

Tozların SEM görüntülerinde zirkonya bazlı disklerin 100-200 µm aralığında tozlar kullanılarak üretildiği tespit edildi (Şekil 4).

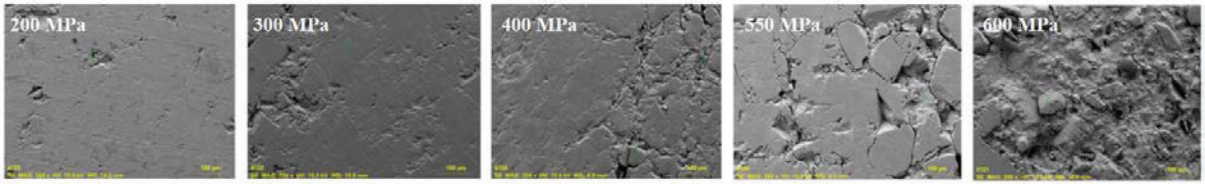


Şekil 4. Zirkonya tozlar

Toz metalürjisi ile üretilen kompaktlardan 200 MPa basınç altında preslenip 1250 °C'de sinterlenen kompakta ait resim Şekil 5'te verilmiştir. Düşük presleme basınçlarıyla yapılan üretimlerde daha düzgün formda numuneler elde edilirken presleme basıncının artmasına bağlı olarak mikro çatlak oluşumlarının arttığı gözlenmiştir (Şekil 6). Çatlak oluşumlarında deformasyona karşı direnç gösteren sert ve kırılgan zirkonya partiküllerin kalıp içerisindeki düzensiz hareketlerinin ve kompakttaki katmanlaşmaların etkili olduğu düşünülmektedir. Bunun yanı sıra rijit olmayan kalıp sistemi ile köşeli kalıp sistemininde aşırı sürtünmeye maruz kalan düşük mukavemetli köşe kısımların çatlak oluşma eğilimi arttırdığı düşünülmektedir.



Şekil 5. Zirkonya kompakt



Şekil 6. Zirkonya kompaktlarda presleme basıncına ağlı mikro çatlak oluşumları.

Kompaktların EDX ve XRD analiz sonuçları şekil 7'de verilmiştir. Analiz sonuçlarından da anlaşılacağı üzere işlenmiş zirkonya disklerin toz haline getirilmesi ve toz metalürjisi ile tekrardan kompakt haline getirilmesi süreçleri kimyasal kompozisyonunda belirgin bir değişiklik ve aşırı kirlenme belirtisi göstermemiştir.

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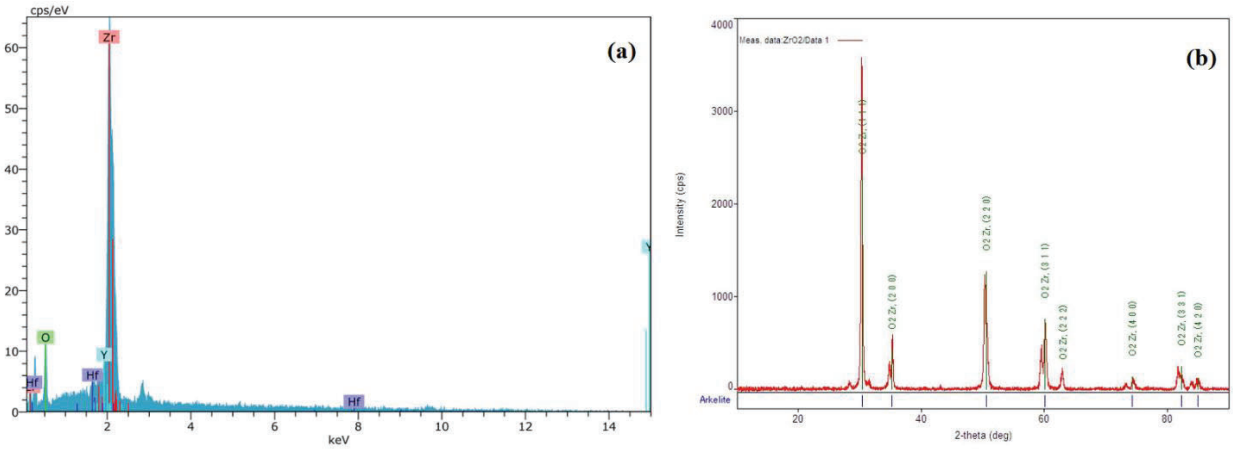


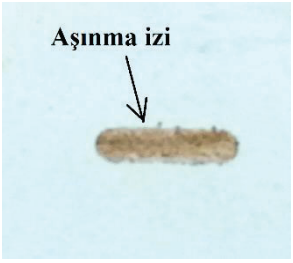
Şekil 7. Zirkonya kompaktların a) EDX ve b) XRD analiz pikleri.

Zirkonya kompaktların 2,5 mm çaplı uç ve 6,25 kg yük uygulanarak elde edilen ortalama sertlik değerleri Tablo 3'te verilmiştir. Veriler karşılaştırıldığında presleme basıncı ve sinterleme sıcaklığının artmasına bağlı olarak sertlik değerlerinin arttığı tespit edilmiştir. Ancak yüksek presleme basıncının numunelerde meydana getirdiği mikro çatlakların sertlik değerlerini olumsuz yönde etkilediği görülmüştür. En yüksek sertlik değeri 600 MPa basınç altında preslenip 1250 °C'de sinterlenmiş numunelerde elde edilirken en düşük sertlik 200 MPa basınç altında preslenip 950 °C'de sinterlenen numunelerde elde edilmiştir. Ayrıca, zirkonya kompaktların esas sinter sıcaklığına (> 1400 °C) yaklaştıkça sertlikte ciddi bir artış meydana geldiği gözlenmektedir.

Tablo3: Zirkonya kompakt sertliğinin presleme basıncı ve yarı-sinter sıcaklığına göre değişimi.

Parametreler	200 MPa	300 MPa	400 MPa	550 MPa	600 MPa
950 °C	11	12	14	19,5	31,1
1050 °C	22	24	27	32	36,2
1150 °C	26	30,4	36,4	42,8	60,6
1250 °C	46	87,9	175	216	228,3

Bilyeli ileri geri hareketli aşınma testine maruz bırakılan 200 Mpa basınç altında preslenip 1250 °C'de sinterlenmiş numuneye ait aşınma izi Şekil 8'de görülmektedir. Aşınma testlerinde elde edilen sonuçlar sertlik ve aşınma değerleri ters orantılı olduğu genel yaklaşımı ile değerlendirildiğinde artan sertlik değerlerine bağlı olarak oluşan izin derinlik ve genişliğinde azalma meydana gelmiştir. Aşınma kayıpları artan presleme basıncı ve sinter sıcaklığına bağlı olarak azalma göstermiştir (Şekil 9). Elde edilen sonuçlar artan sertliğin aşınma direncinin arttırarak aşınma kayıplarını azalttığını göstermektedir.



Şekil 8. 200 MPa basınç altında preslenip 1250 °C'de sinterlenmiş numuneye ait aşınma izi.

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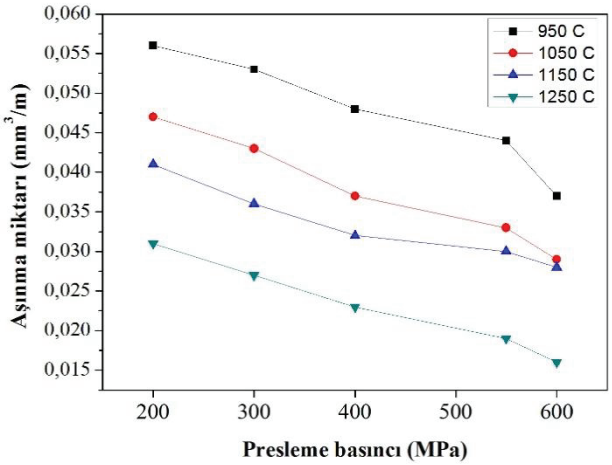

Şekil 9. Presleme basıncı ve sinter sıcaklığına bağlı aşınma kayıplarının değişimi.

Sonuçlar

Üretilen kompaktlarda presleme basıncının ve yarı sinter sıcaklığının artmasına bağlı olarak sertlik ve aşınma dirençlerin de artış gözlenmiştir. Yapılan deneysel çalışmalar neticesinde işlenmiş atık zirkonya disklerin toz metalürjisi üretim süreçleri ile geri kazanımı yönünde başarılı sonuçlar alınmasına karşın üretilen bloklarda çeşitli problemlerin mevcudiyeti de tespit edilmiştir. Bu problemlerin başında ticari olarak üretilen zirkonya disklerin üretimi 100-200 nm aralığında zikonya tozlar kullanılarak yapılmasına karşı geri kazanım esnasında disklerin öğütülerek ve elenerek bu boyuta inilememiştir. 400 mesh elek kullanılarak yapılan eleme işleminde öğütülmüş tozlarda 30 mikronun üzerindeki parçacıklar elimine edilmiş ancak eleme sonrası elde edilen tozlardaki partikül/parçacık boyut aralığının 100nm ile 30 mikron gibi geniş bir aralıkta değiştiği gözlenmiştir. Bu durum üretilen kompaktlarda gözenek oluşumunun yanı sıra mikro çatlak oluşumlarında etkili olmuştur. Plastik deformasyona karşı dirençli ve kırılgan zirkonya tozlarıyla yüksek yoğunluklu parçaların üretimlerde partükül boyutunun küçük ve mümkün mertebe daha dar bir aralıkta değişmesi gerektiği düşünülmektedir. Ayrıca köşegen şekilli kalıpla yapılan üretimlerde kompaktın kalıptan çıkarılması sırasında kompakt ile kalıp arasında sürtünme farklılıkları oluştuğundan numunede çatlak oluşumları gözlenmektedir. Yuvarlak kesitli stabil kalıp ve pres sistemleri ile yapılacak üretimlerde daha başarılı sonuçların elde edilebileceği düşünülmektedir.

Teşekkür

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AYDINLATMA FAKTÖRÜNÜN İŞ SAĞLIĞI VE GÜVENLİĞİ AÇISINDAN İNCELENMESİ

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Özet: İnsanlar algılamanın yaklaşık %85'ini görme duyuları aracılığıyla sağlarlar. Endüstri veya ofis ortamlarında uygun aydınlatma tüm çalışma işlevlerini kolaylaştırır. İşyerlerinde uygun aydınlatma öncelikle çalışanın tehlikeli durumları veya tehlikeli davranışları görmesi açısından önemlidir. Uygun aydınlatma, çalışanın tehlikeyi görmesinin yanında, çabuk uygulama, doğru karar verme ve rahat görmesini de sağlar. İş sağlığı ve güvenliği açısından oldukça önemli olan aydınlatma faktörünün uygun olması; iş kazalarının azalması, çalışanların sağlıklarının korunması, çalışanların psikolojisi ve verimlilik açısından önemlidir. Bu çalışmada aydınlatma kavramını doğru anlamak için gerekli olan temel ışık ve aydınlatma kavramlarından, aydınlatma türlerinden, bahsedilmiştir.

Anahtar Kelimeler: İş sağlığı ve güvenliği, uygun aydınlatma, aydınlık düzeyi

INVESTIGATION OF LIGHTING FACTOR IN TERMS OF OCCUPATIONAL HEALTH AND SAFETY

Abstract: People receive about 85 percent of their information through their sense of sight. Whether in industrial or office settings, optimal lighting makes all work tasks easier. Optimal lighting in the workplace is primarily important for the employee to see unsafe situations or unsafe behaviors. Optimal lighting provides seeing danger and quick application, correct decision making and comfortable viewing as well. The lighting factor, which is very important for occupational health and safety, is suitable for the decline of work accidents, the protection of employees' health, the psychology of employees and productivity. In this study, basic light and lighting concepts, lighting types are mentioned in order to correctly understand the concept of lighting.

Key Words: Occupational health and safety, optimal lighting, illuminance

Giriş

İş sağlığı ve güvenliği kavramı sanayileşme ile birlikte giderek daha da önem kazanan bir kavram haline gelmiştir (İşler, M.C & Gerim, İ. 2010). Günümüzde toplumların önemli ve öncelikli konularından birisi de insan sağlığının korunması, geliştirilmesi ve güvenli bir çalışma ortamı yaratılmasıdır (Demirsu, G. 2011, Ünal, A & Özenç, S. 2004). İş kazaları ve meslek hastalıklarının oluşmasında üretim teknolojisi, üretim araçları, işyerindeki fiziksel ve kimyasal etmenler ile üretimde kullanılan ham ve yardımcı maddelerin yanında ekonomik, sosyolojik, psikolojik, fizyolojik ve ergonomik birçok etken rol almaktadır(Esin, A. 2005).

Çalışma ortamı içerisindeki alanları görsel algılamaya uygun şekilde tasarlanmış ışık uygulamaları olan aydınlatma, fiziksel faktörler içerisinde yer alan önemli unsurlardan biridir (Ünal, A & Özenç, S. 2004). Aydınlatma, amacı bakımından fizyolojik, dekoratif, dikkati çeken aydınlatma olarak üç şekilde ele alınabilir. Fizyolojik aydınlatmada amaç cisimleri şekil, renk ve ayrıntılar ile rahat ve hızlı görebilmektir. Herhangi bir aydınlatma türünde olduğu gibi fizyolojik aydınlatma da gözün görme yeteneğini bozabilecek ve fizyolojik rahatsızlıklar doğurabilecek etkilerden kaçınılmalıdır (Özkaya, M. (1998).

İşyerlerinde güvenli ve sağlıklı bir çalışma ortamı sağlanmasında, görsel ilişkilerin kolaylıkla yapılmasında ve en uygun görüş alanın oluşturulmasında en önemli faktörlerden biri aydınlatmadır. Uygun bir aydınlatma ergonomisi

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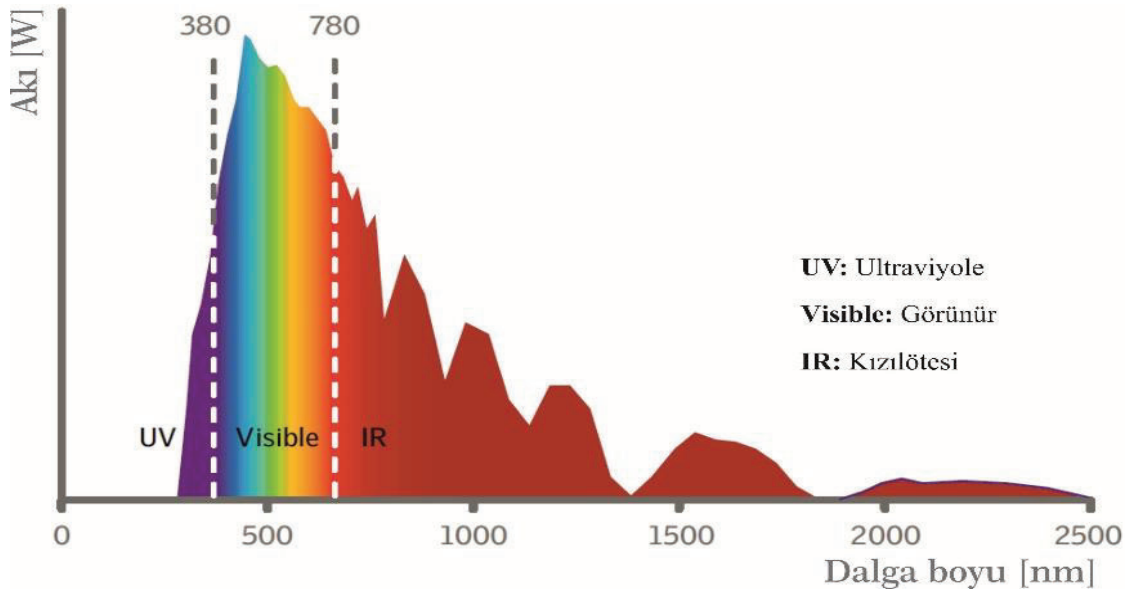
öncelikle iş yerindeki tehlikeli durum/davranışın görünür kılınmasını sağlayacak şekilde olmalıdır (Kürkçü, E.A., Çakar, İ., & Zeyrek, S**.** (2015). İyi bir aydınlatma ergonomisinin en önemli ve birinci ilkesi, yeterli olmasıdır. Yetersiz aydınlık düzeyinin güvenlik ve verim üzerinde olduğu gibi, bireyin fiziksel ve psikolojik sağlığı üzerinde de olumsuz sonuçları olacaktır (Çoşkuner, S & Öztop, H**.** 2016).

Aydınlık düzeyi değerleri kıyaslamasında kullanılan bu standartlar (TS EN 12464-1, TS EN 12464-2) çalışma alanlarındaki kişiler için normal görebilen kişilerin görme rahatlığı ve performans ihtiyaçlarını karşılayan aydınlatma kurallarını kapsamaktadır. Kullanılan standartlar birçok kapalı-açık çalışma yeri ve bunların ilişkili alanları için aydınlatma çözümlerini, aydınlatmanın niceliği-niteliği bakımından belirlemekte ve ayrıca uygun aydınlatma için tavsiyeler de vermektedir.

Işık ve Aydınlatma

Işık, gözlerimiz tarafından algılanan elektromanyetik spektrumun bir parçasıdır. Aralığın sınırları tam olarak belirlenmemiş olmakla birlikte, ortalama bir insan, 380 ile 780nm arasındaki dalga boylarını saptayabilir (Şekil 1) (Anonim1. 2013). Multidisipliner yaklaşım farklılıklarına bağlı olarak aydınlatma ile ilgili literatürde farklı tanımlamalara rastlamak mümkündür. Aydınlatma; nesnelere, bunların çevrelerine, ya da bir bölgeye, bir kent bölgesine, görülebilmeleri için ışık uygulamasıdır (Sirel Ş. 1974). İnsan gözünün algılayabildiği tek ışınım (radyasyon) tipi olan görünür ışık şekil 1. de görüldüğü gibi elektromanyetik spektrumda (tayf) çok ince bir aralık bandında bulunmaktadır (Anonim2. 2014).



Şekil 1. Görünür ışık aralığını gösteren diyagram.

Aydınlatmada Kullanılan Temel Parametreler

Bir işyerindeki aydınlatma faktörünü iş sağlığı ve güvenliği açısından değerlendirebilmek için aydınlatmada kullanılan temel parametreler tanımlanmıştır. Bunlar; ışık akısı (Φ), ışık şiddeti (I), ışıksal aydınlık (E) ve ışıksal ışıklılık (parıltı) (L)'dır.

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Işık akısı [φ] (*Luminous flux*)
Işık akısı, bir ışık kaynağı tarafından yayılan ışık miktarını tanımlar. Işık verimliliği, ışık akısının tüketilen elektrik gücüne oranıdır (lm/W). Bir ışık kaynağının ekonomik verimliliğinin bir ölçüsüdür (Anonim1. 2013). Simgesi: φ, birimi: Lümen (lm)'dir.

Işık şiddeti [I] (*Luminous intensity*)
Işık şiddeti, belirli bir parçacıktan yayılan ışık miktarını tanımlar. Bu reflektörler gibi doğrudan aydınlatma elemanları için yararlı bir ölçümdür (Anonim1. 2013). Simgesi: I, birimi: Kandela (cd)'dir.

Işıksal aydınlık [E] (*Illuminance*)
Işıksal aydınlık (aydınlık düzeyi), bir yüzeye düşen ışık akısını tanımlar. Mesafenin karesi kadar azalır. İlgili standartlar gerekli ışıksal aydınlatmayı belirtir (Anonim1. 2013). Simgesi: E, birimi: lüks (lx), (veya metrekare başına düşen lümen = 10,76 'foot candles', fc)'dir. Bu tez çalışması kapsamında ışıksal aydınlık (aydınlık düzeyi) ölçümleri yapılmıştır ve ışıksal aydınlık düzeyi ölçümlerinde lüks (lx) birimi kullanılmıştır. Ölçüm methodu ile ilgili daha kapsamlı bilgi 'materyal ve method' bölümünde bahsedilmiştir.

Işıksal ışıklılık [L] (*Luminance*)
Işıksal ışıklılık (parıltı), göz tarafından algılanan tek temel aydınlatma parametresidir. Bir yüzeyin parlaklığına bağlıdır ve temelde yüzeyin yansımasına bağlıdır (Anonim1. 2013). Yani bir yüzeyden yansıyan ışık miktarıdır. Simgesi: L, birimi: cd/m^2 (metrekare başına kandela)'dir.

Aydınlatma Türleri

Zaman içinde ergonomi konusu ile ilgili birçok farklı kitap yayınlanmıştır. Ancak, hiçbiri ışığın ergonomisini işlememektedir. Aynı durum ışık ve aydınlatma ile ilgili kitaplarda da vardır. Bunların arasında da ışığın ergonomisini ele alan bir kaynak maalesef yoktur. Işık ergonominin önemli bir parçası ve konunun irdelenmemesi olağan bir durum değildir (Skansi, R. 2016).

Aydınlatma türlerini genel olarak ışık kaynağına göre, doğal aydınlatma ve yapay aydınlatma olarak; aydınlatılan mekânın kapalı veya açık olmasına göre iç mekân aydınlatma ve dış mekân aydınlatma olarak ayırabiliriz. İşyerinin yapısal özellikleri ve çalışma prensiplerine göre daha çok yapay iç aydınlatma ile bağlantılı olduğundan yapay aydınlatma ve daha çok iç mekân aydınlık düzeyi (ışıksal aydınlık) ölçümleri yapılmaktadır. Aydınlatma ile ilgili görsel konfor parametrelerini ve görsel çevreyi değerlendiren çalışmalarda çoğunlukla doğal aydınlatma ve yapay aydınlatma birbirinden ayrı olarak değerlendirilmektedir (Kaçel, S & Yener, A.K**.** 2015).

Aydınlatma, herhangi bir işyeri için vazgeçilmez bir koşuldur. Hem doğal hem de yapay aydınlatma birleştirilerek tüm işyerinde tekdüze aydınlatma sağlamak tercih edilir. Maliyetleri düşürmek ve aydınlatmayı iyileştirmek için bazı durumlarda lokalize aydınlatma gerekebilir (Anonim3. 2003).

Doğal Aydınlatma

Bu aydınlatmanın ana kaynağı gün ışığıdır. Mekânlarda doğal (günışığı ile) aydınlatma, pencereler ve bazı durumlarda çatıdan gelen ışık yardımıyla sağlanmaktadır. Yapılarda doğal ışığın binanın işlevine, konumuna göre planlanması da denilmektedir. Malzemenin cinsi ne olursa olsun, doğal aydınlatmanın doğru yapıldığı mekânlarda ışıksızlık (aydınlatma) problemi yaşanmaz. Günümüzde doğal aydınlatmanın tüm özelliklerini bünyesinde tutan bir aydınlatma elemanı henüz bulunmamaktadır. Gözü yormaması gibi üstün özelliği ile mekânlarda mümkün olduğunca doğal aydınlatma tercih edilmelidir (Taşpınar, A.S. 1977, Ataç, F. 2013).

Doğal aydınlatma, en uygun aydınlatma şeklidir. Endüstride, çeşitli iş şekilleri ve imalat işlemlerinde, pencerelerden ya da çatıdan aydınlatma tekniği ile yeterli aydınlatma sağlanabilir. Böyle bir aydınlatma tercih edildiği zaman, ışığın yönü ve yeğinliği dikkate alınarak, iş istasyonları, makine ve tezgâhların yeri iyi seçilmelidir. Gün ışığı ile aydınlatmada, çalışma yüzeylerinde parlamalar olmaması, çalışanların gözlerine doğrudan ve yeğin ışık gelmemesi ve aydınlatma gereksinimine göre makine ve işlemlerin yerinin iyi seçilmiş olması gibi temel yaklaşımlar özenle ele alınmalıdır (Dizdar, E.N. 2016).

Yapay Aydınlatma

Doğal ışık kaynağının (güneş ışığı, gün ışığı) yeterli olmadığı durumlarda ve gece aydınlatmasında yapay ışık kaynakları kullanılmasıyla yapay aydınlatma sağlanır. Doğal aydınlatmanın yeterli olmadığı durumlarda çalışanların sağlık ve güvenliğinin korunması amacına uygun şekilde yeterli yapay aydınlatma yapılır (Anonim4. 2013).

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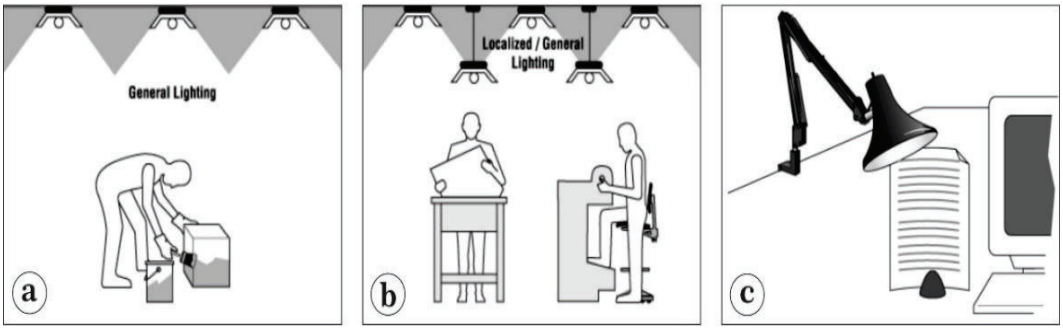
Aydınlatma işlevinin gün ışığı dışında çeşitli aydınlatma elemanlarıyla gerçekleştirilen aydınlatma; yapay aydınlatmadır. Aydınlatma şekli; aydınlatma araçlarından çıkan ışığın, aydınlatılacak yüzeye hangi oranda yollandığının belirlenmesidir (Işık, N. 2003). Yapay aydınlatmaları genel, lokalize genel ve lokal aydınlatma olarak temel üç sınıfa ayırabiliriz (şekil 2.).

- Genel aydınlatma; oldukça tekdüze bir aydınlatma sağlar. Geniş alanları aydınlatan tavan armatürleri örnek verilebilir.
- Lokalize genel aydınlatma; belirli işler için aydınlık düzeyini arttırmak için havai armatürler kullanılabilir.
- Lokal aydınlatma; işin çevresindeki ışık düzeylerini arttırır. Yerel aydınlatma genellikle kullanıcının aydınlatmayı ayarlamasına ve kontrol etmesine izin verir ve her kullanıcı için esneklik sağlar.



Şekil 2. Aydınlatılacak yüzeye göre aydınlatma türleri: (a) genel aydınlatma, (b) lokalize genel aydınlatma, (c) lokal aydınlatma

Sonuç ve Öneriler

Ortalama aydınlık düzeyi ilgili standartlardaki (TS EN 12464-1: 2013, TS EN 12464-2: 2013) değerlerden az olmaması gerekmekte ve ortalama aydınlık düzeyi değerinin iyileştirilmesi ve ilgili standarttaki tavsiye edilen aydınlık düzeyi değerine ulaşması için uygun olan yerlerde aydınlatma armatürlerinin sayısının arttırılması, aydınlatma armatürlerinde ışık yayılımını engelleyen kirlerden ve tozlardan düzenli temizlenmesi, aydınlık şiddeti daha yüksek ampullerin kullanılması ve eskiyen ampullerin değiştirilmesi gereklidir. Bununla birlikte tavan ve duvarlardan yansımanın etkisinin kullanılması, istenmeyen gölgeleri engelleyecek aydınlatma sistemlerinin kurulması da aydınlık düzeyi değerinin arttırılmasına yardımcı olacaktır.

Uygun aydınlatma aynı zamanda insanın hem fizyolojik hem de psikolojik özelliklerine de bağlıdır. Yani, uygun aydınlatma, mekân ve aydınlatma tasarımına bağlı olduğu gibi aydınlatmanın insan üzerindeki etkisine de bağlıdır.

Uygun bir aydınlatma için öncelikle aydınlık düzeyi yeterli olmalı fakat uygun bir aydınlatma için sadece aydınlık düzeyi parametresi üzerinden değerlendirme yapılması doğru değildir. Bir işyerinde, aydınlatma faktörünün daha doğru değerlendirilebilmesi için aydınlık düzeyi değerlendirmesiyle diğer yansıma, parlama, gölge, aydınlatma armatürlerinin düzeni, kullanılan ampullerin cinsi vb. aydınlatma parametrelerinin de titizlikle incelenmesi gerekmektedir.

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$BaCO_3$ KATKILI CaO, MgO, SiO_2 ve Al_2O_3 (CMAS) CAM SERAMİK SİSTEMİNİN ÜRETİMİ

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Özet: CaO-MgO-Al_2O_3-SiO_2 (CMAS) sistemi temel silikat sistemlerinden birisi olup; amorf yapıdaki camların kontrollü kristalizasyonu sonucu üretilmektedir. CMAS esaslı malzemeler; yüksek refrakterlik, yüksek korozyon direnci ve çok iyi aşınma özelliklerinden dolayı endüstrinin birçok alanında yaygın olarak kullanılmaktadır. Mevcut çalışmada $BaCO_3$ katkılı CMAS cam seramik sistemi üzerinde çalışılmıştır. CMAS bileşimini oluşturmak üzere tartılan hammaddeler (Zirkonya, Bizmut Oksit, Kaolen, Wollastonit, Baryum Karbonat ve Çinko Oksit) ve magnezit atık malzeme bilyalı değirmende yaş olarak 12 saat boyunca homojen olarak karıştırılmıştır. Etüvde kurutulan tozlar 10°C/dk ısıtma hızı ile alümina pota içerisinde 1450°C'de 2 saat süre ile MSE marka asansörlü ergitme fırınında ergitilip grafit kalıplara dökülerek; ardından Lenton marka fırında 600°C'de 1 saat gerilim giderme tavlamasına tabi tutulmuştur. CMAS esaslı cam numuneler Retsch marka RS 100 model halkalı değirmende 700 devir/dk hızla kırılıp-öğütülerek toz haline (<45 µm) getirilmiştir. Bu tozlara farklı ısıtma hızlarında DTA analizi yapılmıştır. Elde edilen cam tozları hidrolik pres kullanılarak şekillendirildikten sonra 1000°C-1200°C'lerde 1 ve 5 saat sürelerde sinterlenmiştir. CMAS cam seramiklerin mikroyapı ve faz yapıları incelenmiş, yoğunluk ve sertlik testleri gerçekleştirilmiştir.

Anahtar kelimeler: CMAS, Cam Seramik, sertlik, $BaCO_3$

Abstract: The CaO-MgO-Al_2O_3-SiO_2 (CMAS) system is one of the basic silicate systems (ceramic/ glass material) controlled crystallization of glass in amorphous form is produced. CMAS based materials; high refractivity, high corrosion resistance and very good abrasion properties. In the present study, the glass ceramic system with $BaCO_3$ addition was studied. The CMAS composition to form the aqueous raw and waste materials are weighed and homogeneously mixed in a ball mill for 12 hours. Powders were dried in an oven than melted in a MSE lift furnace at 10°C/min heating rate of in the alumina crucible at 1450°C for 2 hours and poured into graphite mold; then annealing at 600°C for 1 hour. CMAS-based glass samples broken-by grinding in Retsch RS 100 a cyclic mill 700 rpm speed were ground into powder. The powders were calibrated the correct particle size (<45 µm) for pressing. The obtained glass powders were sintered at 1000°C-1200°C for 1 and 5 hours after they were formed using a hydraulic press. The resulting product was characterized using SEM-EDS, DTA, density, microhardness test and XRD techniques.

Keywords: CMAS, Glass Ceramics, hardness, $BaCO_3$

Giriş

Cam-seramikler, 1970'li yıllardan beri üzerinde artan şekilde bilimsel araştırmaların yapıldığı ve farklı uygulamaların ortaya konduğu bir alan olarak karşımıza çıkmaktadır. Ağırlıklı olarak geleneksel cam teknolojisi ile şekillendirilen camlar, çekirdeklenme ve kristal büyüme aşamalarını kapsayan kontrollü ısıl işlemlerle cam-seramik haline dönüştürülmektedir. Böylelikle, istenilen fazlarla, kontrollü yüzeylerde ve kristal büyüklüklerde cam-seramik grupları oluşturulabilmektedir. Ayrıca, farklı üretim yöntemleriyle üretilen cam veya tozların kristallendirilmesiyle de cam-seramik malzemeler üretilebilmektedir (Yılmaz, 2010). Cam-seramik malzemelerin üretimi 2 temel şekilde yapılabilmekte olup; bunlar üretilen camların kontrollü olarak pişirilmesi yada üretilen camların önce toz haline getirilip sonra pres vb. yöntemlerle şekillendirildikten sonra sinterlenmesidir (Cai, 2014). Cam bileşimine katılan ZrO_2, BiO_2, P_2O_5 gibi oksitler çekirdekleşme oluşumunu sağlayarak kristallenmede heterojen çekirdekleyici rolü oynamaktadırlar. Cam-seramikler kristalleşmenin tamamen homojen cam fazından kaynaklanmasıyla geleneksel seramiklerden farklılaşırlar (Öcal, 1997). Cam-seramikler, camlara kıyasla daha yüksek mekanik mukavemete, darbe direncine, sertliğe ve aşınma direncine sahiptir (Üzümlü, 2002). Bu gibi

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mekanik özelliklerin camlara göre iyi olmasının nedeni oluşan kristallerin tane boyutlarının 1 mikrondan daha küçük olmasından kaynaklanmaktadır (Merkit, 2016).

Temel silikat esaslı seramik/cam malzeme gruplarından birisi olan CMAS sistemi; amorf yapıdaki camların kontrollü kristalizasyonu ile elde edilmekte olup; oluşan ana fazlar diyopsit, anortit ve kordiyerittir. Bu fazlar CMAS esaslı malzemelerin; yüksek refrakterlik, iyi kimyasal direnci ve üstün aşınma direnci gibi özelliklerini doğrudan etkilemektedir ve bundan dolayı da endüstrinin birçok alanında aranan malzeme gruplarından biri olmasını sağlamaktadır. CMAS cam seramikleri birçok farklı alanda geleneksel malzemelere alternatif malzeme olmaya adaydır. Bunlar nükleer kalkan malzemesi, katı oksitli yakıt hücrelerinde sızdırmazlık elemanı, bina yapımında iç ve dış koruyucu uygulamalar ve ağır sanayide koruyucu olarak baca, tünel, kanal vb. kullanımı düşünülmektedir (Cai, 2014). CMAS cam ve cam seramiklerinin birçok farklı hammadde kaynakları kullanılarak üretimi mümkün olup; bunlar kaolen, atık cam, kırmızı çamur, kireç, magnezit atığı, lityum porselen kil atığı, feldspat, uçucu kül, kum, alümina-silika tuğla harcı, wollastonit (Ballıcaoğlu, 2016, Toplan, 2016) vb. üretildiği gibi saf oksitlerden de üretimi gerçekleşmektedir (Cannaerts, 2009, Augmented, 2014, Hechinger, 2000, Billinghurst, 2010).

Günümüzde endüstriyel faaliyetlerin artmasına paralel olarak endüstriyel atıklar da artış göstermiştir. Bu atıkların geri dönüşümü başta çevre olmak üzere gelecek için büyük bir sorun teşkil etmektedir. Bu atıklar doğaya bırakılmaları sonucunda önce toprak ve yeraltı sularına karışarak besin zincirine girmektedir. Bu nedenle cam ve cam seramik üretimi sürecinde bu gibi atıkların verimli olarak kullanımının araştırılması gereklidir. Seramik üretiminde atık malzemelerin kullanılması atıklar içinde mevcut olan ağır metallerinde ekosisteme zararını önlemiş olmaktadır. Magnezit üretimi esnasında meydana gelen $MgCO_3$ atığı magnezyumca zengin olup, bu çalışmada CMAS cam-seramik üretiminde MgO kaynağı olarak kullanılması tercih edilmiştir.

Mevcut çalışmanın temel hedefi saf ve atık malzemeler kullanılarak üretilen CMAS sistemine Ba_2CO_3 katkısının etkisinin incelenmesidir. Üretilen CMAS bileşiminin (CMAS-Ba) mikroyapı ve faz yapıları sırası ile SEM ve XRD analizleri ile incelenmiş, DTA, yoğunluk ve mikrosertlik testleri yapılmıştır.

Deneysel Çalışmalar

Mevcut çalışmada kullanılan hammaddelerin ve atık malzemenin ağırlıkça %'leri Tablo 1'de verilmiştir. Belirlenen CMAS bileşimini oluşturmak üzere tartımı yapılan tozlar bilyalı değirmen yardımıyla 250 dev/dk hızla yaş olarak 12 saat boyunca homojen olarak karıştırılmıştır. Karıştırılan tozlar 100ºC'de 48 saat etüvde bekletilerek kurutulmuştur. Kurutulan tozlar MSE marka asansörlü ergitme fırınında 10ºC/dk ısıtma hızı ile alümina pota içerisinde önce 900°C'de 1 saat karbonatların parçalanması için bekletildikten aynı hızla 1450°C'de 2 saat süre ile bekletilerek erimesi sağlanmış ve sonrasında bileşim grafit kalıba dökülmüştür. Lenton marka fırında 600°C'de 1 saat gerilim giderme tavlamasına tabi tutulan CMAS esaslı cam numuneler oda sıcaklığına soğutulduktan sonra Retsch marka RS 100 model halkalı değirmende 700 devir/dk hızla kırılıp-öğütülerek toz haline getirilmiştir. Toz haline getirilen CMAS tozları camsı geçiş (Tg), kristallenme (Tp) ve ergime (Te) sıcaklıklarının belirlenmesi için TA Instrument Q-600 marka cihaz ile 10ºC/dk ısıtma hızında DTA analizine tabi tutulmuştur. Üretilen tozlar daha sonra paslanmaz çelik kalıplarda hidrolik presle şekillendirilip 1000ºC ve 1200ºC sıcaklıklarda 1-5 saat sürelerde sinterlenmiştir. BaO katkılı CMAS cam-seramik üretim akım şeması Şekil 1'de görülmektedir. Sinterleme sonrası numunelerin mikroyapısal incelemeleri JEOL 6060 LV marka taramalı elektron mikroskobu ile faz analizleri ise Rigaku DMAX /2200 marka X-ray difraktometresinde CuKα ışınımı kullanılarak gerçekleştirilmiştir. CMAS-Ba kodlu 1000 ve 1200˚C sıcaklıkta 1 ve 5 saat sinterlenen numunelerin mikrosertlik değerleri; Leica marka mikrosertlik cihazı ile 50 gr yük altında 30 sn bekleme süresi ile alınan 10 ölçümün ortalaması hesaplanarak Vickers (HV) sertlik değerleri tespit edilmiştir. Mikrosertlik testi öncesi numuneler metalografik yüzey hazırlama işlem kademelerine tabi tutulmuştur. 60-1200'lük SiC zımpara kâğıdı kullanılarak yüzeyler düzgün hale getirildikten sonra alümina pasta yardımıyla parlatılıp %5'lik HF ile dağlanmıştır.
CMAS-Ba kodlu bileşimlerden hazırlanan numunelerin yoğunluk değerleri Arşimet yöntemi kullanılarak ASTM (c693-93) standardına göre eşitlik 1 yardımıyla hesaplanmıştır.

$$\rho = \frac{W_a}{W_c - W_b} \mathrm{ds} \qquad (1)$$

ρ= numunenin yoğunluğu (g/cm^3),

w_a= numunenin kuru ağırlığı (g),

w_b= sıvı içinde numunenin asılı haldeki ağırlığı (g),

w_c= sıvı emdirilmiş numune ağırlığı (g) ve d_s= sıvı yoğunluğu (g/cm^3)

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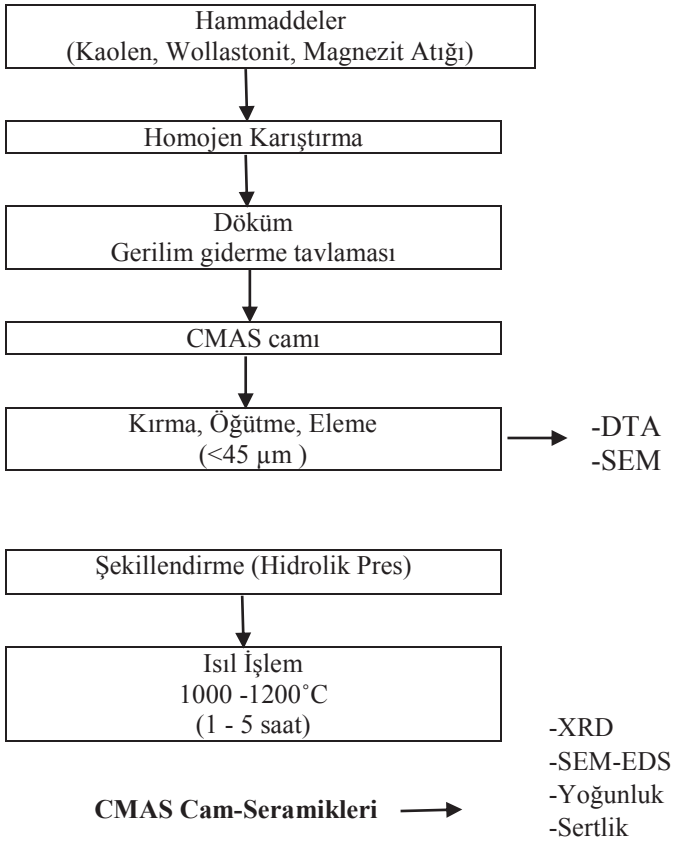
Tablo 1: CMAS-Ba bileşimini oluşturan hammadde ve atık malzemeler (ağ.%)

Hammaddeler	ZrO_2	Bi_2O_3	Kaolen	Magnezit Atığı	Wollastonit	$BaCO_3$	ZnO
CMAS-Ba	4	4	35	20	30	6.44	2



Şekil 1. CMAS cam-seramik üretim akım şeması

Deneysel Sonuçlar Ve İrdelemeler

Mikroyapı Analizi

Şekil 2'de CMAS-Ba kodlu numunelerin 1000ºC ve 1200ºC'de 1 ve 5 saat sinterlenmeleri sonucu oluşan parlatılmış yüzey mikroyapı görüntüleri görülmektedir. Yapıda sıcaklık ve süre arttıkça tane büyümesi meydana geldiği görülmektedir. Bununla beraber artan sıcaklık ve süreyle yapıda porozite artışı ve camlaşmalar görülmüştür. Yoğunluk testi sonuçlarında görüleceği üzere sıcaklık arttıkça CMAS cam-seramik malzemelerin yoğunluğu azalan yönde değişmektedir. Diyopsit fazı yapıda kolonsu kristaller şeklinde mevcut olduğu bilinmektedir (Zheng 2015).

Faz Analizi

CMAS-Ba kodlu preslenmiş numunelerin 1000° ve 1200ºC'de 1 ve 5 saat sinterlenmesi sonucu oluşan XRD grafikleri sırası ile Şekil 3'te görülmektedir. Yapılan XRD analizleri Rigaku DMAX /2200 marka X-ray difraktometresinde CuKα ışınımı kullanılarak tespit edilmiştir. Sonuçlar incelendiğinde CMAS cam seramiklerinin karakteristik iki fazı olan diyopsit ($CaMgSi_2O_6$) ve anortit ($CaAl_2Si_2O_8$) tespit edilmiştir. Sonuçlar incelendiğinde her sıcaklık 1000°C'den 1200ºC'ye çıkarıldığında hem anortit hem de diyopsit faz şiddetinin arttığı, süre 1 saatten 5 saate çıkarıldığında ise her iki sıcaklık değerinde anortit faz şiddetinin azaldığı gözlenmiştir.

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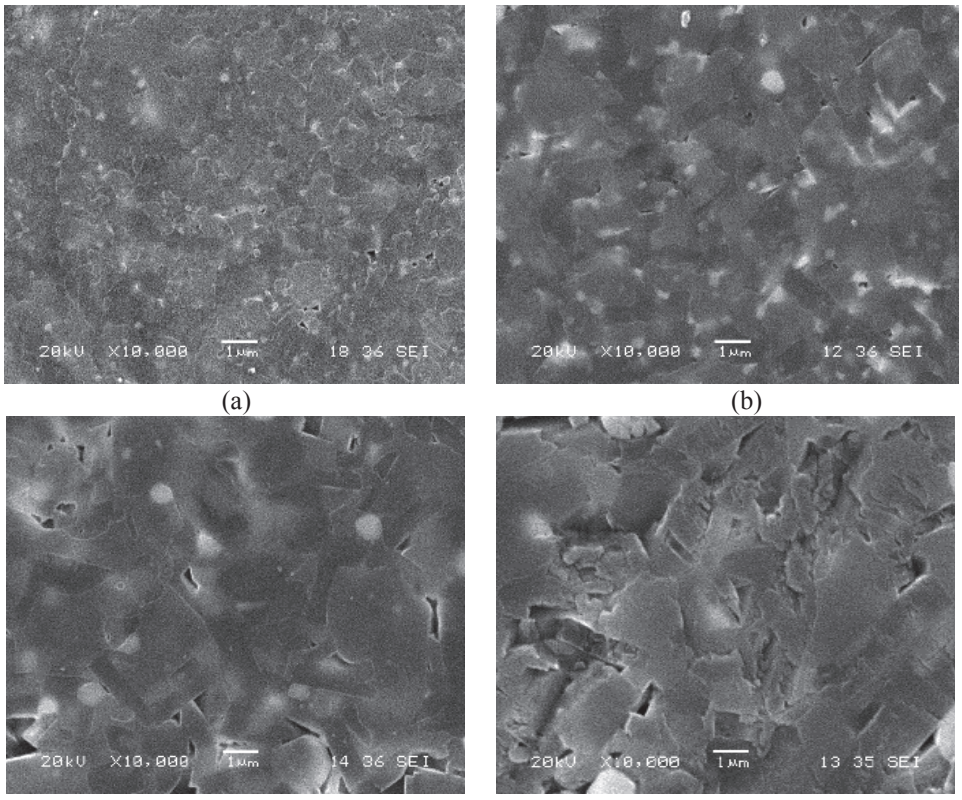
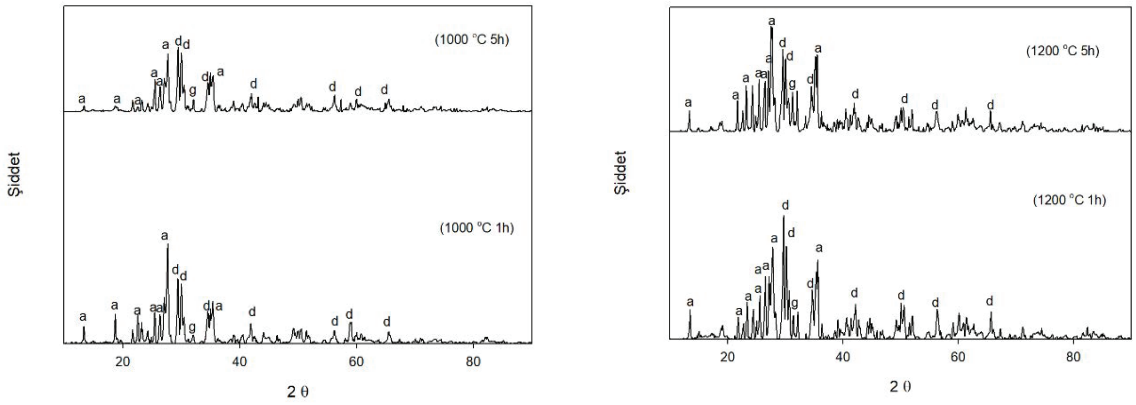


(a) (b)

(c) (d)

Şekil 2. CMAS-Ba kodlu a. 1000ºC 1s, b. 1000ºC 5s, c. 1200ºC 1s ve d. 1200ºC 5 saat sinterlenen numunelere ait mikroyapılar



(a) (b)

Şekil 3. CMAS-Ba kodlu numunenin a. 1000 ve b. 1200ºC'de 1 ve 5 saat sinterlenmesi sonrası XRD analizleri

Cai ve arkadaşlarının yüksek saflıktaki SiO_2, Al_2O_3, MgO, CaO ve CaF_2 hammaddeleri kullanarak hazırladıkları ve çekirdekleştirici olarak da P_2O_5, ZrO_2, TiO_2 kullandıkları çalışmalarında anortit ve diyopsit fazlarını yapıda tespit etmişlerdir (Cai, 2014). CMAS camların izotermal olmayan kristalizasyonuna Fe_2O_3'ün etkisi başlıklı çalışmada cam numuneleri 800°C'de 2 saat çekirdeklenme ve 1050°C'de 2 saat kristalizasyon sonrası ana fazların diyopsit ve wollastonit olduğunu ve Fe_2O_3 içeriği arttıkça diyopsit fazının arttığını tespit etmişlerdir. Diyopsit esaslı cam-seramikler mükemmel mekanik özelliklere, yüksek aşınma direnci, yüksek kimyasal kararlılığa ve dekoratif amaçlı kullanımlara adaydır (YU, 2015).

Yoğunluk ve Sertlik Testi

Baryum katkılı tabletlerin 1000, 1050, 1100, 1150 ve 1200ºC'de 1, 3 ve 5 saat sinterlenmesi sonucu elde edilen ürünlerin sertlik ve yoğunluk değerleri Şekil 4'te görülmektedir. Yoğunluk değerleri incelendiğinde düşük olan sıcaklıklarda sürenin artmasıyla birlikte yoğunluğun azalma gösterdiği, bu düşüşün sıcaklık artışı ile daha da belirgin hale geldiği görülmektedir. En yüksek yoğunluk 2.99 gr/cm^3 değerine 1000ºC'de 1 saat sinterlenen

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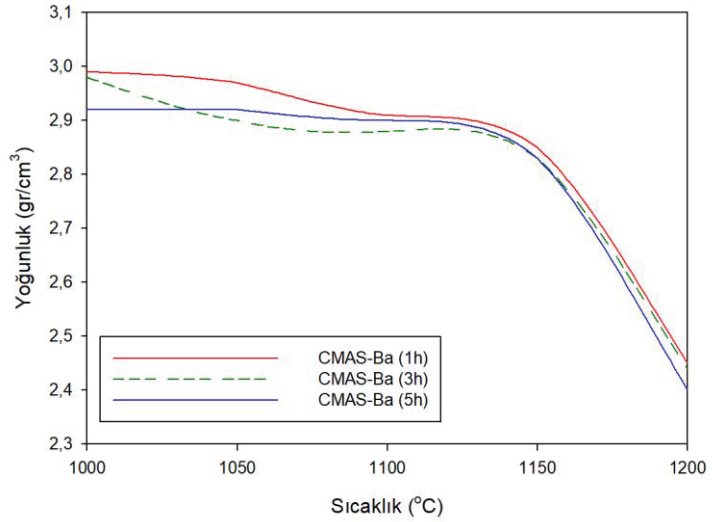
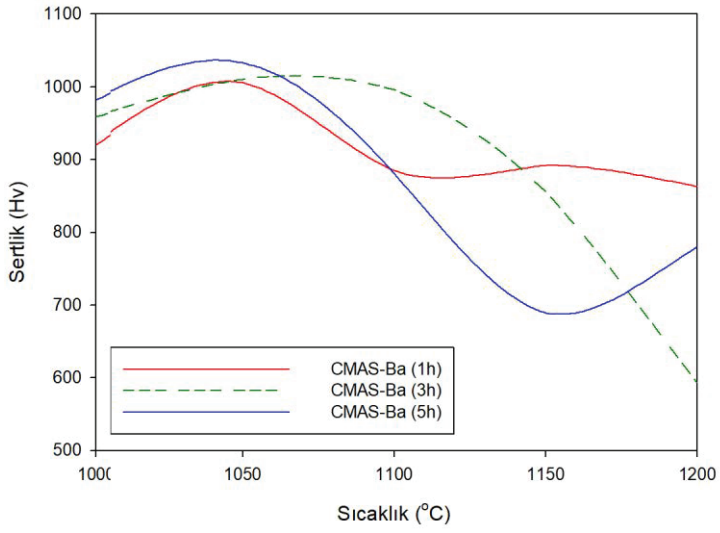
numunede ulaşılırken; en düşük değer olan 2.40 gr/cm^3 1200°C 5 saat sinterlenen numunede tespit edilmiştir. Bunun nedeni ise düşük sıcaklıklarda sinterlenme süresinin artmasıyla difüzyonun daha uzun sürmesidir. Yüksek sıcaklıklarda ise iç çekilmeler sıcaklıkla birlikte daha da arttığından poroziteler oluşmuş bu da yoğunluk ve sertliğin düşmesine neden olmuştur.



(a)



(b)

Şekil 4. Baryum katkılı tabletlerin 1000, 1050, 1100, 1150 ve 1200°C'de 1, 3 ve 5 saat sinterlenmesi sonucu elde edilen ürünlerin (a) yoğunluk ve (b) sertlik değerleri.

Park ve çalışma grubu; ağ.%75 uçucu kül, %20 SiO_2 ve %5 MgO hammaddelerine ilaveten çekirdekleyici olarak ağ.%2 TiO_2 ilavesi ile cam ve cam-seramik numuneleri üretmişler ve bunların mekanik özelliklerini incelediklerinde cam-seramik yapının mikrosertliğinin oluştuğu ana cama göre daha yüksek çıktığını belirtmişlerdir (Park, 2002). Cheng ve arkadaşları CAS esaslı cam-seramikler üzerine yaptıkları çalışmada kristalizasyon işlemi (artan sıcaklık ve süreyle) ile kristal büyümesi sonucu malzemede fiziksel ve mekanik özelliklerin düştüğünü rapor etmişlerdir (Cheng, 2003). Kang ve çalışma grubu granit atıkları, magnezit ve dolomit kullanarak üretmiş olduğu CMAS seramiklerde sertlik değerini bileşime bağlı olarak 6.7-7.4 GPa aralığında tespit etmişlerdir (Kang, 2017). Sertlik sonuçları mevcut çalışmada 7.649-9.022 GPa (780-920 HV) aralığında tespit edilmiştir. Vitor ve arkadaşları anortit-diyopsit cam-seramik altlıkların yoğunluk davranışı ve özelliklerine TiO_2 ve P_2O_5'in etkisi üzerine yapmış oldukları çalışmada 2.27-2.78 gr/cm^3 yoğunluk değerleri ile 48-558 HV sertlik değerine ulaşmışlardır (Vitor, 2010). Kırmızı çamur, Tunçbilek ve Orhaneli uçucu külleri kullanılarak üretilen cam-seramiklerde yoğunluk değerini 2.71-3.32 gr/cm^3, sertliği ise 577-867 kg/mm^3 olarak tespit edilmiştir (Erol, 2007).

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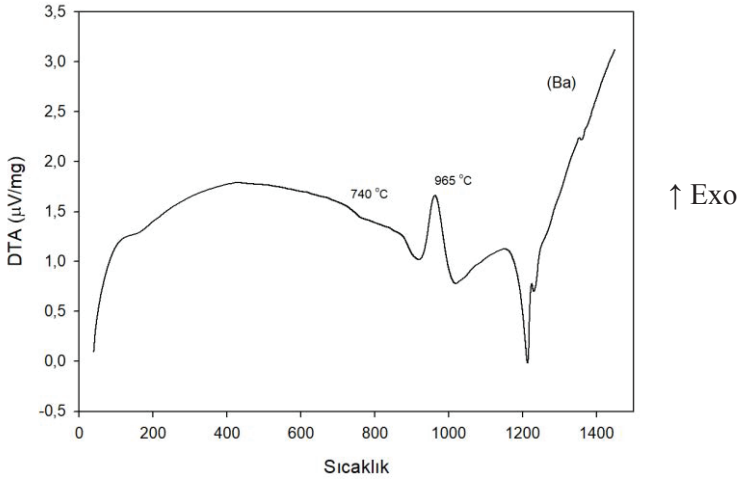
DTA Analizi

Üretilen CMAS-Ba kodlu cam tozunun (<45µ) DTA analizi hava atmosferinde oda sıcaklığından 1450°C'ye kadar 10°C/dk ısıtma hızında alumina pota kullanılarak yapılmıştır. Şekil 5'te görülmekte olan DTA analizine göre CMAS-Ba için cam geçiş sıcaklığı (Tg) ve kristalleşme sıcaklığı (Tp) sırası ile 740ºC ve 965°C olarak tespit edilmiştir. Deng ve arkadaşları yaptıkları çalışmada, ağ. %21 CaO, %15 MgO, %10 Al_2O_3 ve % 54 SiO_2 içeren CMAS bileşimi için cam geçiş sıcaklığını (Tg) 750ºC ve kristalleşme sıcaklığını (Tp) 1015 ºC olarak belirtmişlerdir. Farklılığın başlıca sebepleri; CMAS'ı oluşturan bileşenlerin oranlarının farklılık göstermesi ile birlikte, toz boyut dağılımının farklı seviyede olmasıdır (Yu, 2015).



Şekil 5. CMAS-Ba tozuna ait DTA Analizi

Genel Sonuçlar

Bu çalışmada doğal hammadde kaynağı olarak kaolen ile wollastonit, atık hammadde kaynağı olarak magnezit atığı ve saf hammaddeler kullanılarak CaO-$MgOAl_2O_3$-SiO_2 (CMAS-Ba) bileşim tozu hazırlanmıştır. 1450ºC'de 2 saat ergitme ve 600ºC'de 1 saat temperleme işlemi ile cam numuneler elde edilmiştir. CMAS esaslı cam numuneler halkalı değirmende 700 devir/dk hızla kırılıp-öğütülerek toz haline getirilmiştir. Bu cam tozları hidrolik presler yardımıyla çelik kalıplarda şekillendirildikten sonra bu tabletler 1000-1200ºC'de 1-5 saat sürelerde sinterlenme ve kristalizasyon işlemi ile de cam-seramik numuneler üretilmiştir. Cam ve cam-seramik numunelerin faz analizleri ve mikroyapısal özellikleri, yoğunluk ve mikrosertlik incelemeleri gerçekleştirilmiştir.

1. XRD analizi doğrultusunda CMAS-Ba bileşimli camların amorf yapıda olduğu ve bu camların soğuma sırasında kristal faz oluşturmadığı tespit edilmiştir. Camların öğütülüp sinterleme işlemi yapıldıktan sonra ki XRD analizi sonuçlarına göre anortit ($CaAl_2Si_2O_8$) ve diyopsit ($CaMgSi_2O_6$) fazları tespit edilirken, sıcaklık ve sürenin artışıyla anortit fazı diyopsit fazına dönüşmüştür.
2. Cam-seramiklerin mikro-yapılarında çubuksu şekilde diyopsit kristalleri ile tabakalı yapıda anortit kristalleri oluşmuştur.
3. CMAS-Ba bileşimlerden elde edilen cam-seramiklerin yoğunluk değerleri 2.84-2.40 g/cm^3 arasında değişirken; mikro sertlik değerleri de 920-780 HV arasında ölçülmüştür. Sıcaklık ve sürenin artmasına paralel olarak sertlik ve yoğunluk değerlerinde düşme tespit edilmiştir.
4. 10ºC/dk ısıtma hızında uygulanan DTA analizine göre CMAS-Ba kodlu camın camsı geçiş sıcaklığı (T_g) 740ºC, kristallenme sıcaklığı (T_p) 965 ºC olarak bulunmuştur.

Teşekkür

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BAĞLAM (YAŞAM) TEMELLI ÖĞRENME YAKLAŞIMI ÜZERINE TEMATIK VE METODOLOJIK BIR DEĞERLENDIRME

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Özet:Günümüzde yaşanan hızlı bilgi artışı sonucunda; var olan bilginin tümüne hakim olmak değil, gerektiğinde sahip olunan bilgiyi kullanabilmek önem kazanmıştır. Bu değişimin eğitime yansıması yapılandırmacı öğrenme kuramıyla gerçekleşmiştir.Ülkemizde 2004 yılında yenilenen ilköğretim programlarıyla birlikte yapılandırmacılığın temel alınmasıyla bağlam temelli yaklaşıma ilgi artmıştır. Bağlam temelli öğrenme yaklaşımı, ders içeriklerinin oluşturulmasında öğrencilerin günlük yaşamlarında karşılaştıkları çeşitli durumlardan yararlanılması olarak açıklanabilir. Bu yaklaşımın, dersi öğrenciler için ilginç ve eğlenceli hale getirerek öğrenme gereksinimi oluşturduğu ve konuların anlaşılmasını kolaylaştırdığı söylenebilir.

Bilimin birikimli ilerlemesi sonucunda önceki çalışmalar daha sonra yapılacak çalışmalara yön vermektedir. Ayrıca bir alanla ilgili literatür incelemesi yapmak o alana ilişkin gelişmeler ve araştırma eğilimleri hakkında bilgi sağlamakta, daha sonra yapılacak çalışmalara zemin hazırlamaktadır.Bu çalışmanın amacı bağlam temelli öğrenme yaklaşımına ilişkin Türkiye'de yapılan tüm yüksek lisans ve doktora tezlerini tema ve metodoloji açısından değerlendirmektir. Araştırmanın yöntemi metodolojik değerlendirmedir. Çalışma grubunu 2008-2016 yılları arasında YÖK (Yüksek Öğretim Kurulu) Tez Merkezi'nde yayımlanan bağlam (yaşam) temelli öğrenme yaklaşımına ilişkin yapılmış 37 tez oluşturmaktadır. Çalışma grubundaki erişime açık tezler araştırmaya dahil edilmiştir. Veriler doküman analizi tekniğiyle elde edilmiştir. Elde edilen tezler araştırmacı tarafından geliştirilen Araştırma Değerlendirme Formu'nda yer alan maddelere göre analiz edilmiştir. Bu maddelerden bazıları; ders, konu, araştırma yaklaşımı, araştırma yöntemi, örneklem büyüklüğü, örnekleme tekniği, çalışma grubu ve veri çözümleme tekniğidir. Elde edilen bulgular için frekans, yüzde ve kategorik analizler yapılmıştır.

Keywords: Bağlam temelli öğrenme yaklaşımı, yaşam temelli öğrenme yaklaşımı, bilgi üretimi

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BAKIR İZABE CÜRUFUNDAN DEĞERLİ METALLERİN HİDROMETALURJİK OLARAK GERİ KAZANILMASI

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Bu çalışmada, bakır üretim tesisi flash fırın ve konverter fırını cürufundan bakırın seçimli ekstraksiyon şartları hidroklorikasit varlığında hidrojen peroksit liçi ile incelendi. Çeşitli liç parametrelerinin sonuç üzerindeki etkisi; liç sıcaklığı (25-65 °C), HCI konsantrasyonu (0.01-0.4 M), H_2O_2 konsantrasyonu (0-4 M), liç süresi (5-360 dk) ve sıvı-katı oranı (5-100 ml/gr) araştırıldı. Elde edilen sonuçlara göre liç işleminde optimum şartlar olarak 0,1 M HCI , 3 M H_2O_2, 45ºC liç sıcaklığı, 400 devir/dk karıştırma hızı, sıvı/katı oranı 25 ml/g ve 60 dakika liç süresi olarak belirlendi. Optimum şartlarda yapılan liç işleminde elde edilen bakır, çinko ve demir ekstraksiyonu sırası ile % 76, %21 ve %2,8 olarak saptandı.

Keywords: Hidrojen peroksit, Hidroklorik asit, Değerli metaller, Seçimli liç

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BAKIR ÜRETİM CÜRUF KARIŞIMININ AMONYUM HİDROKSİT VE PERKLORİK ASİT İLE LİÇİNİN İNCELENMESİ

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Özet: Bu çalışmada, Samsun Karadeniz Bakır İşletmelerin den temin edilen konverter fırın cürufu ve flash tipi bakır ergitme fırın cürufu karışımı amonyum hidroksit ve perklorik asit ortamında bakırın seçimli olarak ektraksiyonu liç çalışmaları ile incelendi. Deneylerde optimum şartların ortaya konulması için; NH_4OH konsantrasyonu (0-10 M), $HClO_4$ konsantrasyonu (1-4 M), liç sıcaklığı (25-65 °C), liç süresi (5-360 dk), katı/sıvı oranı (1/5-1/100 gr/ml), karıştırma hızı (200-1000 rpm) gibi etkin liç parametreleri çalışıldı. Yapılan deneyler sonucunda optimum şartlar; 5 M NH_4OH konsantrasyonu, 1 M $HClO_4$ konsantrasyonu, 65 °C liç sıcaklığı, 120 dk liç süresi, 1/25 gr/ml katı/sıvı oranı, 600 rpm karıştırma hızı olarak belirlendi. Optimum şartlarda Cu, Zn ekstraksiyonu sırasıyla % 72,5 ve % 13,5 olarak saptanmıştır. Cüruf fraksiyonunda oldukça fazla miktarda bulunan ve çözeltinin selektifliğini azaltan demirin ise ortam pH'ına bağlı olarak hidroksitleri formunda çöktüğü düşünülmektedir.

Keywords: Amonyum hidroksit, Perklorik asit, Değerli metaller, Seçimli liç.

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BİLGİSAYAR PROGRAMLAMA DİLLERİ: ÖĞRETME VE ÖĞRENME STRATEJİLERİ

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Özet : Programlama dili, programcının belirli bir düzende oluşturulmuş bir algoritmayı (İş Akışı) ifade etmek için kullanılan bir komut veya ifadeler topluluğudur. Programlama dilleri, bilgisayara hangi işlemleri yapacağını anlatmayı sağlayan komut veya fonksiyonlara sahiptir. Alt seviye, orta seviye ve yüksek seviye olmak üzere üçe ayrılırlar. Yüksek seviyeli programlama dilleri konuşma diline çok yakın komut veya fonksiyonlara sahiptir. Bu yüzden öğrenilmesi daha kolaydır. Örneğin C#.Net (C Sharp) veya Visual Basic.Net. Alt seviye diller bilgisayarın makine diline (İkili sayı sistemi) çok yakın dillerdir ve bu dillerde program yazmak oldukça zordur. Fakat çok hızlı çalışırlar. Ortaseviyeli diller hem alt seviye hem de yüksek seviye özelliğini taşırlar. Örneğin C++ Programlama dili
Bir dili öğrenmeye başlarken öncelikle niçin kod yazılması gerektiğinin belirlenmesi gereklidir. Daha sonra geliştirilecek uygulamanın algoritması ya kâğıt üstünde veya zihinde netleşmesi gerekir. Sonraki adımda ise hangi programlama dili seçilecek buna karar verilir. Genel amaçlı bir uygulama geliştirmek için yüksek seviyeli bir dil olan C# seçilebilir. Küçük uygulamaları geliştirerek işe başlanması iyi olacaktır. Kod yazımı sırasında hatalar meydana gelebilir. Fakat sabırlı bir şekilde hataların çözülmesi gereklidir. Eğitim videolarını takip ederek öğrenmeye devam edilebilir. Mümkünse seçilen programlama dili ile ilgili kurslar alınmalıdır. Bu konuda yönlendirici olacak bir eğitmen edinilmesi çok önemlidir. Başkalarının yazdığı örnek kodların incelenmesi, dil öğrenimini oldukça etkileyecektir. Yeni bir şeyleri geliştirebilmenin hazzını programlama dilleri öğrenerek kolayca elde edilebileceği unutulmamalıdır.

Anahtar Kelimeler: Programlama Dilleri, Makine Dilleri, Algoritma, C#.Net, Visual Basic.Net, C++ Programlama Dili

GİRİŞ

Gittikçe sanallaşan ve dijital hale dönüşen bir dünyaya doğru hızla gidiyoruz. Bilgisayarlar ve dolayısıyla bilgisayar yazılımları günlük yaşantımızın her anında karşımıza çıkmakta. Firmalar, ürünlerine erişim hizmetlerinin kalitesini arttırmak için geliştirmiş oldukları yazılımların reklamlarını duyurarak daha geniş kitlelere ulaşmak arayışındalar. İnternet'in hayatın her noktasına girmesi sonucunda hizmetlere hem Web hem de Mobil ortamlardan erişim vazgeçilmez hizmetlerin başında gelmektedir. Bahsedilen bu tür işlerin tamamı yazılımlarla yapılmaktadır. Yazılımları geliştirildiği ortam, programcıların kullandığı bilgisayar programlama dilleri adı verilen kendisi de bir yazılım grubudur. Ticari anlamda yazılımın gücünü, dünyada en çok kullanılan işletim

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sistemi (Operating Systems) ve çeşitli yazılımların geliştiricisi olan Microsoft'un kurucusu ve sahibi Bill Gates'in kişisel servetinin 87.4 milyar dolar olması durumu yeteri kadar açıklamaktadır.
Bu makalede bilgisayar programlama dillerinin önemine vurgu yapılarak tanımı yapılacak ve bir dili öğrenme noktasındaki incelikleri tartışılacaktır.

PROGRAMLAMA DİLLERİ

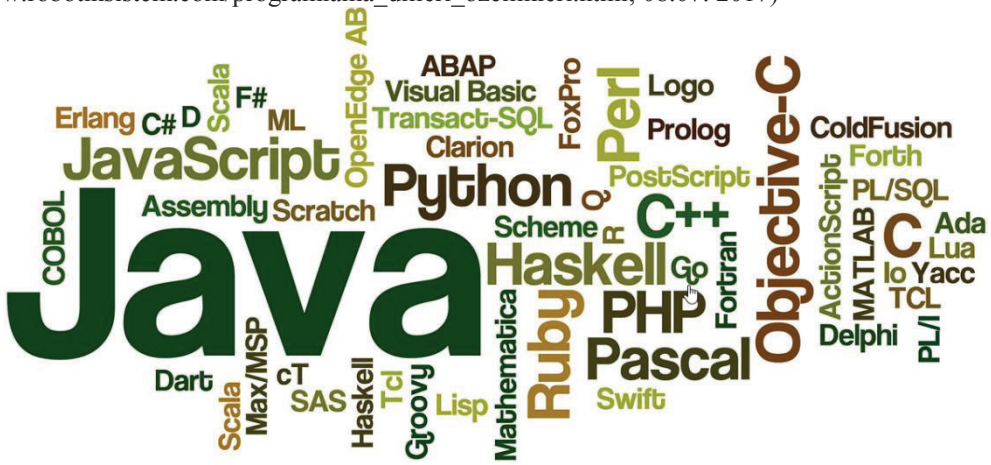
Programlama dili, programcının belli bir algoritmayı ifade etmek için kullandığı standartlaşmış bir yazım şeklidir. Bir programcı komutları yazmak için farklı programlama dilleri kullanabilir. Programlama dilleri, programcının bilgisayara hangi veri üzerinde işlem yapacağını, verinin nasıl depolanıp iletileceğini, hangi koşullarda hangi işlemlerin yapılacağını tam olarak anlatmasını sağlar. Şu ana kadar 2500'den fazla programlama dili yapılmıştır.
Programlama dilleri insanların algı seviyesine yakın durumuna göre 3 gruba ayrılır.

Alt seviye programlama dilleri: Makine koduna oldukça yakın programlama dilleridir. Makineye yani donanıma hâkimiyeti yüksektir. Bu programlama dillerini bilen kişilerin mikro işlemciler hakkında bilgi sahibi olması gereklidir.(Makine dili, Assembly programlama dili). Alt seviye programlama dilleri ile program yazmak insan algı seviyesine uzak olduğu için biraz daha zordur.

Orta seviye programlama dilleri: Oldukça esnek olan bu diller hem üst hem alt seviye programlama yapabilirler. Alt seviye dillere oranla biraz daha anlaşılır haldedirler. İki seviye ile iletişimde bulunması, tercih sebebini arttırır. Daha kolay kod yazma imkânı doğurur. Deyimleri günlük hayattaki kelimelere yakındır. (C programlama dili, C++ programlama dili)

Yüksek seviye programlama dilleri: Olay tabanlı programlama dilleri olarak da adlandırılırlar yalnız bu programlama dilleri sadece belirli fonksiyonlar etrafında çalışırlar ve programlama hâkimiyetini azaltırlar. En hızlı ve en etkili programlama dilleri bu kategoridedir. (Visual Basic.Net, C#.Net, Pascal, Delphi) Diğer programlama dillerine kıyasla daha kolay öğrenildiği ve uygulandığı için yeni başlayanlara en uygun diller üst seviye programlama dilleridir (http://www.robotiksistem.com/programlama_dilleri_ozellikleri.html, 24.08.2017).

Yüksek seviyeli programlama dillerinde yazılan programın çalışabilmesi için makine diline çevrilmesi gerekir. Bunun için program hangi yüksek seviyeli dil ile yazıldıysa o dilin derleyicisi kullanılır. Böylece yüksek seviyeli programlama dili ile yazılmış olan kaynak program, makine dilindeki amaç programa dönüştürülür. Kaynak programın içeriğinin değiştirilmesi mümkündür, ancak derlenmiş olan amaç programın içeriğine müdahale etme imkânı yoktur. Ters mühendislik metotları ile derlenmiş uygulamaların bir kısmı geri döndürülebilir (http://www.robotiksistem.com/programlama_dilleri_ozellikleri.html, 08.07. 2017)



Şekil 1: Dünden bugüne kadar gelmiş birçok programlama dilleri

Aşağıdaki şekilde bir Microsoft Windows işletim sisteminde kendi başına çalışabilen makine diline dönüşmüş bir uygulamanın derleme ve bağlama aşamaları gösterilmektedir.

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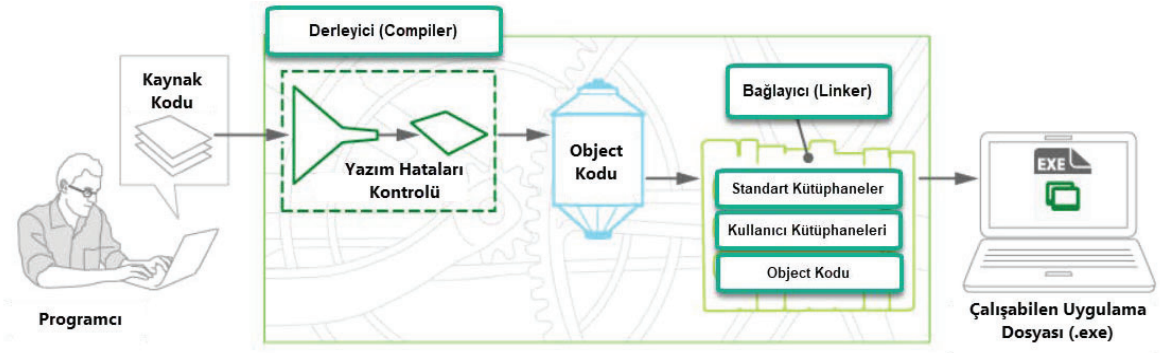

Şekil 2: Microsoft Windows işletim sisteminde kendi başına çalışabilen bir uygulamanın oluşturulma evresi

Assembly Programlama Dili

Assembly programlama dilini 3 kelime ile tanımlayacak olursak, güçlü, hızlı ve küçük kelimelerini olarak seçilebilir. Bu demek oluyor ki aynı programı Assembly dili ile ve C++ programlama dili ile yaparsak, iki programın boyutlarına baktığımızda Assembly ile yazılan daha kısa olduğunu görürüz, aynı zamanda mikroişlemciyi ve hafızayı daha verimli kullandığı için Assembly dilinde yazılan program diğerlerine nazaran daha güçlü olacaktır, son olarak Assembly dilinde yazılan program diğerine oranla çok daha hızlı çalışır.

Son zamanlarda mikroişlemcilerin hızları GHz'ler (Giga Hertz) mertebesine çıktığından Assembly dilinin en büyük özelliği olan hızlılığı artık pek popüler değildir. Kullanıcıya, 2GHz hızındaki bir CPU da hemen hemen her uygulama aynı hızda çalışıyor gibi görünür. Buna rağmen C gibi yüksek düzey programlama dilleri ile hazırlanan büyük projelerde işlemciyi çok fazla meşgul edecek olan kod bölümleri Assembly rutinleri çağrılarak yapılmaktadır.(http://www.csharpnedir.com/articles/read/?id=436, 24.08.2017).
Assembly programlama dili genellikle şu amaçlar için kullanılmaktadır.

- Bilgisayar donanımına kolay ve hızlı erişmek için
- Aygıt sürücüleri (Device Driver) yazmak için
- Yongalara (Chip) program yüklemek için (PIC, Microcontroller gibi...)
- İşletim sistemlerinin yapımında (OS)
- Şifre kırma ve Hacking işlemleri için
- Virüs programları yazmak için

```
Title Yazi Programi
dosseg
.model small
.stack 100h
.data
my_message db 'Selam!',0dh,0ah, '$'
.code
main proc
          mov ax,@data
          mov ds,ax
          mov ah,9
          mov dx,offset my_message
          int 21h
          mov ax,4C00h
          int 21h
main endp
end main
```

Şekil 3: Ekrana bir yazı yazan Assembly kod örneği

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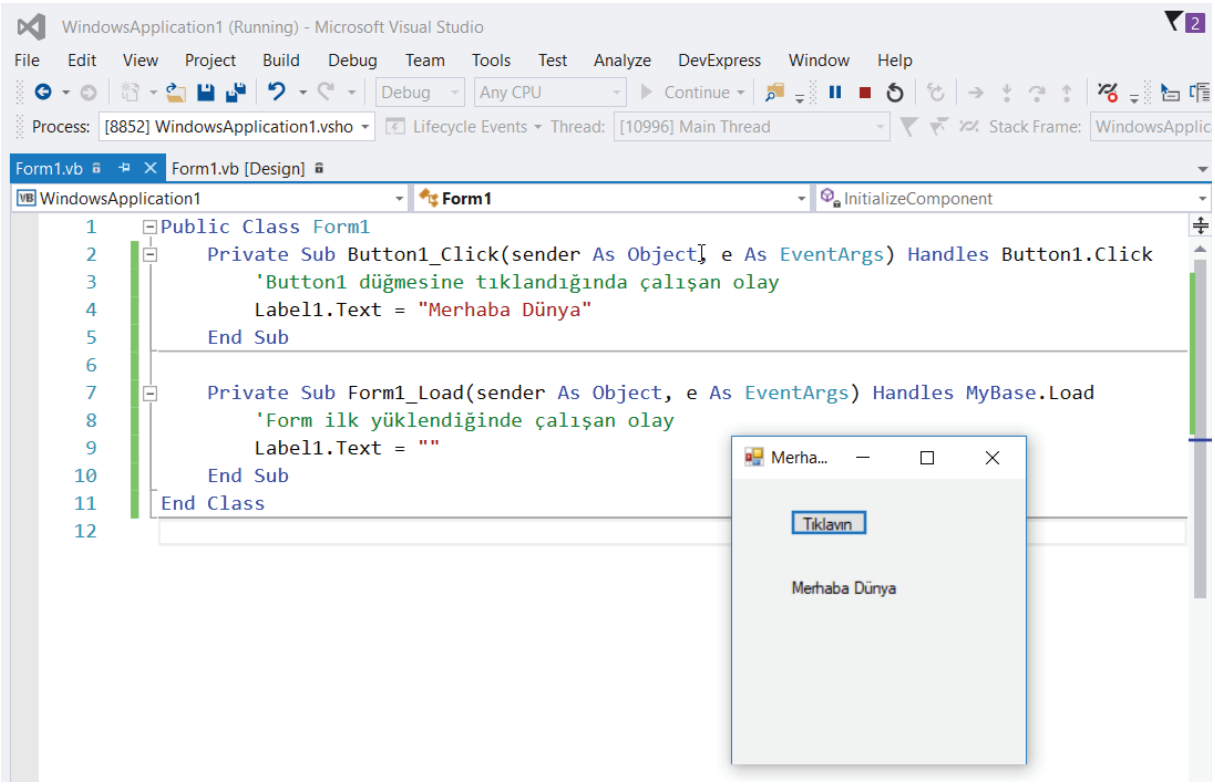
Visual Basic.Net Programlama Dili

Görsel programlama dillerinden biti olan Visual Basic 'in en son sürümüdür. Görsel programlama dilleri, programcıya büyük kolaylıklar sağlamıştır. Bu özelliğe ilave olarak Microsoft'un ortak çalışma çatısı olan Net Framework'a üye olması sayesinde Net kütüphanesinin tüm imkânlarından faydalanmıştır (https://www.visualstudio.com/tr/, Erişim Tarihi 07.08.2017). Kütüphaneler, içerisinde birçok fonksiyonu barındıran yapılardır. Halen API olarak ta anılırlar (Application Program Interface). Programlama dili dünyasına 1980'li yıllarda adım atanlar genelde Basic (Beginners All Purpose Instruction Code) veya GWBasic programlama dili ile tanışmışlardır. (http://kisi.deu.edu.tr//levent.senyay/bilgisayarprogramlama/5_%20BASIC%20Programlama.pdf, 24.08.2017). VB.NET ise bu alışkanlığı güçlü kütüphaneleri ile devam ettirmiştir.

VB.NET ile program geliştirmek için iyi bir geliştirme ortamı olan Visual Studio'nun ücretsiz sürümünü yani Community sürümünü indirebilirsiniz (https://www.visualstudio.com/tr/, 07. 08. 2017).



Şekil 4: Visual Studio geliştirme ortamında VB.NET ile yazılmış örnek kod.

C Sharp (C#) Programlama Dili

C# (si şarp diye okunur) Microsoft tarafından geliştirilmiş olan bir programlama dilidir. C++ ve Java dillerine oldukça benzer, ancak C#'ın bu dillere benzerliği yanında farkları da vardır. Örneğin C#, C++'dan farklı olarak % 100 nesne yönelim tekniğine sahiptir. Java'dan farklı olarak ise C#'ta gösterici (pointer) kullanılabilir. Böylelikle eski yazılım bileşenleriyle uyumlu bir şekilde çalışılabilir (https://tr.wikibooks.org/wiki/C_Sharp_Programlama_Dili, 18. 07. 2017).

C#' Programlama dili ile şunları yapabilirsiniz:

- Konsol uygulaması geliştirme
- Windows uygulaması geliştirme
- ASP.NET uygulaması geliştirme
- Web servisleri yazma
- Mobil uygulama geliştirme (PDA, cep telefonları vb. için)
- DLL yazma

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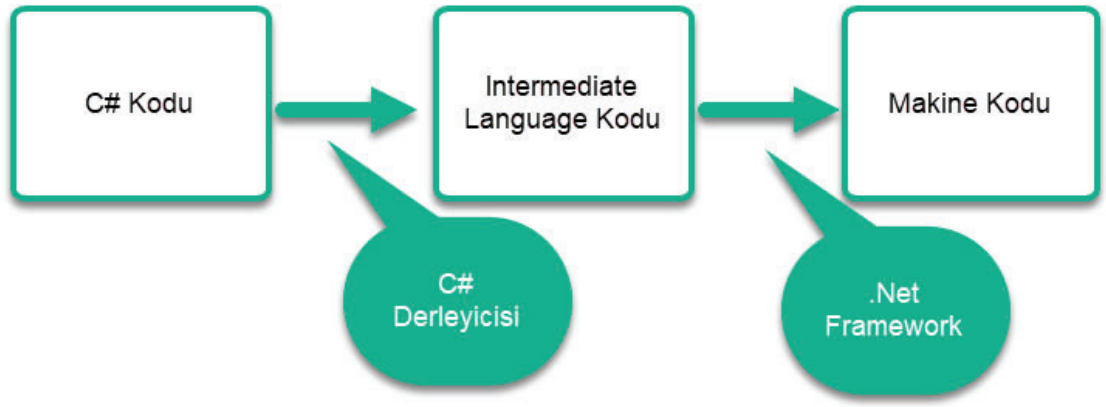
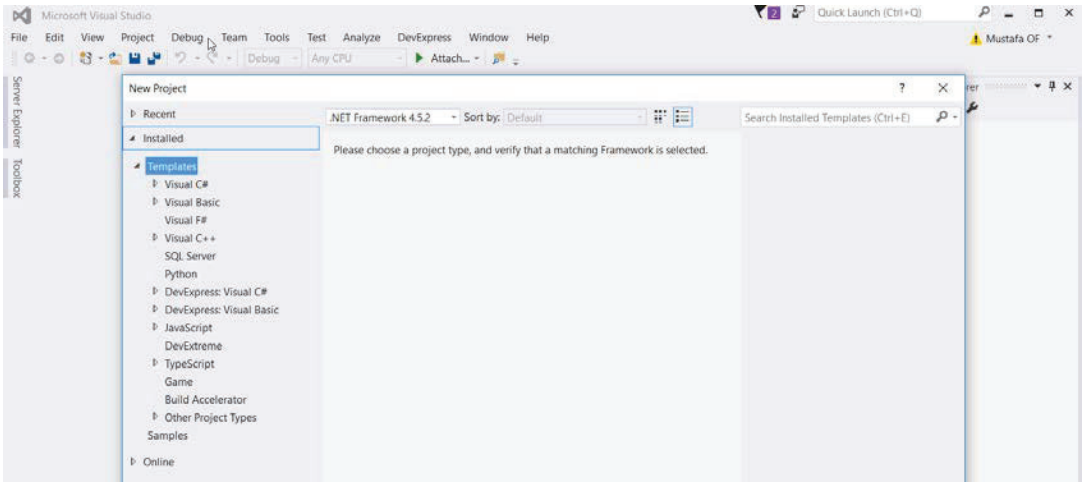
C# kodları, C++ veya Visual Basic'ten farklı olarak direkt makine koduna derlenmez. Önce IL dediğimiz bir ara koda derlenir. Bu derlenen ilk kodun dosyasına Assembly denir ve uzantısı exe'dir. Bu dosya çalıştırılmak istendiğinde ise Net Framework devreye girer ve IL (Intermediate Language) kodu makine koduna dönüştürür, böylelikle artık kodu bilgisayar anlayabilir. İşte bu yüzden de yazdığımız programın bir bilgisayarda çalışması için o bilgisayarda Net Framework programının kurulu olması gerekir, çünkü Net Framework IL kodu bilgisayarın anlayabileceği koda çevirir. .Net Framework, oluşturduğu makine kodlarını geçici bir süreliğine belleğe koyar, eğer aynı kodlar tekrar çalıştırılmak istenirse tekrar IL koddan makine koduna dönüşüm yapmak yerine bu belleğe kaydettiği makine kodlarını kullanır. Bu yüzden oluşturduğumuz programımızı ilk çalıştırdığımız zaman programımız biraz yavaş çalışabilir, ancak daha sonraki çalışmalarda oldukça hızlanacaktır. (Algan, 2007)



Şekil 5: C# kodunun makine koduna dönüştürülmesi

Program Geliştirmeye Nereden Başlanmalı

Analitik düşünme yeteneği olan herkes bir programcı adayıdır. İşe öncelikle programlama dili seçimi ile başlanmalıdır. Yüksek seviyeli dillerden VB.NET veya C#.NET biri seçilerek işe başlanabilir. Öncelikle iyi bir Programlama dili IDE (Integrated Development Environment) ortamı yani geliştirme ortamı edinerek başlanabilir. Visual Studio bu anlamda iyi bir seçim olacaktır (https://www.visualstudio.com/tr, 07. 08. 2 017). Ücretsiz sürümü olan Visual Studio Community, internetten rahatlıkla indirilebilir. Bu ortam sayesinde hem masaüstü, web ve bazı ilavelerle mobil uygulama geliştirilebilir.



Şekil 6: Visual Studio Community 2015 yeni proje geliştirme ekranı

Program Yazarken Nelere Dikkat Edilmeli

Bir programlama dilini kullanarak uygulama geliştirirken aşağıdaki kurallara dikkat edilmesi işlemlerin düzgün ilerlemesi açısından önemlidir (Of, 2006).

- IDE (Inegrated Development Environment) adı verilen uygulama geliştirme ortamları kullanılmalı. Birçok özelliği öğrenilmeli. Örneğin Visual Studio, çok güçlü bir uygulama geliştirme ortamıdır.

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- Değişken, metot vb. yapıların isimlendirmelerinde genel kurallara uyulmalı. İngiliz alfabesinin dışında bir karakter kullanılmamalı, noktalama işaretleri kullanılmamalı, boşluk karakteri kullanılmamalı. Sayı ile başlamamalı. Çok uzun ve çok kısa olmamalı. Niçin kullanıldığını belirten bir isim olmalı. Örnek: birimfiyati, hizsabiti

- Kodların başlangıç ve bitiş blokları, birbiri ile uyumlu olmalı. Dikey olarak aynı hizada olmalarına özen gösterilmeli. Açıklama satırları ile başlangıç ve bitiş blokları birbirleri ile bağlanmalı.

Örnek C# :

```
ab = 5;
while(ab<10)
        {
                ab++;
                Console.WriteLine("Sayaç :" + ab + "\n");
        }//while bitişi
```

- Yazılan birçok kodun başlangıcı ve sonuna yorum yani derlemeye tabi olmayan açıklama satırları konulmalı. Bu açıklamalar daha sonra kodlar değişirken çok işe yarayacaktır.

Örnek C# : tutar = adet * birimfiyat; //Tutar, ürün adeti ile birim fiyatının çarpımına eşittir.

- Dikey olarak bakıldığında içe doğru ve dışa doğru girintiler kullanılmalı. Bu sayede bir kod bloğunun nerede başlayıp nerede bittiğini görmüş oluruz.

Örnek C# :

```
for(int i=0; i<5; i<5)
        {
                Console.WriteLine(i);
                Console.WriteLine("\n");
        }
```

- Değişken tipleri seçiminde uygun aralıklara uyulmalı. Örneğin müşterinin yaş bilgisini tutmak için bir değişken tipi seçerken bir insan yaşının alabileceği bir sayısal aralıkta değişken tipi seçilmeli.

Örnek C# :

int musteriyasi=45;//Burada int tipi -2147483648 – 2147483647 aralığında bir sayı alabilir. Yaş için çok büyük. Bunun yerine

sbyte musteriyasi = 45; //sbyte tipi -128 ile 127 arasında bir değer alabilir.

- Büyük ölçekli projeler geliştirildiğinde ve bir kod bloğunun birden fazla yerde kullanılması gerektiğinde mutlaka NYP (Nesne Yönelimli Programlama) teknikleri kullanılmalı. Bu sayede kod satırları daha da azalacak ve bakım işlemleri çok daha kolaylaşacaktır.

Örnek C# :

```
public class Selam{
        public void SelamVer(string kime)
        {
                Console.WriteLine("Merhaba" + kime);
```

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```
        }
}
```

Class ve metodun kullanımı

```
Selam selam1=new Selam();
```

Selam1.SelamVer(“Mustafa”);//Konsol ekranına “Merhaba Mustafa” yazacaktır.

Selam1.SelamVer(“Ahmet Eren”);//Konsol ekranına “Merhaba Ahmet Eren” yazacaktır.

- Hata yakalama deyimleri kullanılarak çalışma zamanı hataları (Run Time Errors) kontrol altına alınmalı. Örneğin C# programlama dilinde try-catch blokları kullanılarak hata kontrol altına alınabilir.

C# Kodu

```
try     {
                //Hata oluşturabilecek kod veya kodlar
        }
catch   {
                //Hata oluştuğunda çalıştırılacak kodlar
        }
```

- Uygulamanın çalışabildiği donanım sayısı arttı. Şimdilerde İnternet ortamında ve Mobil ortamda çalışmasını istediğimiz birçok yazılım bulunmakta. Bu yüzden uygulamaların taşınabilir olma durumuna göre yazılım geliştirme yapılmalıdır.

SONUÇ

Program geliştirmek sanıldığı kadar zor bir olay değildir. Analiz yeteneği olan ve bilgisayar dünyasına yabancı olmayan herkes bir uygulama geliştirebilir. Bir şeyi geliştirmenin vermiş olduğu haz duygusunu yaşayabilir. Yüksek seviyeli programlama dilleri ile işe başlama çok daha mantıklı olacaktır. İyi bir geliştirme ortamını (IDE) kullanarak bir uygulama (Application) ortaya çıkarma işleminin basit bir operasyon olduğu söylenebilir. Günümüz dünyasında programcı ihtiyacı gün geçtikçe artmaktadır. Programcılık, gelir getirisi yüksek olan bir meslek haline gelmiş ve her alanda kullanılabilirliği ve uygulanılabilirliği hızlı bir şekilde yaygınlaşmaya devam etmektedir.

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BREAST CANCER CLASSIFICATION USING K-NEAREST NEIGHBORS ALGORITHM

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Abstract: Breast cancer is a very common disease around the world and the second leading cause of cancer death in women. Expert systems are developed using data mining methods in order for disease diagnosis and significant tools for assisting medical doctors in their clinical decision. In this study, *k*-Nearest Neighbors algorithm (*k*-NN) was used in order to classify breast cancer disease. Besides, *k*-NN was implemented for different *k* values and the obtained classification accuracies were compared with each other. According to the study results, it was seen that breast cancer disease was successfully classified using *k*-NN.

Keywords: Breast Cancer, Classification, Data Mining, Expert Systems, *k*-Nearest Neighbors Algorithm

Introduction

According to the recent studies, breast cancer is the most common cancer in young women (Jelen et al., 2016). Among all cancers, it causes the second highest number of deaths around the world (Mittal et al., 2017; DeSantis et al., 2014; Misek and Kim, 2011). Nearly 1.7 million women suffer from breast cancer every year (Tang et al., 2016). In 2012, breast cancer was the reason for 18.3% of all cancer cases in Egypt (Abdel-Zaher and Eldeib, 2016; Salama et al., 2012). In 2015, approximately 481 women were diagnosed with breast cancer every week in Canada according to the statistics of the Breast Cancer Society of Canada (2015).

Disease diagnosis is a very sophisticated process in medicine. In order to diagnose a disease accurately, several tests are required. Computer-aided diagnostic tools, expert systems, assist physicians to make primary decision for early diagnosis. Thanks to early detection of a disease, treatment process can be minimized and patients' lives may be saved. Especially in breast cancer, medical doctors desire to know the condition of the patient early who has benign or malignant case. Computer-aided diagnostic tools classify benign or malignant cases successfully in order for detection of breast cancer disease (Jelen et al., 2016). In this study, *k*-Nearest Neighbors algorithm (*k*-NN) is utilized to classify breast cancer disease as benign or malignant.

The rest of the paper is organized as follows. Materials and Methods Section introduces the classification of breast cancer disease using *k*-NN and the dataset used. In Results and Discussion Section, the experiments including classification accuracies and error values of the methods used in this study are demonstrated. Finally, conclusions being under study are summarized in Conclusion Section.

Materials and Methods

In this section, the dataset of breast cancer diagnosis used in this study is described. Then, the algorithm used for classification of breast cancer disease is explained.

Dataset Description

In order to classify breast cancer disease, Wisconsin Breast Cancer Database was used. The dataset was created by Dr. William H. Wolberg from the University of Wisconsin (Wolberg, 1991). It is available online in Machine Learning Repository at the University of California - Irvine (Lichman, 2013). The dataset contains 699 instances. There are 11 attributes which are sample code number, clump thickness, uniformity of cell size, uniformity of cell shape, marginal adhesion, single epithelial cell size, bare nuclei, bland chromatin, normal nucleoli, mitoses and class (benign or malignant). 458 (65.5%) instances are benign and 241 (34.5%) instances are malignant. There are

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16 instances containing a single missing attribute value. The description of the attributes is shown in Table 1.

Table 1. Attributes of the Wisconsin Breast Cancer Database.

Attribute #	Attribute name	Domain	Mean	Standard deviation
1	Sample code number	Id number	-	-
2	Clump thickness	1 - 10	4.418	2.816
3	Uniformity of cell size	1 - 10	3.134	3.051
4	Uniformity of cell shape	1 - 10	3.207	2.972
5	Marginal adhesion	1 - 10	2.807	2.855
6	Single epithelial cell size	1 - 10	3.216	2.214
7	Bare nuclei	1 - 10	3.545	3.644
8	Bland chromatin	1 - 10	3.438	2.438
9	Normal nucleoli	1 - 10	2.867	3.054
10	Mitoses	1 - 10	1.589	1.715
11	Class	2 for benign 4 for malignant	-	-

Classification with *k*-Nearest Neighbors Algorithm

k-NN is a widely used pattern classification technique because of its simplicity and efficiency (Eyupoglu, 2016; Zhang et al., 2012; Wang et al., 2007). Furthermore, *k*-NN, a versatile multivariate statistical method, utilizes standard Euclidean distance and evaluates the distinguishing features. It makes no assumption with regard to the statistical structure of the data (Niwas et al., 2013; Shakhnarovish et al., 2005).

k-NN estimates class attribute depending the *k* nearest training examples in the feature space. When a dataset is given, it chooses the *k* nearest samples from the classified training data and determines the class considering the most representative samples. Euclidean distance similarity metric is used to select the neighborhoods and calculated using Eq. (1) as follows (Shen et al., 2016):

$$\text{Euclidean distance} = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2} \tag{1}$$

where x_i and y_i are two points in Euclidean n-space. After all test samples are classified by *k*-NN, the classification accuracy is calculated with dividing the number of correctly classified samples by the total number of samples. Mean absolute error (MAE) is calculated according to the following Eq. (2) as follows (Willmott and Matsuura, 2005):

$$\text{MAE} = \frac{1}{n} \sum_{i=1}^{n} |y_i - x_i| \tag{2}$$

where y_i is the prediction value and x_i is the real value. Root mean square error (RMSE) is calculated using Eq. (3) as follows (Willmott and Matsuura, 2005):

$$\text{RMSE} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} |y_i - x_i|^2} \tag{3}$$

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Results and Discussion

In this paper, *k*-NN was used to classify breast cancer disease and implemented for different k-fold cross-validation and *k* values. Then, the obtained classification accuracies were compared with each other. The application used for classification was implemented using Weka 3.8 software. Weka (Waikato Environment for Knowledge Analysis) was developed by Machine Learning Group at the University of Waikato in New Zealand. It is a collection of machine learning algorithms and data preprocessing tools for data mining tasks (Witten et al., 2011). The tests were performed for 2-fold, 5-fold and 10-fold cross-validation and *k* values were ranging from 1 to 20. The classification accuracies of *k*-NN for different k-fold cross-validation and *k* values were presented in Table 2.

Table 2. Classification accuracies of *k*-NN for different k-fold cross-validation and *k* values.

k	2-fold cross validation	5-fold cross validation	10-fold cross validation
	Classification accuracy (%)	Classification accuracy (%)	Classification accuracy (%)
1	95.8512	95.4220	95.1359
2	94.5637	94.5637	94.4206
3	96.8526	96.7096	96.8526
4	95.9943	96.4235	96.7096
5	96.1373	96.5665	96.9957
6	96.1373	96.2804	96.7096
7	96.4235	96.2804	96.7096
8	96.2804	96.1373	96.1373
9	96.4235	96.2804	96.2804
10	96.2804	95.9943	96.4235
11	96.1373	96.2804	96.2804
12	96.1373	96.1373	96.2804
13	96.1373	96.2804	96.1373
14	96.1373	96.2804	96.1373
15	96.1373	96.4235	96.4235
16	95.9943	96.4235	96.7096
17	96.1373	96.4235	96.5665
18	95.9943	96.4235	96.4235
19	96.1373	96.4235	96.5665
20	95.8512	96.4235	96.4235

As seen from Table 2, the classification accuracies of *k*-NN range from 94.4206% to 96.9957%. For 2-fold, 5-fold and 10-fold cross validation techniques, the classification accuracies vary between 94.5637% - 96.8526%,

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94.5637% - 96.7096% and 94.4206% - 96.9957%, respectively. The best classification accuracies of 2-fold, 5-fold and 10-fold cross validation techniques are obtained for k=3, k=3 and k=5, and these rates are 96.8526%, 96.7096% and 96.9957%, respectively. As a result, the classification accuracy of nearly 97% was achieved using k-NN. Moreover, the error values of k-NN for different k-fold cross-validation and k values were shown in Table 3.

Table 3. Error values of k-NN for different k-fold cross-validation and k values.

k	2-fold cross validation		5-fold cross validation		10-fold cross validation	
	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.0441	0.2031	0.0474	0.2136	0.0501	0.2202
2	0.0435	0.1722	0.0452	0.1813	0.0444	0.1763
3	0.0447	0.1634	0.0463	0.1719	0.0444	0.1672
4	0.0493	0.1648	0.0469	0.1659	0.0454	0.1659
5	0.0523	0.1703	0.0467	0.1594	0.0458	0.1596
6	0.0522	0.1681	0.0480	0.1600	0.0460	0.1559
7	0.0525	0.1668	0.0491	0.1605	0.0472	0.1566
8	0.0541	0.1692	0.0506	0.1630	0.0481	0.1584
9	0.0535	0.1675	0.0514	0.1630	0.0491	0.1595
10	0.0536	0.1684	0.0526	0.1660	0.0503	0.1585
11	0.0545	0.1692	0.0532	0.1665	0.0508	0.1603
12	0.0551	0.1713	0.0540	0.1653	0.0510	0.1612
13	0.0554	0.1715	0.0542	0.1648	0.0522	0.1629
14	0.0557	0.1719	0.0539	0.1641	0.0526	0.1622
15	0.0556	0.1723	0.0543	0.1650	0.0526	0.1617
16	0.0552	0.1719	0.0545	0.1657	0.0524	0.1617
17	0.0559	0.1734	0.0553	0.1672	0.0530	0.1628
18	0.0565	0.1748	0.0549	0.1670	0.0531	0.1625
19	0.0568	0.1756	0.0554	0.1672	0.0537	0.1643
20	0.0563	0.1754	0.0555	0.1678	0.0541	0.1653

According to Table 3, MAE and RMSE values range between 0.0435 - 0.0568 and 0.1559 - 0.2202. For 2-fold, 5-fold and 10-fold cross validation techniques, MAE and RMSE values vary between 0.0435 - 0.0568, 0.0452 - 0.0555 and 0.0444 - 0.0541; 0.1634 - 0.2031, 0.1594 - 0.2136 and 0.1559 - 0.2202, respectively. The minimum MAE values of 2-fold, 5-fold and 10-fold cross validation techniques are obtained for k=2. For RMSE, the minimum values are attained for k=3, k=5 and k=6, respectively. Consequently, the error values of 0.0435 and 0.1559 for MAE and RMSE were procured by k-NN. The change of error values with the increase of k values can be easily observed from Figure 1.

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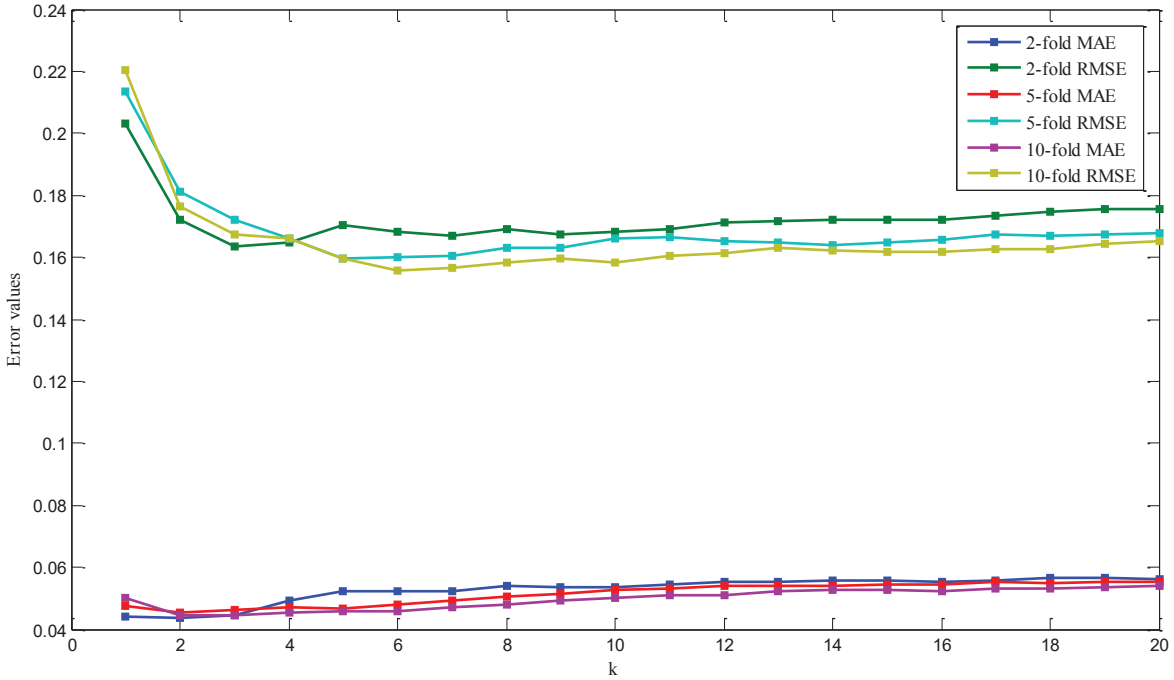

Figure 1. Change of error values with the increase of *k* values.

Conclusion

In this paper, in order to classify breast cancer disease as benign or malignant, *k*-NN was utilized. It was implemented for 2-fold, 5-fold and 10-fold cross validation and different *k* values. The classification accuracies and error values were attained to assess the success of *k*-NN. According to the test results, the achieved classification accuracy of *k*-NN is approximately 97%. Besides, the study results show that *k*-NN is an effective classifier in order for classifying breast cancer disease.

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CaO, MgO, SiO_2 ve Al_2O_3 (CMAS) SERAMİK SİSTEMİNE STRONSİYUM ZİRKONAT ($SrZrO_3$) KATKISININ ETKİSİ

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Özet: CMAS seramikleri tıpta biyomalzeme olarak, yüksek korozyon ve aşınma dayanımı nedeniyle dış ve iç cephe yüzey kaplaması olarak, katı yakıt hücreleri, kimya endüstrisinde pompa, boru vb. uygulamalarda, hava ve uzay sanayinde kullanılabilmektedir. Mevcut çalışma kapsamında CMAS-A, CMAS-A_1 ve CMAS-A_2 kodlu seramiklerin üretimi için belirlenen hammaddeler (olivin, kuvars, mermer tozu, alümina ve $SrZrO_3$) tartıldıktan sonra homojen bir karışım sağlamak amacı ile bilyalı değirmende yaş olarak 250 dev/dk hızda 24 saat süreyle karıştırılmıştır. Hazırlanan karışımlar etüvde 24 saat süreyle kurutulduktan sonra havanda öğütülerek toz haline getirilmiştir. Hazırlanan tozlar paslanmaz çelik kalıp kullanılarak hidrolik pres yardımı ile 4 ton basınç uygulanarak şekillendirilmiş ve sonrasında tabletler halindeki numuneler 1100˚C, 1150˚C, 1200˚C ve 1250˚C sıcaklıklarında 1, 3 ve 5 saat sürelerde sinterleme işlemine tabi tutularak CMAS esaslı seramikler elde edilmiştir. Hazırlanan numunelerin XRD ile faz yapısı ve SEM-EDS analizleri ile elde edilen CMAS seramiklerin mikroyapısı detaylandırılmıştır. CMAS-A, CMAS-A_1 ve CMAS-A_2 kodlu üretilen numunelerin ayrıca Arşimet prensibi ile yoğunlukları ölçülmüş, mikrosertlik değerleri tespit edilmiştir.

Anahtar Kelimeler: CMAS Seramik, $SrZrO_3$, diyopsit

Abstract: Glass-ceramics is one of the most promising systems due to its excellent mechanical properties, high abrasive resistance and adequate chemical resistance. In recent years, glass-ceramics have been used as a sealant for solid oxide fuel cells, biomedicine materials, optical and building materials.. In the present study, the raw materials (olivine, quartz, marble dust, alumina and $SrZrO_3$) determined for the production of CMAS-A, CMAS-A1 and CMAS-A2 coded ceramics were weighed for th eproduction of CMAS based ceramic sand then mixed for 24 hours in aqueous environment. The prepared mixtures were dried for 24 hours. The prepared powders were press edunder 4 ton pressure and the shaped powders are sintered at temperatures between 1100˚C-1150˚C-1200˚C and 1250˚C. Sintering times are 1, 3 and 5 hours. The resulting product was characterized using SEM-EDS, DTA, density, microhardness test and XRD techniques.

Keywords: CMAS Ceramics, $ZrSrO_3$, Diopside

Giriş

Olivin, camsı özelliklere sahip oldukça sert bir mineral olup; olivinin sertliği, ufalanabilme ve öğütülebilme özelliklerine etki etmektedir. Olivin genel bir terim olarak Fosterit (Mg_2SiO_4) ve Fayalit (Fe_2SiO_4)'in katı çözelti karışımlarını içeren orta silikat grubu bir mineral olmakla beraber; %85 fosterit içeren mineralleri tanımlamak için kullanılır. Olivinlerin belirgin köşeli yapıya sahip olması olivine aşındırıcı özellik kazandırmıştır. pH derecesi 8,9-9,5 arasında değişen olivin bazik cüruflara karşı çok mukavemetli olmasına karşın, asit cüruflarına karşı çok fazla mukavemet gösterememektedir. Olivinin kuvarstan daha ağır olması olivin için dezavantajdır. Çünkü bu durum eşit hacim için daha fazla kütle gereksinimi gerektirir (Kanarya, 2010). Olivin en fazla demir-çelik sanayinde eritici, cüruf düzenleyici ve sinterleşme derecesini düşüren bir hammadde olarak, refrakter sanayinde forsterit tuğla, ateş tuğlası ve çeşitli refrakter yapı ve malzemelerin üretiminde, ısı ve ses yalıtımı sağlamak amacı ile kaya yünü olarak ve ayrıca özel boya ve beton üretiminde kullanılmaktadır (Özkarakaşoğlu, 2006).

Daha önceki yıllarda dörtlü CaO-MgO-Al_2O_3-SiO_2 (CMAS) cam-seramik malzemeleri üzerine birçok araştırma yapılmış olup; Ana kristal faz olarak diopsit içeren malzemeler üzerine yoğunlaşılmıştır. CMAS cam-seramiklerde diopsit ana kristal fazı olarak genellikle yüksek mukavemete sahiptirler ve geniş bir uygulama yelpazesine sahiptir.

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Yapılan araştırmalara göre, cam seramikler yakıt hücresi uygulamaları için sızdırmazlık elemanı olarak, yer karosu sırları, yapay kemikler, diş köklerinde kullanılabilir CMAS cam seramikleri, ana camdan neredeyse tamamen devitrifikasyon ile elde edilen mikrokristalin malzemelerdir. Camlar, termik santral uçucu külleri, belediye katı atıkların yakılması sonucu oluşan uçucu kül ve cam kırıntısı gibi atık maddelerden geleneksel eritme yöntemiyle üretilebilir. Lityum porselen kil atıkları da CMAS cam seramiğinin hazırlanmasında kullanılabilir (Zheng 2015).

CaO-MgO-Al_2O_3-SiO_2 (CMAS) sistemi temel silikat esaslı seramik/cam malzeme gruplarından birisi olup; amorf yapıdaki camların kontrollü kristalizasyonu ile elde edilmektedir. CMAS esaslı malzemeler; yüksek refrakterlik, yüksek korozyon direnci, yüksek mekanik (sertlik, aşınma) özelliklerinden dolayı endüstrinin birçok alanında yaygın olarak kullanılmaktadır ve bu sistemdeki bazı camlar nükleer atıkların depolanması gibi özel uygulamalara da sahiptir. CMAS esaslı seramikler farklı hammadde kaynaklarından (kalsit, feldspat, kaolen, atık cam, uçucu kül, kırmızı çamur, yüksek fırın cürufu, kireç, çimento, kum, lityum porselen kil atığı, sarı fosfor cürufu, yer karosu parlatma atığı vb.) üretilebilmekle beraber, saf oksitler kullanılarak da üretilmektedir (Cannaerts, 2009, Augmented, 2014, Hechinger, 2000, Billinghurst, 2010). CMAS üretim süreci hammaddelerin ergitilmesi, dökümü, kalıplarda şekillendirilmesi ve yüksek sıcaklıklarda kristalleştirilmesi süreçleriyle gerçekleşmektedir. Büyük boyutlu (bulk) parçaların kristalleşme sürecine kıyasla cam tozlarının kristalleşmesini kontrol etmek daha kolaydır. Yapıda oluşan ana fazlar anortit ($CaAl_2Si_2O_8$), diyopsit ($CaMgSi_2O_6$), wollastonit ($CaSiO_3$) ve kordiyerit ($Mg_2Al_4Si_5O_{18}$)'tir (Çetin, 2012). CMAS bileşimi uçak ve endüstriyel türbin motorlarındaki termal bariyer kaplamalar (TBK)'da servis esnasında oluşabilmektedir. Ucuz yakıtlar kullanıldığında yakıt içindeki V, S ve P gibi empüriteler zirkonya esaslı TBK'ların deformasyonuna yol açmakta bağ tabakada TGO adı verilen istenmeyen, kaplamanın ömrünü azaltan tabaka büyümekte ve kaplama ömrü azalmaktadır. Servis şartlarında CMAS oluşumu termal iletkenliği azaltmakta ve TBK'larda boyutsal değişimlere neden olmaktadır. TBK/CMAS sisteminde eğer sıcaklık CMAS'ın ergime sıcaklığından düşükse bozunma oluşumu sınırlanmaktadır (Craig, 2015). Eğer çalışma sıcaklığı CMAS'ın ergime sıcaklığından yüksek ise eriyen CMAS poroziteli seramik kaplama tabakasına infiltre olacak kaplamanın genleşme toleransı ve TBK'nın termal yalıtımı azalacak, seramik ve bağ tabaka arasındaki TGO'nun büyüme hızı artacaktır (Chen, 2015). Bu durumlar dikkate alındığında uçak ve endüstriyel türbin motorlarında kendiliğinden oluşan ve ergime sıcaklığı düşük olduğunda TBK'ların deformasyonuna sebep olan CMAS tabakasının oluşturduğu problemlerin çözümü için daha yüksek sıcaklığa dayanıklı CMAS kaplama tabakasının oluşturulması alternatif bir yöntem olabilir. CMAS cam seramikler camlara yakın bir yoğunluğa sahip olmakla birlikte, sistemdeki MgO, CaO gibi ana oksitler ve PbO ve BaO gibi katkılar arttıkça yoğunlukları artan yönde değişmekte olup; (Yüksel, 2007) genellikle 2,42 ile 2,67 gr/cm^3 aralığındadır (Courtial, 1999).

Mevcut çalışmada CMAS seramikler literatürden farklı hammadde kaynakları kullanılarak hazırlanmış olup; ayrıca $SrZrO_3$ katkının CMAS seramiklerin mikroyapısal ve bazı fiziksel özelliklerini nasıl etkilediği incelenmiştir.

Deneysel Çalışmalar

CMAS Seramik Üretimi

Mevcut çalışmada CMAS bileşimine sahip tozlar olivin, kuvars, mermer tozu, alümina ve $SrZrO_3$ (katkı) tozları kullanılarak hazırlanmış olup; üretilen CMAS kodlu seramiklerin üretim akış şeması Şekil 1'de, çalışmada kullanılan tozların kompozisyonları Tablo 1'de verilmiştir. Belirlenen CMAS (CMAS-A, CMAS-A_1, CMAS-A_2) kodlu bileşimleri üretmek için SiO_2 ve MgO kaynağı olarak olivin, CaO kaynağı olarak da mermer tozu ile stokiometriyi tamamlamak için kuvars ve alümina kullanılmıştır. Ayrıca CMAS seramiklerin özelliklerine $SrZrO_3$'ın etkisini tespit etmek için bileşimlere ağ.% 5 ve 10 oranlarında $SrZrO_3$ ilave edilmiştir. Başlangıç hammaddeleri yaş olarak bilyalı değirmende 24 saat homojen şekilde karıştırılmış olup; devam eden süreçte MSE marka etüvde 100°C de 24 saat kurutulmuştur. CMAS esaslı numuneler Retsch marka RS 100 model halkalı değirmende 700 devir/dk hızla kırılıp-öğütülerek toz haline getirilmiştir. CMAS bileşimlerini oluşturan tozlar hidrolik pres yardımı ile 4 ton basınç uygulanarak 1.5 cm çapındaki paslanmaz çelik kalıp yardımı ile tabletler halinde şekillendirilmiştir. Sinterleme işlemi molibden disilikat ısıtıcı elemanlı MSE marka elektrikli fırın içerisinde 10°C/dk artan ısıtma hızı ile 1100°, 1150°, 1200°, 1250˚C sıcaklıklarında 1, 3 ve 5 saat sürelerde gerçekleştirilmiş olup; makro görüntüler Şekil 2'de görülmektedir. Sinterlenen CMAS bileşimlerin mikroyapıları ve faz yapıları incelenmiş sertlik ve yoğunluk değerleri de hesaplanmıştır.

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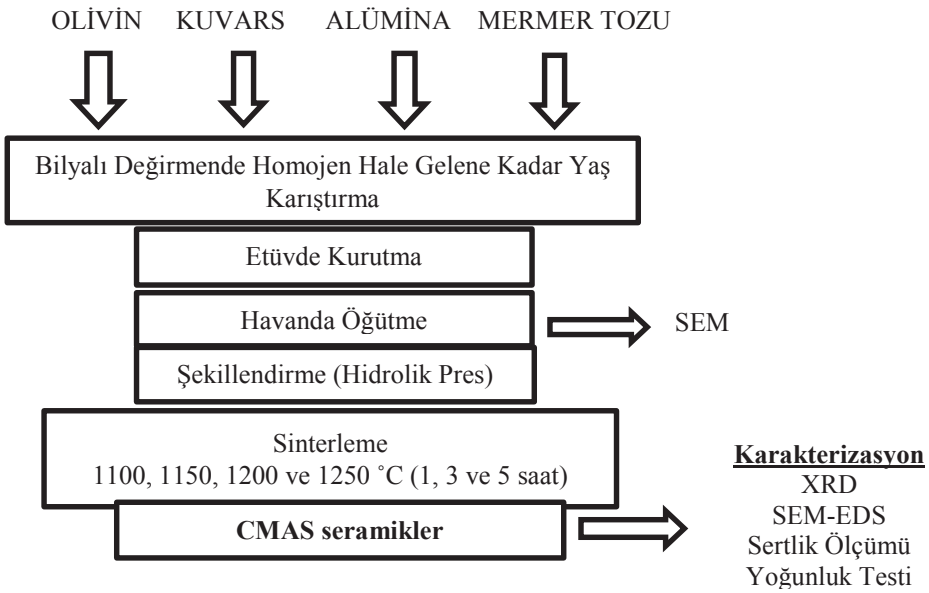
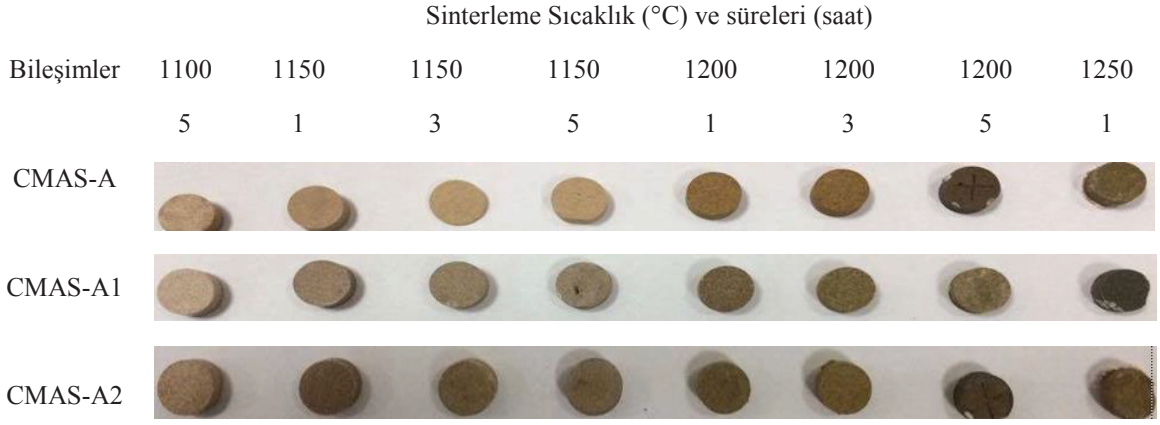


Şekil 1. Deneysel Çalışma Akış Diyagramı

Tablo 1. Üretilen CMAS kompozisyonları

	Kullanılan Hammaddeler (ağ.%)				
Bileşimler	Olivin	Kuvars	Mermer Tozu	Alümina	$SrZrO_3$
CMAS-A	40.205	39.96	13.96	14.5	-
CMAS-A_1	40.205	39.96	13.96	14.5	5
CMAS-A_2	40.205	39.96	13.96	14.5	10



Şekil 2. CMAS seramiklerin makro görüntüleri

CMAS Seramiklerin Karakterizasyonu

1100, 1150, 1200 ve 1250°C'lerde 1, 3 ve 5 saat süre ile sinterlenen CMAS numunelerin yoğunluk ölçümü Arşimet yöntemi kullanılarak ASTM (C693-93) standardına göre denklem 1'deki formül yardımı ile hesaplanmıştır (ASTM C 693-93, 2013).

$$\text{Yoğunluk} = \frac{Wa}{Wc - Wb} ds \quad (1)$$

Wa = Kuru ağırlık (g)

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Wc = Sıvıdan çıkarılıp kabaca kurulanan numune ağırlığı (g)
Wb = Sıvı içerisindeki ağırlık (g) ve ds = Sıvının yoğunluğu (g/cm^3)
CMAS kodlu numunelerin 1150˚C 5 saat, 1200˚C 1-5 saat ve 1250˚C 1 saat sinterlenmesi sonrası mikrosertlik değerleri; Leica marka mikrosertlik cihazı ile 50 gr yük altında 30 sn bekleme süresi ile alınan 5 ölçümün ortalaması hesaplanarak vickers (HV) sertlik değeri olarak tespit edilmiştir. Mikrosertlik testi öncesi numuneler metalografik yüzey hazırlama işlem kademelerine tabi tutulmuştur. 400-1200'lük SiC zımpara kağıdı kullanılarak yüzeyleri düzgün hale getirilmiş, alümina pasta yardımıyla yüzeyler parlatılıp %5'lik HF çözeltisi ile dağlanmıştır.

Mevcut tez çalışmasında CMAS-A CMAS-A_1 ve CMAS-A_2 kodlu numunelerin mikroyapı görüntüleri taramalı elektron mikroskobu (SEM) ile incelenerek detaylandırılmıştır. CMAS-A, A_1 ve A_2 kodlu numunelerin tek aşamalı sinterleme işleminden sonra yapıdaki kristal fazların tespiti için X-ışınları difraksiyon (XRD) analizleri yapılmıştır. XRD çalışmalarında, dalga boyu λ=1.54056 olan CuK_α ışın demeti kullanılarak tarama açısı (2θ) 10 ile 90º arasında olacak şekilde RIGAKU marka D/MAX/2200/PC model X-ışınları difraktometresi kullanılmıştır. Difraksiyon diyagramları üzerinde yapılan ölçme ve hesaplamalarda düzlemler arası mesafeden (d değeri) hareket edilerek, CMAS-A, A_1 ve A_2 kodlu bileşimlerdeki mevcut fazlar tanımlanmıştır.

Sonuçlar ve Tartışmalar

Yoğunluk Testi

Farklı sıcaklık ve sürelerde sinterlenen CMAS seramik malzemelerin yoğunluk değerleri Tablo 2'de verilmiştir. 1100°C'de 1 ve 3 saat süreyle sinterlenen CMAS kodlu numunelerde yeterli sinterleme olmadığından numuneler kısa bir süre sonra parçalanmıştır. Sinterleme sıcaklığının artmasıyla birlikte yoğunluğun azaldığı gözlenmiş olup; bu sonucun sebebinin sıcaklığın artmasıyla birlikte porozite miktarının artmış olmasından dolayı olduğu düşünülmektedir. Bu porozitelerin artışının sebebi ise sıcaklığın artmasıyla birlikte yapıda gerçekleşen iç çekilmelerdir. En yüksek yoğunluk değerlerine her 3 bileşim içinde 1100°C'de 5 saat sinterlenen numunelerde ulaşılmıştır. $SrZrO_3$ katkısı CMAS bileşiminin yoğunluğunu artırıcı yönde etkilemiştir.

Tablo 2. CMAS kodlu seramiklerin yoğunluk değerleri (g/cm^3)

Sıcaklık	1100°C	1150°C			1200°C			1250°C
Süre	5h	1h	3h	5h	1h	3h	5h	1h
CMAS-A	**2.834**	2.732	2.564	2.443	2.426	2.422	2.372	2.213
CMAS-A_1	**2.738**	2.716	2.708	2.701	2.675	2.432	2.290	2.221
CMAS-A_2	**2.767**	2.623	2.604	2.585	2.558	2.541	2.524	2.306

Cheng ve arkadaşları CAS esaslı cam-seramikler üzerine yaptıkları çalışmada kristalizasyon işlemi (artan sıcaklık ve süreyle) ile kristal büyümesi sonucu malzemede fiziksel ve mekanik özelliklerinin düştüğünü rapor etmişlerdir (Cheng, 2003). Anortit-diyopsit cam-seramik altlıkların yoğunlaşma davranışı ve özelliklerine TiO_2 ve P_2O_5'in etkisi başlıklı çalışmada; ağ % 47.57SiO_2, 15.69 Al_2O_3, 24.60 CaO, 9.75 MgO, 0.37 CaF_2 ve 2.02 P_2O_5 miktarları sabit tutulup, TiO_2 miktarları 2.02-8 arasında değiştirilerek 5 farklı bileşim hazırlanmıştır. Yoğunluk ölçümlerinde TiO_2'nin kullanılmadığı bileşimde yoğunluk 2.78 g/cm^3, P_2O_5'in kullanılmadığı bileşimde 2.85 g/cm^3 iken, TiO_2 miktarı arttıkça yoğunluk değeri azalan yönde değişerek 2.27 g/cm^3 değerlerine düşmüştür (Marques 2010).

Mikrosertlik Testi

CMAS-A, A_1 ve A_2 kodlu seramikler ile bu seramiklerin 1150-1250ºC sıcaklık aralığın da 1-5 saat süre ile kristalizasyon işlemi sonucu oluşan numunelerin sertlik değerleri elmas uçla 50 g yük altında ve 30 sn bekleme süresi ile Vickers sertlik değeri (HV) cinsinden ölçülmüştür. Elde edilen sonuçlar Tablo 3'de verilmiştir. Bileşime ağ. %5 $SrZrO_3$ katkısı ile mikrosertlik değerleri artış gösterirken, katkı miktarının artmasıyla birlikte (ağ.%10 $SrZrO_3$ ilavesi) mikrosertlik değerlerinde düşüş gözlenmiştir. En yüksek sertlik değeri olan 976 HV'ye 1250ºC'de 1 saat sinterleme ile ulaşılmıştır. Park ve çalışma grubu; ağ.%75 uçucu kül, %20 SiO_2 ve %5 MgO hammaddelerine ilaveten çekirdekleyici olarak ağ. %2 TiO_2 ilavesi ile cam ve cam-seramik numuneler üretmişler ve bunların mekanik özellikleri incelediklerinde cam-seramik yapının mikrosertliğinin oluştuğu ana cama göre daha yüksek çıktığını belirtmişlerdir (Park, 2002). Atık pencere camı ile kaolen kullanarak wollastonit cam-seramikleri üreten araştırmacılar 4.42-5.32 GPa sertlik değerine ulaşmışlardır. Mevcut çalışma ile karşılaştırıldığında mikrosertlik değerleri 451-545 HV değerlerine tekabül etmekte olup; daha düşük seviyelerdedir (Zhang 2013). Granit atıklarından üretilen CMAS cam-seramik bileşimlerde mikrosertlik değeri bileşime bağlı olarak 6.7-7.4 GPa olup, 684-755 HV'ye tekabül etmektedir ve mevcut çalışmadaki sertlik değerlerinden daha düşüktür.

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Tablo 3. Mikrosertlik Testinden Elde Edilen Değerler

Sıcaklık (°C)	Süre (saat)	Mikrosertlik Değerleri ($HV_{0.05}$) Bileşim		
		CMAS-A	**CMAS-A_1**	**CMAS-A_2**
1150	5	-	773.6	829.6
1200	1	842.6	877	820
	3	772.4	951	681.2
	5	674.2	838.4	895
1250	1	963.6	**976**	925

Faz Analiz Sonuçları

CMAS A, A_1 ve A_2 kodlu seramiklerin 1150°C 5h ve 1200°C 5h sinterlenmeleri sonucu elde edilen faz yapılarında bileşime göre meydana gelen değişimler Şekil 3'de verilmiştir. Yapılan çalışmada sinterleme süreleri sabit tutularak sıcaklığın değişimi sonucunda her üç bileşim için malzeme bünyesinde meydana gelen faz değişimleri incelenmiştir. Yapılan çalışmalar değerlendirildiğinde; CMAS A numunelerine 1150°C ve 1200°C 5h yapılan XRD analizleri sonucunda CMAS esaslı seramik veya cam seramiklerin yapısında bulunan diyopsit ($CaMgSi_2O_6$) ve anortit ($CaAl_2Si_2O_8$) fazlarına rastlanmıştır. Bunlarla birlikte düşük 2Θ değerlerinde her üç bileşim için akermanit fazına rastlanmıştır. Sıcaklığın artışıyla birlikte XRD grafiklerinde anortit ve diyopsit pik şiddetlerinde artışın meydana geldiği gözlenmiştir. CMAS A1 kodlu numunenin faz yapısında diyopsit ve anortit fazları ile birlikte akermanit ve spinel fazına rastlanmıştır. Yapıya ilave edilen $SrZrO_3$ katkısı ile Şekil 3 b'de görülmekte olan grafikte ana faz yapısı değişmemiş, anortit fazının şiddeti azalırken; diyopsit pik şiddetinde artışın meydana geldiği tespit edilmiştir. CMAS A2 kodlu numunelerde diyopsit ve anortit fazları ve ilave edilen SrZrO3 katkısı ile baddeleyite (ZrO_2) oluşumu 2Θ=30, 50 ve 60 civarlarında gözlenmiştir. Farklı sıcaklıklardaki faz sonuçları Şekil 3 c'de görülmekte olup sıcaklığın artışıyla birlikte XRD çıktılarında anortit pik şiddetlerinde artış gözlenirken, diyopsit fazının pik şiddetleri düşmüş baddeleyit fazı ile birlikte camsı fazın oluşum eğilimi artmıştır. CaO, MgO, SiO_2, Al_2O_3, Fe_2O_3, Cr_2O_3, Na_2CO_3 ve CaF_2 hammaddelerini kullanarak 4 farklı bileşim hazırlayan araştırmacılar faz yapılarında ana kristal faz olarak diyopsit fazını tespit etmişlerdir (Yang 2016). CaO,Al_2O_3, MgO, CaF_2, K_2CO_3, P_2O_5, B_2O_3, SiO_2 ve ağ %8 ZrO_2 hammaddelerini kullanarak zirkonyalı ve zirkonyasız 2 bileşim hazırlayan araştırmacılar 1550 °C'de 1.5 saat Platin potada ergittikleri bileşimleri 800-1000°C'lerde 1 saat sinterlemişler ve ana kristalin faz olarak anortit fazını ve bunun yanısıra ZrO_2 katkılı bileşimde ise t-ZrO_2 piklerinin varlığı belirlenmiştir (Hsiang 2014). SiO_2, MgO, $CaCO_3$, Na_2CO_3, K_2CO_3, Al_2O_3, ZnO, TiO_2, CaF_2 ve P_2O_5 hammaddeleri platin pota içerisinde 1470–1520 °C'lerde 3 saat ergitildikten sonra at 730 °C'de 30 dk çekirdeklenme ve ardından 930 °C'de 30 dk kristalizasyon ısıl işlemine tabi tutulmuş ve mevcut çalışma ile aynı 2Θ değerlerinde anortit ve diyopsit fazları gözlenmiştir (Zheng 2016).

Mikroyapı İncelemeleri

Üretilen CMAS A- A_1-A_2 kodlu seramiklerinin SEM analizleri gerçekleştirilmiş olup; farklı sıcaklık ve sürelerde yapıda meydana gelen değişimler tespit edilmiştir. Şekil 4'de CMAS A, A_1 ve A_2 kodlu seramiklerin farklı sıcaklıklara göre SEM analizleri görülmektedir. CMAS-A kodlu seramiklerinin mikroyapı görüntüleri incelendiğinde artan sıcaklıkla beraber yapıdaki porozitelerin arttırdığı, sıcaklık ve sürenin artışıyla birlikte diyopsit fazının (çubuksu yapılar) arttığı gözlenmiştir Şekil 4 (a-d). CMAS-A_1 kodlu seramiklerinin mikroyapı görüntüleri incelendiğinde artan sıcaklıkla yapıdaki porozitelerin azaldığı, stronsiyum zirkonat katkı ilavesiyle birlikte çubuksu yapının belirginleştiği (e-h), CMAS-A_2 kodlu seramiklerinin mikroyapı görüntüleri incelendiğinde ise porozitelerin azaldığı anortit fazının tipik çubuksu yapıdaki formunun yapıya hakim olduğu belirtilebilir Şekil 4 (ı-l). Partyka ve arkadaşlarının SiO_2-Al_2O_3-CaO-MgO-K_2O-Na_2O bileşimde ZnO miktarını değiştirerek yapmış oldukları çalışmada yapıda çubuksu formda diyopsit fazlarını tespit etmişlerdir (Partyka, 2016).

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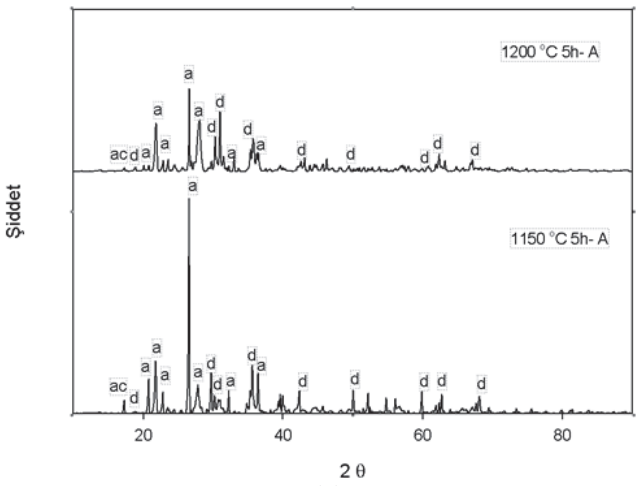
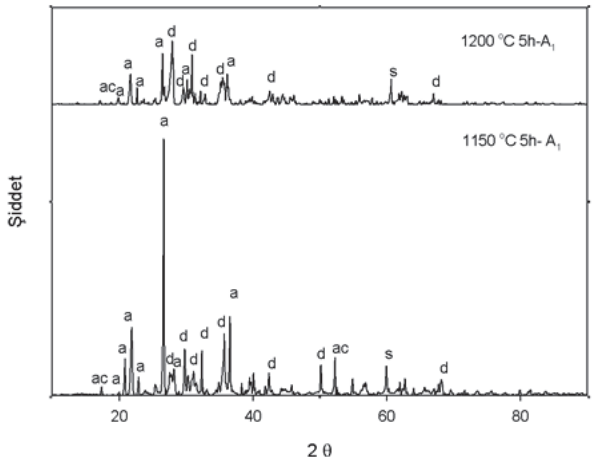
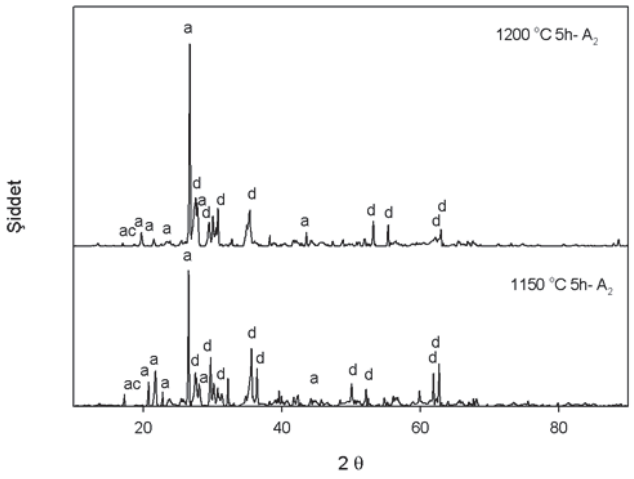


(a)



(b)



(c)

Şekil 3. a) CMAS-A b) CMAS-A_1 ve c) CMAS- A_2 kodlu bileşimlere ait XRD analizleri
(a: Anortit, ac: Akermanit s: spinel ve d: Diyopsit)

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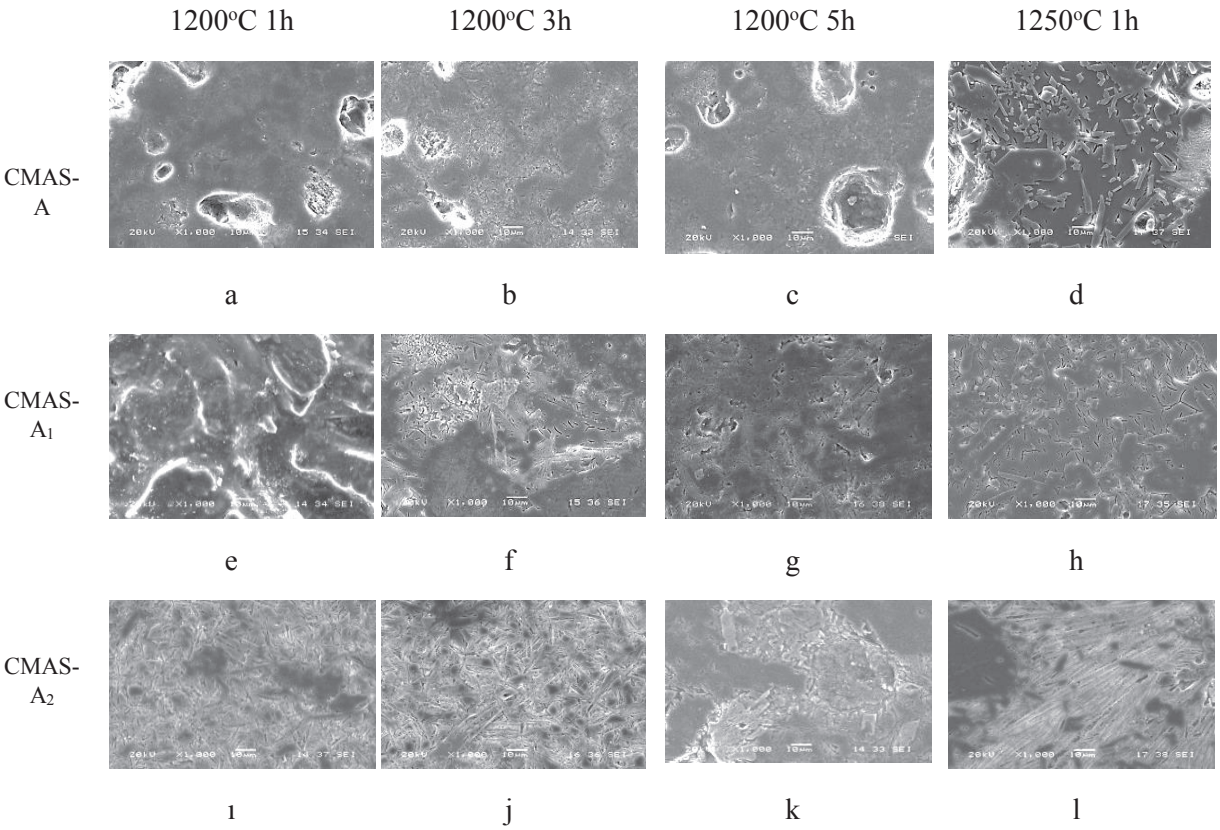

Şekil 4. CMAS A, A_1 ve A_2 kodlu seramiklerin farklı sıcaklıklara göre mikroyapı analizleri

GENEL SONUÇLAR

- CMAS esaslı seramikler olivin, kuvars, alümina, mermer tozu hammaddeleri ve $SrZrO_3$ katkısı kullanarak 3 farklı kompozisyon üretilmiştir.
- Deney numunelerinin üretiminde kullanılan hammaddelerin maliyetinin düşük, sürdürülebilirliği olan ve mermer tozu gibi çevreye zararlı atık malzemeler olmasına dikkat edilmiştir. Mermer endüstrisinde mermer çamuru olarak nitelendirilen mermer tozu %95 $CaCO_3$ içermekte olup; bu malzeme doğaya deşarj edildiğinde toprağın asit-baz dengesini bozduğundan çölleşmeye, balık ölümlerine ve içeriğinde bulunan karbonik asit sebebiyle asit yağmurlarının oluşumuna sebebiyet verdiği tespit edilmiştir (Yeşil gazete, 2011).
- Üretilen seramiklere Arşimet prensibi yöntemine göre yoğunluk testi yapılmıştır. 1100°C'de 1 ve 3 saat süreyle sinterlenen CMAS kodlu numunelerde yeterli sinterleme olmadığından numuneler kısa bir süre sonra parçalanmıştır. Sinterleme sıcaklığının azalmasıyla birlikte yoğunluğun arttığı gözlenmiş bu sonucun sebebinin sıcaklığın artmasıyla birlikte porozite miktarının artmış olmasından dolayı gerçekleştiği ve porozitelerin artışının sebebinin ise sıcaklığın artmasıyla birlikte yapıda gerçekleşen iç çekilmelerin olduğu belirtilebilir. En yüksek yoğunluğa sahip bileşim CMAS-A_2 kodlu bileşimdir.
- $SrZrO_3$ katkısı CMAS bileşiminin yoğunluğunu artırıcı yönde etkilemiştir.
- Yapıya ağ.%5 $SrZrO_3$ katkı ilavesiyle birlikte mikrosertlik değerleri artış gösterirken, katkı miktarının artmasıyla birlikte (%10 ilavesi) mikrosertlik değerlerinde düşüş gözlenmiştir.
- Sinterlenmenin etkisiyle kristal (düzenli) yapıların oluştuğu gözlenmiştir. Artan sıcaklıkla birlikte CMAS seramiklerine ait diyopsit fazlarının şekilleri bariz olarak görülmüştür. Bununla birlikte süre ve sıcaklık artışıyla doğru orantılı olarak tane büyümesi gözlenmiştir.

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- Yapılan analizler sonucunda CMAS esaslı seramik veya cam seramiklerin yapısında bulunan diyopsit ($CaMgSi_2O_6$)ve anortit ($CaAl_2Si_2O_8$) fazlarına rastlanmıştır. Bunlarla birlikte akermanit, spinel ve ZrO_2 fazlarına da meydana gelmiştir.

Teşekkür

Çalışmada kullanılan olivin hammaddesi için Erkrom Madencilik A.Ş. şirketine teşekkürlerimi sunarım.

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CARDIAC ARRYTHMIA CLASSIFICATION BY NEURONAL NETWORKS (MLP)

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Abstract: Cardiac activity is one of the most important determinants of a patient's condition. It results in the appearance of several waves on the course of the electrocardiograph: it is the cardiac signal, the electrocardiogram: ECG. The analysis of the ECG signal and the identification of its parameters constitute an essential step for the diagnosis. However, a set of methods and algorithms are developed in view of the importance of this signal and its use in clinical routine in the diagnosis of cardiac pathological cases. This paper fits into this problem and proposes a classifier of cardiac arrhythmias by application of neural networks. The results were validated by ECG signals from the different patients in the MIT-BIH Arrhythmias database, and given a recognition rate of 94%, this rate of classification exceeds the results obtained in the literature.

Keywords: Neuronal Network , Classification, MIT-BIH data base, Electrocardiogram (ECG).

Introduction

Over the past decade, automatic preventive recognition of markers for cardiac arrhythmia in which numerous studies have been proposed. Which will, for the most part, exploit artificial intelligence and data mining approaches to automatically analyze ECG signals, which are difficult to perform manually. These systems improve signal quality (noise filtering), extract information that is not visible through direct visual analysis and provide a diagnosis that can provide sufficient support to doctors to make the right decisions. However, automating the detection of cardiovascular disease from the ECG signal is not trivial and gives the doctor a good diagnosis. In addition, the provision of a system with sufficient expertise to automate diagnosis is an extremely tedious task.

The presented work in this paper proposes classification of PVC beats, and is organized as follows:
In the first section, we introduced the problematic and then examined related works to classify cardiac arrhythmia in Section 2. The third section presents details works specialized in detection of the PVC pathology. The proposed approach is detailed in Section 4.
Our experimental results and a discussion are presented in Section 5. Finally, the conclusion is drawn and future work is suggested in the last section.

Related Works

In the literature, we find several techniques applying various methods, the goal of which is to simplify the reading of an ECG signal; we have been interested in the following works:
The ARTMAP (Adaptive Resonance Theory Mapping) theory was used in (Ham, 1996) to test two types of heartbeat (normal beat and beat of premature ventricular contraction). It gave a classification rate of 97%. In (Al-Nashash, 2000) ,using only 14 records from the MIT-BIH database, the neural network-based classifier presented by Nashash reached a sensitivity of 98.1% and a positive predictive of 94.7%. A neural classifier of the PVC (Premature Ventricular Contraction) combined with the wavelet transformation and the temporal characteristic of the ECG was proposed by Inan. It obtained an accuracy of 85.20% on 40 records (Inan, 2006). Quiniou et al (Quiniou, 2006) proposed inductive logic programming, which is an automatic learning technique for chronicle recognition. Their system called CRS (Chronicle Recognition System), developed at France Telecom R & D Lannion, allows efficient processing of important event flows and chronic bases of consequent size.

Artificial Neuro Networks (ANN)

A neural network is a computational model whose design is very schematically inspired by the functioning of real neurons. Neural networks are generally optimized by statistical learning methods, so that they are placed on the one hand in the family of statistical applications, which they enrich with a set of paradigms allowing to generate large spaces functional, flexible and partially structured, and on the other hand in the family of methods of artificial intelligence which they enrich by making decisions based more on perception than on logical reasoning forms

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(Haykin, 1999).

Structure Of Artificial Neuro Networks (ANN)

There are three possible types of neurons, which are organized into disjoint subsets called layers (input layer, hidden layer, and output layer). A neuron is connected to another neuron with a connection, which functions as a unidirectional instant signal. Each connection between these neurons is associated with a quantity called the weight or binding force (Haykin, 1999) [Figure 1].

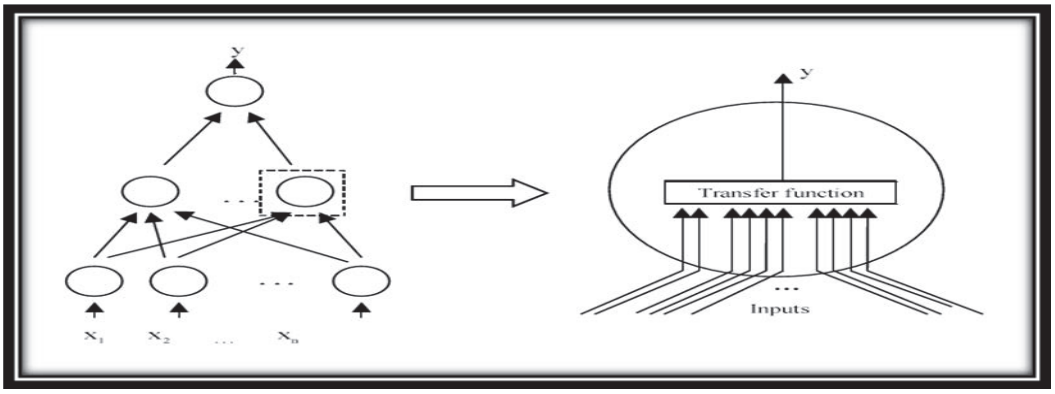

Figure 1: A network of neurons and its basic processing element.

First, the neuron computes an input network value by summing the input values multiplied by their corresponding weights. Then, the neuron determines the output value by applying a transfer function, which is generally a threshold function as a sigmoid. In addition, updates the weights of the neurons according to the procedure gained. Input neurons behave differently from other neurons. Each of the input neurons receives exactly one input signal, which represents an element of an input configuration outside the network. Therefore, the neurons of the input layer thus have an input pattern for all output neurons. As a general rule, these neurons do not distribute signals to the neurons in the next layer (Haykin, 1999).

ECG Signal

In [Figure 2], we have the different waves of a normal ECG, in our study we are interested in the Ventricular case that can cause sudden death in a patient.

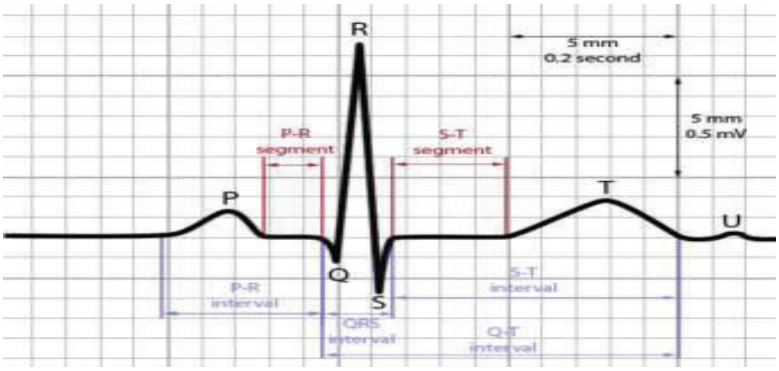

Figure 2: The different wave Electrocardiogram (ECG) signal.

[1]

Premature Ventricular Contraction (PVC)

Ventricular fibrillation is a cardiac rhythm disorder which manifests as a complete disorganization of the electrical activity of the ventricles with the immediate consequence of the loss of any effective cardiac contraction. According to (Briand, 2002) Ventricular fibrillation is characterized by the occurrence of very abnormal, widely varying, abnormally large, unequally amplitude ventricular complexes, occurring in a totally irregular and high frequency manner (Talbi, 2011).

The parameters used to try to predict the risk of PVC are relative to the QRS and P waves of the ECG [Figure 3].

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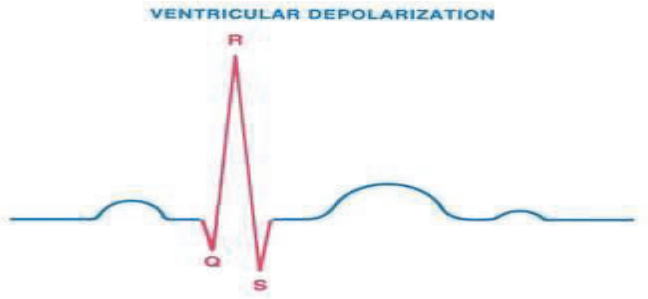

Figure 3: ECG of a subject which has premature ventricular contractions (PVC) (Talbi, 2011).

To discriminate between the two types of beats (normal and at risk (PVC)), it is imperative to calculate certain parameters and characteristics that can constitute the input vectors of the classifier. These feature vectors are each composed of 9 elements:

- The temporal parameters, namely the duration and the amplitude of the P wave represent the two first elements of the vector and the duration of the QRS complex.
- The shape of the QRS complex.

[2]

Experimentation

The ECG signals used in this work are the actual recordings of the database MIT-BIH. These signals are sampled at the frequency of 360 Hz. two American cardiologists have made annotations on these signals and who made the diagnosis for these recordings, and each cardiac cycle has been annotated by them. These parameters are essential for learning and classification evaluation.

The parameters used were calculated using an algorithm developed and implemented in the LTSI laboratory at the University of Rennes 1 France. This algorithm is based on the technique presented by J. Pan WJ Tompkins and (Pan et al, 1985) was applied to the MIT-BIH data base (MIT BIH, 1992).

The right choice of the parameters of the input vector classifier is very important. For this three-dimensional geometric data analysis is recommended to see the degree of membership of each parameter for each class (Normal, Ventricular, Other).

Parameters	SIGNIFICATION
1	*The moment of detection of the peak R*
2	*QRS onset*
3	*QRS offset*
4	*Last RR interval*
5	*Beat begin*
6	*Beat end*
7	*Iso electric level*
8	*Amplitude pic to pic*
9	*ST level*

Table 1: Parameters of MIT-BIH data base.

[3]

[4] Methodologies

The multilayer perceptron (PMC) is the most widely used network. It is a feedforward network composed of successive layers. Each neuron of a layer receives signals from the previous layer and transmits the result to the next one, if it exists. Neurons of the same layer are not interconnected. A neuron can not therefore send its result that has a neuron located in a layer posterior to his. The orientation of the network is fixed by the single direction of propagation of information, of the input layer to the output layer. For the networks considered, the notions of

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input and output layers are therefore systematic. The latter constitute the interface of the network with the outside. The input layer receives the input (or variable) signals and the output layer provides the results. Finally, the neurons of the other layers (layers hidden) have no connection with the outside and are called hidden neurons.By convention, the input neurons always have an activation function (identity), letting the information pass without modifying it. As regards the output neuron, it may be associated with a linear or non-derivative activation function, which may or may not be derivable, depending on the nature of the problem to be solved. This type of network is very efficient for classification problems (Parizeau, 2004).

Architecture

The network designed for the classification of heart beats is Multi-Layer Perceptron (MLP) [Figure 4].

- The input vector X=[x1 x2 … x9] represents 9 parameters characterizing a heartbeat of the data base LTSI [Table 1], which have been linked to all neurons in MLP network, and gives a single output unit, which produces the variable Y.

- The external connections of the neuron i with the input vector S is materialized by a synaptic weight vector Mi = [mi1 mi2 …mi9] whose weights are assigned randomly to the top.

- Each neuron i of the map is related to all other neurons map: interaction between neurons. wik the internal connections of the neuron i with its neighbors are performed by assigning synaptic weights.

- This model realizes an application of Rp in R.
- The network architecture determined by the neuron connection scheme is a composition of elementary function and represents a family G (.W) of nonlinear functions and whose parameters are the weights of connections of the network W.

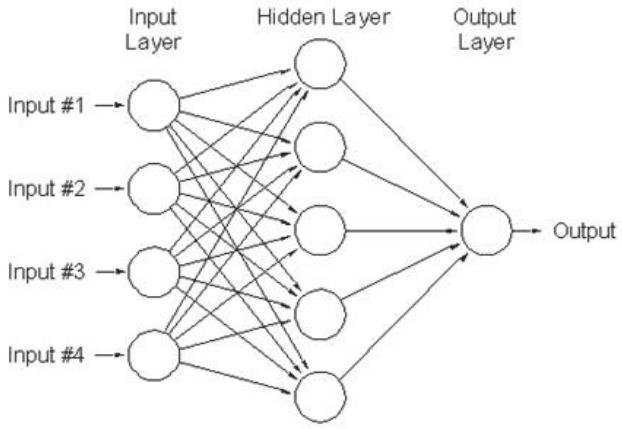

Figure 4: Multi-Layer Perceptron (MLP).

- The output of the network will have an expression of the following form depending on the number of layers which compose it :

$$Y=\sum_{i=1}^{n} W_i - f_i\left(\sum_{j=1}^{p} W_{ij}.X_j + X_{i0}\right) + W_0 \qquad (1)$$

- Estimating the weights of the MLP network involves least-squares minimization of the error (a cost function) defined on the learning basis. This error is given by:

$$E(W)=\frac{1}{2}\times \sum_{\text{examples}} (\text{cible}-\text{output})^2 \qquad (2)$$

Learning Network

A learning system takes as input a set of examples (cardiac cycles) from which it seeks a definition. In our case, the system seeks to learn the forms of cardiac arrhythmias from the examples provided at its entry from the MIT-BIH database.

These examples are presented in the form of parameters (elements of the input vector [Table 1]) which represent

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the temporal and morphological characteristics of the cardiac cycles classified according to the arrhythmias to which they correspond.
The learning algorithm-back propagation in this case-ensures that the classes produced allow to best discriminate the input examples.

Implementation Of The Classifier

The purpose of the software implementation of the classifier is to determine the size and parameters of the neural network, namely:
- Number of layers and number of neurons for each layer.
- Error reached.
- Number of iterations.

These settings provide the best network performance. We discuss in this section the conditions and method of learning, the database used the programming and the dimensioning of the network.

Experiment Results

The database used allowed the creation of two other databases: one for learning and the other for testing, which will be used for the training and evaluation of our classifier. The selected patients are given in the following table [Table 3].
Once the learning has been completed, it is necessary to test on another database different from that of the learning. For the evaluation of our classification system, we used four statistical laws based on the recognition of mutual categories: Tp (True positive), Tn (True negative), Fp (False positive), Fn (False negative).
These laws are as follows:
The sensibility : Se = Tp / (Tp + Fn), it is the fraction of real cases targeted correctly recognized on all the actual cases referred to.
The specificity: Sp= Tn / (Tn + Fp), this is the fraction of actual non-target cases properly rejected.
The correct classification : CC= (Tp + Tn) / (Tp + Tn + Fp + Fn), this is the correct classification rate.
The results presented in this study for the classification of ECG signals were obtained by applying to the classifier input ECG signals of "MIT BIH Arrhythmia Database". The sensitivity, specificity and classification rate are three parameters calculated for each signal to evaluate and compare the results obtained. The performance of the classifier is shown in [Table 3].
Our classification system allowed us to obtain a recognition rate of 94% by applying the set of ECG signals of MIT BIH Database with a specificity of 96.49% and a sensitivity of 94.60%. These performances were achieved mainly through:

Signals	Normal Beat	PVC Beat	SE	SP	CC
Patient 1	2272	2239	99	95.08	95.03
Patient 2	1864	1860	NAN	93.01	93.5
Patient 3	2186	99	100	100	100
Patient 4	2026	1506	97.01	97.05	97.01
Patient 5	2650	2423	86.03	84	84.02
Patient 6	2256	225	99.01	83.05	83.06
Patient 7	2601	1743	81.04	96.07	94.03

Table 3: Percentage recognition rate of the classifier.

Conclusion and Perspectives

In this article, we propose a system for the diagnosis of very common cardiac arrhythmias (PVC), based on neural networks MLP, which is responsible for determining the type of heartbeat according to its most representative characteristics. The learning algorithm was implemented under the Matlab environment. Tests carried out on a

MIT-BIH database made it possible to achieve a classification rate close to 94%. The result is satisfactory as long as we have improved the performance of the classifier on the one hand and, on the other hand, a network that has a minimal architecture with respect to the number of classes in output. This point is very important because it allows minimizing the response time of the classifier if one wants to have a Reel time classifier.
Among the prospects of this work, the expansion of the database, and tried other methods of classification.

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CHARACTERIZATION OF NATURAL AND MODIFIED CHABAZITE

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Abstract: Chabazite (CHA) is naturally occurring zeolite with ideal composition $(Ca_{0.5},Na,K)_4[Al_4Si_8O_{24}].12H_2O$ [1]. Chabazite, an aluminosilicate mineral, is available both in natural and synthetic form. Structurally, chabazite consists of stacked, double six membered ring prisms, interconnected through four rings, in a cubic, close-paced array [2,3]. In this study, samples obtained from Bala region from Turkey were crushed, ground and sieved to pass through a < 63µm sieve. Samples were treated with salt solutions according to the following procedure. Chabazite samples were modified by batch method using 100 ml of 1.0 M nitrate solutions at 90°C for 5h. The natural (CHA) and salt modified forms (Ag-CHA, Na-CHA, K-CHA, Mg-CHA and Ca-CHA) were characterized by using X-ray diffraction (XRD), X-ray fluorescence (XRF), thermogravimetric analysis (TG) and differential thermal analysis (DTA) methods.

Keywords: Zeolite**,** Chabazite, XRF, XRD, TG/DTA.

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CHARACTERIZATION OF THERMOSTABLE β-GALACTOSIDASE FROM *Anoxybacillus ayderensis* AND OPTIMAL DESIGN FOR ENZYME INHIBITION USING SEMIPARAMETRIC EIV MODELS

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Abstract: The thermostable β-galactosidase from *Anoxybacillus ayderensis* was partially purified by Sephadex G-75 with a fold purification of 14.4 and a yield of 13.4%, respectively. The optimal activity and stability of β-galactosidase was pH 9.0 and a temperature of 60 °C. The molecular weight of the subunits was estimated as 90 kDa by sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE). The effect of different concentrations of chelating agents (ethylenediaminetetraacetic acid, 1,10 phenantroline), some chemicals (dithiothreitol, phenylmethlysulfonyl fluoride, 4-Chloromercuribenzoic acid, N-ethylmaleimide, iodoacedemide and β-mercaptoethanol) and divalent metal ions (Mg^{2+},Ca^{2+}, Cu^{2+} and Zn^{2+}) on enzyme activity was assayed. According to the results, the thermostable β-galactosidase was significantly activated by Ca^{2+} while inhibited Zn^{2+} and Cu^{2+} ions. In addition, the enzyme activity was inhibited by EDTA, PCMB, N-ethylmaleimide and 1,10 phenantroline. We used a new semiparametric errors in variables model in order to explain the combined effect of the chemicals on enzyme activity, considering that there is a measurement error in nonparametric variable and there is no information at all about the error distribution and compared the no measurement error case and errors in variables case.

Keywords: β-galactosidase, characterization, inhibition, EIV model

Introduction

Enzymes are used in a number of new applications such as food, feed, agriculture, paper, leather and textile industries, which is costly. At the same time fast technological developments; The chemical and pharmaceutical industry, which includes enzyme technology, which is a stronger trend in health, energy, raw materials and environmental issues (Beilen and Lie 2002).

With the advancement of biotechnology and the purification of enzymes, the number of enzyme applications has increased a lot and many possibilities for industrial processes have emerged with the availability of thermostable enzymes. Thermostable enzymes, which are mainly isolated from thermophilic organisms, find many commercial applications due to their general internal stability (Haki and Rakshit 2003).

β-Galactosidase is found in various microorganisms, plant and animal tissues in nature. The commercial importance of microbial β-galactosidases is greater when compared to other sources because of their easy control of their production and their high productivity. (Juajun et al. 2010).

In this study, we purified thermostable β-galactosidase from thermophilic *Anoxybacillus ayderensis* and also we tried to explained the combined effect of the some chemicals on b- galactosidase activity using semi-parametric errors in variables model.

Materials and Methods

Moderately thermophilic *Anoxybacillus ayderensis* (NCBI GenBank database accession number is KP992869) was obtained from Dicle University and it was grown in 100 mL Luria-Bertani medium (LB) incubated at 50 °C for 24 h. After incubation, cells were harvested by centrifugation (8200 g, 30 min, 10 °C) and were lyzed by ultrasonicator (for 3 times 25 sec.) and centrifuged. Supernatants (crude extracts) containing the β-galactosidase were used for purification steps. β-galactosidase purification and anzyme activity determined with *o*-nitrophenyl-β-D-galactopyranoside (*o*-NPG, Sigma) method according to Matpan Bekler et al. (2017). The protein content was determined by the Lowry method (1951) using bovine serum albumin (BSA) as a standard. The molecular weight of β-galactosidase was estimated by SDS-PAGE (Sodium Dodecyl Sulphate Polyacrylamide Gel Electro-phoresis) according to Laemmli (1970) and zymography analysis was performed as described by Gül-Güven et al. (2007).

After purification steps, the purified enzyme was characterized. Optimum pH was determined under standard assay conditions using *o*-NPG (pH 4.0–10.0). For the pH stability, the purified enzyme was incubated at 60 °C for 1 h in different buffers (4.0 to 11.0). Optimum temperature was determined under standard assay conditions using *o*-

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NPG at temperatures ranging from 20 to 90 oC. The thermostability was incubated at 60 °C and 70 °C for different time (0-120 min). The unheated purified enzyme was taken as 100%. The remaining β-galactosidase activity was measured under standard assay conditions.
The effect of chelating agent (1,10- phenanthroline: phen), some chemicals dithio-threitol (DTT), phenylmethylsulfonyl fluoride (PMSF), N-ethylmaleimide (NEM), iodoacetamide (Iod A) and β-Mercaptoethanol (β-Mer) and divalent metal ions (Mg^{2+}, Ca^{2+}, Cu^{2+}, Hg^{2+}) on β- galactosidase activity was assayed using 1.5 mM *o*-NPG solution in 0.1 M sodium phosphate buffer (pH 9.0) at 60 °C. The partially purified enzyme was pre-incubated with all agents and then enzyme activity was measured. The combined effects of some chemicals on β-galactosidase activity by *Anoxybacillus ayderensis* were studied using semiparametric errors in variables methodology as described by Matpan Bekler et al (2017).

Results and Discussion

The β-galactosidase was purified as described in materials and methods. The purification steps resulted in 14.4 fold purification and a yield of 13.4% (Table 1).

Table 1: Purification steps of β-galactosidase

	Total protein (mg)	Total activity (U)	Specific activity (U/mg)	Purification (fold)	Yield (%)
Crude extract	201,6	34943,8	173,3715	1	100
Ammonium sulphate precipitation and dialysis	16,2	16215,2	1003,118	8,0	46,4
Sephadex G-75	2,7	4683,9	1721,989	14,4	13,4

The purified β-galactosidase was subjected to SDS-PAGE analysis and BNG staining (Figure 1a, b). Data of the SDS-PAGE (Figure 1a, lane 2) showed that the purified β-galactosidase had a molecular weight of 90 kDa.

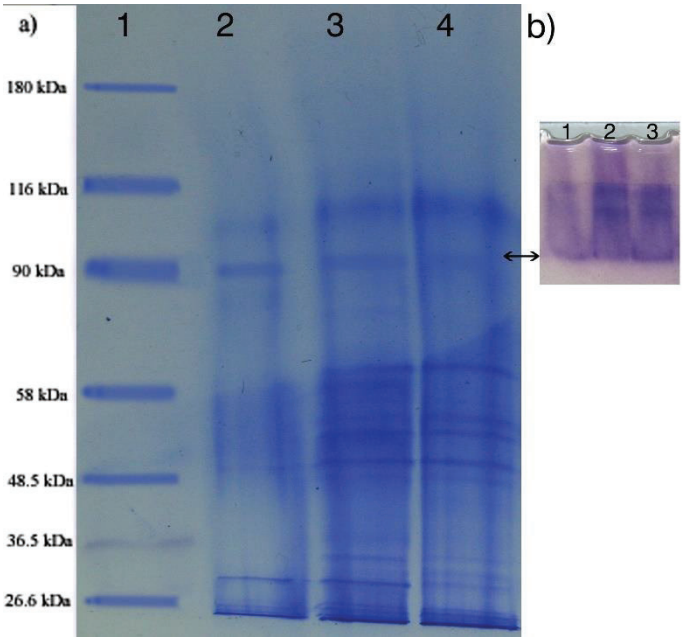

Figure 1. SDS-PAGE CBB-staining (a) BNG-staining (b) analysis of β-galactosidase from *Anoxybacillus ayderensis*. a: Lane 1, molecular mass markers [Sigma SDS7B2: a2-macroglobulin (180 kDa), β- galactosidase (116 kDa), lactoferrin (90 kDa), pyruvate kinase (58 kDa), fumarase (48.5 kDa), lactic dehydrogenase (36.5 kDa), triosephospate isomerase (26.6 kDa)]; lanes 2 CBB-staining of partially purified β- galactosidase (Sephadex G-75), 3b: BNG-staining lane 1, crude extract; lane 2, ammonium sulphate precipitation and dialysis; lane 3,

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Sephadex G-75.

Matpan Bekler et al. (2017) reported that the molecular weight of purified β-galactosidases from *Anoxbacillus* were 68.5 kDa. According to Uniport Protein sequence databases (http://www.uniprot.org/), molecular weight of β-galactosidases belonging to *Anoxybacillus* are between 49.1-116.7 kDa.

The optimum pH for β-galactosidase activity was found to be 9.0 (Figure 2). The enzyme was also stable at pH 9.0 (Figure 3).

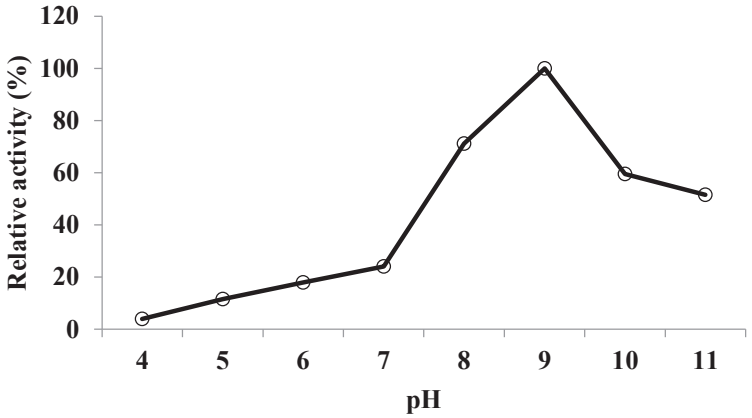

Figure 2. Effect of pH on β-galactosidase.

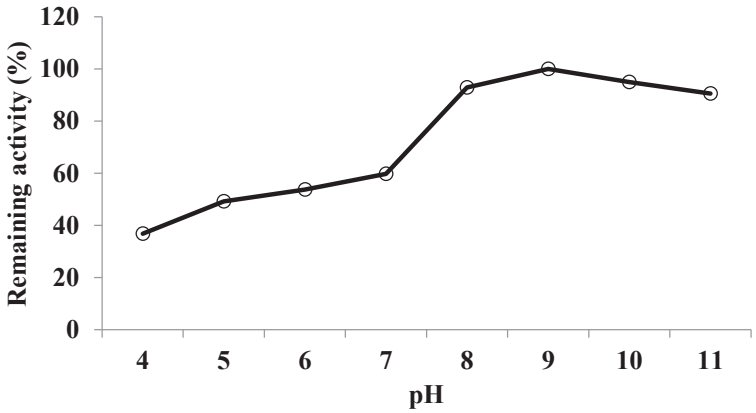

Figure 3. Effect of pH on stability of β-galactosidase.

The purified β-galactosidase activity increased with temperature up to 60 °C, after 70 °C the enzyme activity decreased (Figure 4).

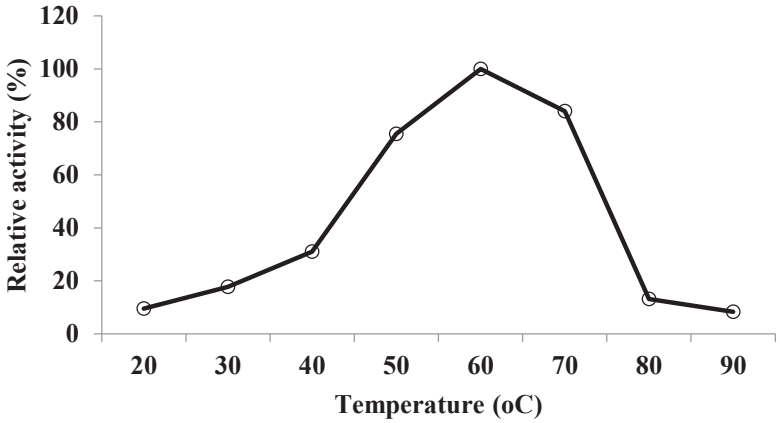

Figure 4. Effect of temperature on β-galactosidase.

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Vetere and Paoletti (1998), Chakraborti et al. (2000) and Di Lauro et al. (2008) reported optimum temperature of β-galactosidase activity was 60 °C for *B.circulans, Bacillus sp*. and *A. acidocaldarius*, respectively. The enzyme is highly stable at 60 °C for 120 min (Figure 5). Thermostable β-galactosidases are tolerant to immobilization and pasteurization have an economic advantage (Ohtsu et al. 1998).

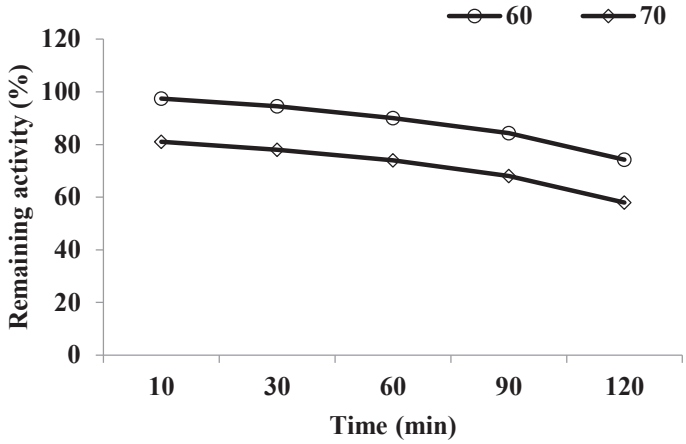

Figure 5. Effect of temperature on stability of β-galactosidase.

the effect of some metal ions on enzyme activity In Table 2 we can see that. The enzyme activity was significantly inhibited by divalent metal ions Cu^{2+} and Zn^{2+} in the total activity result. In previous studies,Ladero et al. (2002) and Shipkowski et al. (2006) stated that Cu^{2+} ions inhibited the enzyme activity. In addition, Ca^{2+} (at 1 mM to 20 mM) activated the enzyme activity while addition of EDTA to assay mixute leads to enzyme inactivation. It is known that enzyme activity in most β-galactosidases increases with Ca^{2+} (Berger et al. 1997) β-galactosidase is considered a metalloenzyme since treatment of the unfolded protein with chelating agents and subsequent refolding experiments ought to be carried out in order to leave out the structural and catalytic metal ions on the enzyme.

Table 2: Effect of some metal ions on β-galactosidase

	Percentage activity retained (%)				
Concentrations / Metal	1 mM	2 mM	5 mM	10 mM	20 mM
EDTA	68	64	63	60	58
CaCl2	108	111	114	132	178
MgCl2	94	94	94	94	95
ZnCl2	48	46	46	46	39
CuCl2	29	24	23	11	6

Optimal combinations of β-Mer and Iod A for maximum β-galactosidase activity was determined as 8 mM β-Mer and 2 mM Iod A while for minimum β-galactosidase activity was determined as 4 mM β-Mer and 10 mM Iod A. (Fig. 6) The optimal combinations of DTT and Iod A for maximum β-galactosidase activity was determined as 8 mM DTT and 8 mM Iod A and for minimum β-galactosidase activity was determined as 1 mM DTT and 4 mM Iod A (Fig. 7). The combined effect of DTT and β-Mer for maximum β-galactosidase activity was determined as 8 mM DTT and 8 mM β-Mer and minimum β-galactosidase activity was determined as 4 mM DTT and 4 mM β-Mer (Fig. 8). According to our experimental design, in Fig. 9, the combined effect of PMSF and NEM on maximum activity was obtained at 2 mM PMSF and 8 mM NEM. Therefore, it was concluded that no thiol or carboxylic residue are essential for its catalytic activity. It can be seen that there is also a decrease in enzyme activity at 4 mM PMSF and 1 mM NEM because of the measurement error.

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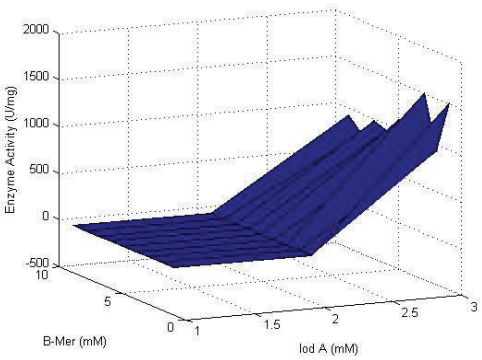

Figure 7: Response surface plot showing the effect on β-mer, Iod A and their mutual effect on the β-galactosidase activity.

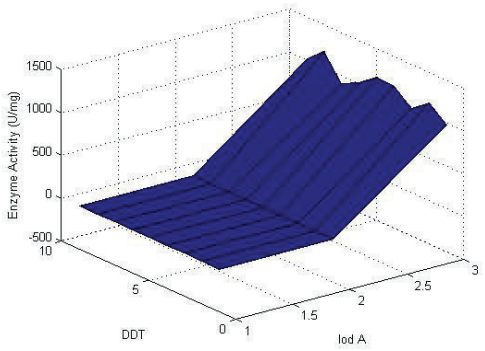

Figure 8: Response surface plot showing the effect on DTT, Iod A and their mutual effect on the β-galactosidase activity.

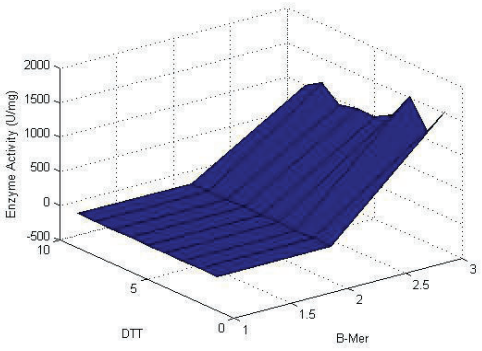

Figure 6: Response surface plot showing the effect on DTT, β-mer and their mutual effect on the β-galactosidase activity.

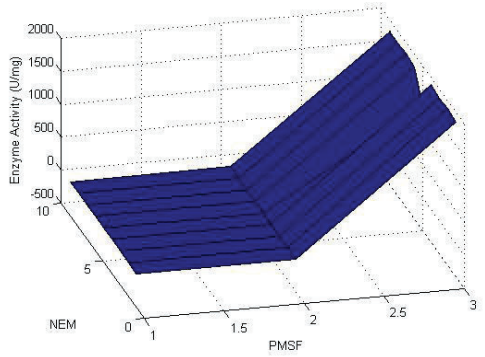

Figure 6: Response surface plot showing the effect on MEN, PMSF and their mutual effect on the β-galactosidase activity.

Conclusion

The main goal of this study was to purify, characterize and reveal the effect of concentrations of some chemicals on β-galactosidase activity and for that purpose experimental design in semiparametric regression method was used as variable of nonparametric part had unknown measurement error. The significant achievement of the present work was to enable us to have no information about a measurement error in nonparametric variable and the combined effect of the six chemicals on the enzyme activity. The method that was selected for the optimization of chemical concentration was found to be quite simple, adequate, and taking less time and material.

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COLD METAL TRANSFER (CMT) WELDING TECHNOLOGY

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Abstract: The cold metal transfer (CMT) process basically uses the same system as a Metal Inert Gas/Metal Active Gas (MIG/MAG) system. The CMT process concentrates on welding of thin sheet metal products from stainless steel, aluminum (Al), magnesium (Mg), Mg-Al alloys and dissimilar metals etc. The CMT technology is an alternative to MIG/MAG, providing advantages, such as reduction of distortions, high welding speed, good tensile performance and increased productivity. This is mainly due to low heat input, achieved by controlled movement of the electrode. CMT provides the most stable arc and a complete process regulation. Thus, it gives better results. In this study, the technology of cold metal transfer welding was investigated.

Keywords: Welding, CMT, Process, Metal Joint

Introduction

Fusion welding is an ideal and economical means of achieving good productivity. Fusion welding through MIG/MAG is achieved by coalescence of metals by melting continuously feed current-carrying wire. Its wide popularity is due to practical advantages offered like: continuously feed electrode, flux free operation, relatively low operator skills required, ease of automation. But, it is very important to reduce the negative effects of local melting at fusion welding of metals.

There are materials and applications that cannot withstand the constant heat of a welding process. During welding, temperature variations in welds and parent metals have important effects on material characteristics, residual stresses as well as on dimensional and shape accuracy of welded products. This is especially important in the case of thin sheet metal products, where control over welding distortions or deformations is difficult. The joining of dissimilar materials requires precise knowledge of the properties of each material. Aluminum is highly regarded due to its low specific weight and its excellent usability and processing characteristics. On the other hand, its strength and low cost make steel indispensable in many areas of industry. Other requirements primarily address anti-corrosion features, thermal expansion coefficient, and atomic properties. When joining steel and aluminum under the influence of heat, what is known as an intermetallic phase is created at the interface between the two materials. The more heat that is applied, the more extensive the intermetallic phase and the poorer the mechanical properties of the join will be.

The CMT process evolved from the continuous adaptation of the MIG/MAG process to resolve the problems posed by the joining of metals. CMT is a controlled process and allows the material transfer to take place with barely any flow of current (Talalaeva et al, 2012; Website1, 2017; Pickin et al, 2015; Pickin et al, 2011).

Cold Metal Transfer (CMT) Method

The CMT (Cold Metal Transfer) process is a revolution in welding technology both in welding equipment and applications (Website2. 2017). Cold metal transfer (CMT) is an automated welding process based on dip transfer welding, characterized by controlled material deposition during the short circuit of the wire electrode to the workpiece (Pickin and Young, 2013). CMT welding is a variant of MIG/MAG welding. This process has been developed for applications where a controlled low level of heat transfer is desired (Website3, 2017).

CMT is known as an innovated welding process based on short-circuiting transfer process with low heat input and no spatter. It is suitable to join the very thin sheets which are widely used in the machine parts (Lin et al, 2013). The principal innovation is that the motions of the wire have been integrated into the welding process and into the overall control of the process. Every time the short circuit occurs, the digital process-control both interrupts the power supply and controls the retraction of the wire. The wire retraction motion assists droplet detachment during the short circuit, thus the metal can transfer into the welding pool without the aid of the electromagnetic force. Then the heat input and spatter can be decreased greatly (Feng et al, 2009). During the joining process, the low

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heat input is the key important factor, and it is directly related to the joining zone. Therefore, in order to obtain a joint with excellent performance, a lower heat input is preferred. In this situation, cold metal transfer (CMT) arc welding as a modified metal inert gas welding process is characterized by low heat input and no-spatter welding, which is very suitable for joining of metals (Zhou et al, 2014). The CMT welding equipment is shown in Figure 1.

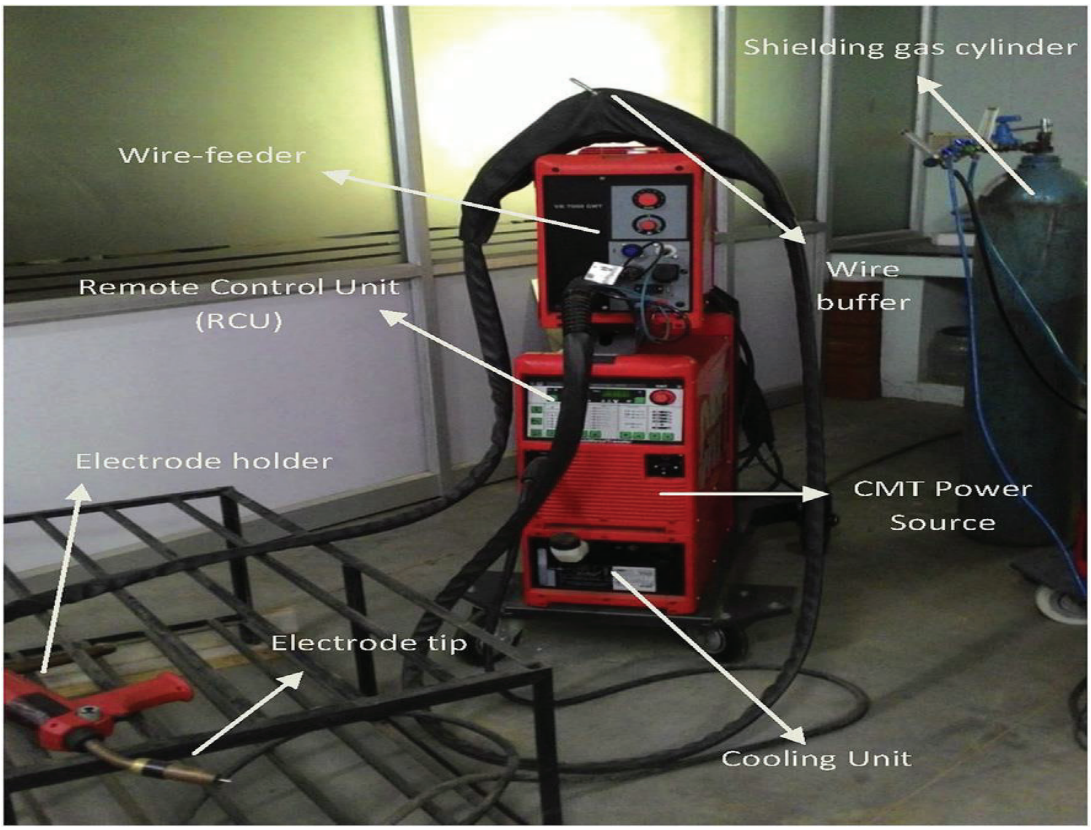

Figure 1. CMT welding equipment (Kumar et al, 2016).

A typical CMT welding electrical signal cycle is shown in Figure 2. A cycle can be defined as the period required to deposit a droplet of molten electrode into the weld pool. From the figure, we can divide the cycle into three phases: (1) the peak current phase. This is represented by a constant arc voltage corresponding to a high pulse of current. The high pulse current make the ignition of the welding arc easily and then heats the wire electrode to form droplet. In this phase, the brightness of the arc is very high. (2) The background current phase. The phase is represented by a lower current. Through the peak current phase, a little liquid droplet is formed on the wire tip. In order to inhibit the globular transfer, so the current decreases abruptly. This phase is the background current phase. Then the low current keeps constant until the short-circuiting process happens. (3) The short-circuiting phase. In this phase, the wire contacts with the weld pool and the arc voltage changes into zero and the arc extinguishes. The back-drawing force becomes the main factor to urge the droplet break away from the wire into the weld pool (Zhang et al, 2009).

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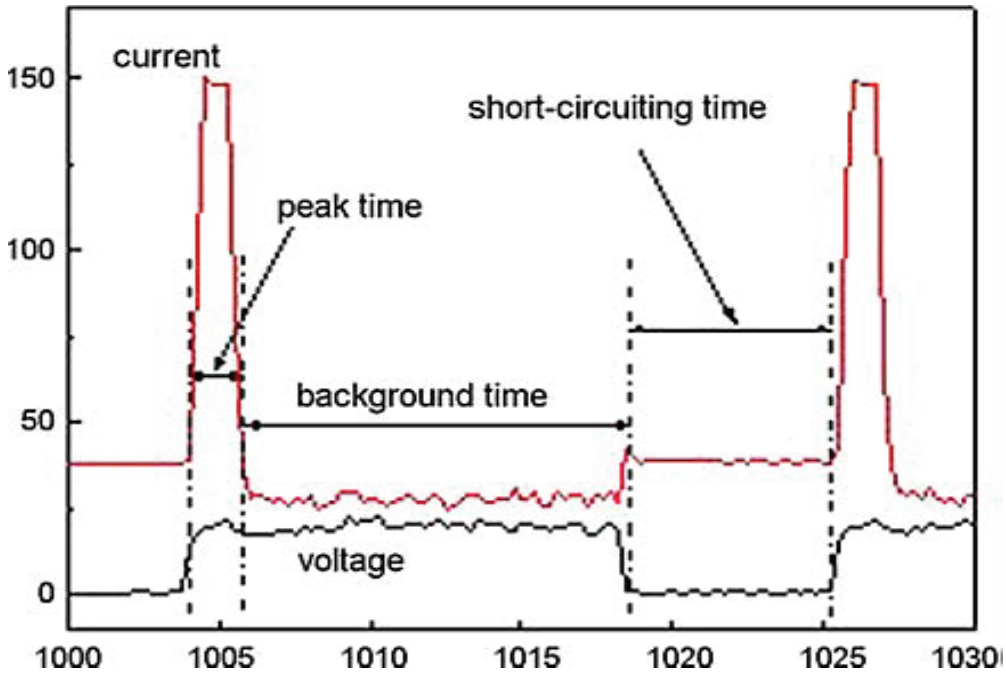

Figure 2. The current and voltage waveforms of the CMT process (Zhang et al, 2009).

The only major difference between most of the systems relates to whether they are regulated by software or hardware. The exception is the CMT system, which integrates control of the motion of the wire into the welding process control to support droplet formation and detachment. This principal phases of wire motion control is shown in Figure 3 (A,B,C,D). During the arcing period, the wire motion towards the weld-pool (A), When the wire dips into the weld-pool, short circuiting occurs, the arc is extinguished and the welding current is lowered (B), at which point the wire is retracted, the rearward movement of the wire assists droplet detachment during the short circuit (C). Metal transfer supported by surface tension in the melt means that the current can be maintained at a very low level; with reduced heat input and spatter. After opening of the short circuit, the wire motion is reversed and the process begins all over again (D). In this case, the process cycle is random, with the oscillation frequency varying with time; but typically around 70 Hz. Up to 70 shifts of cold and hot phases are made every second and this decreases the thermal influence on the workpiece (Website4. 2017).

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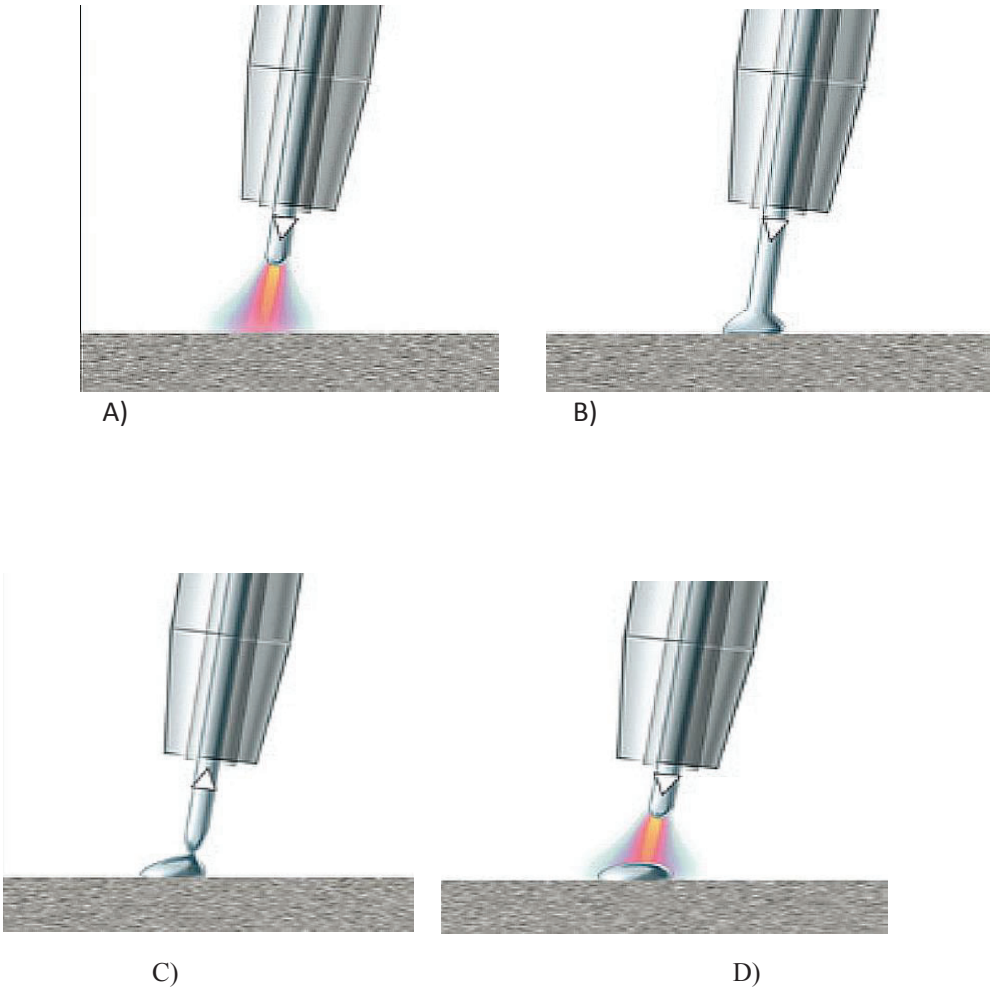

Figure 3 (A,B,C,D). Principal phases of wire feed control in the CMT process (Website4. 2017).

Conclusions

The CMT process has a universal range of application and sets brand-new standards in welding technology. CMT has a number of more than satisfactory mechanical and technological characteristics. The CMT Process is suitable for use in all industrial sectors: from the automotive and supplier industries to industrial plant and pipeline construction, to maintenance and repair work. Essentially, all automated or robot-assisted tasks are suitable. All customary base and filler metals can be used. There are a number of other extremely interesting potential applications, including the spatter-free brazing of coated sheets, the light-gauge welding of aluminum, welding of magnesium, dissimilar metal joining and controlling of the intermetallic compound layer thickness. A large number of trials are currently in progress. CMT process is likely to be suitable for many applications in the future.

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COMPARING THE TURKISH FOREST ROAD TYPES AND SPECIFICATIONS TO DIFFERENT COUNTRY REGULATIONS

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ABSTRACT: With the expansion in forest areas, the need of forest roads has been increasing each and every day due to reasons including increased productivity in rehabilitation activities, faster and efficiently. In addition, access and extinguishing intervention to the fireplace in forest in case of fire on time is very important to prevent spread of the fire. Countries have their own regulations and guidelines to provide guidance to their technical specialists in design, construction and management phases of forest roads. These guidelines are generally used to provide information to the specialists by giving standards and application methods in main characteristics of forest roads including; study, application, road standards, superstructure, repairs and maintenance. In this study forest road types and specifications of the Turkish General Directorate of Forestry Communiqué No. 292 is examined and compared with Coford and Colorado.

Keywords : Turkish Forest road types, Coford, Colorado Forest Roads

ÖZET

Orman arazilerinin genişlemesi, rehabilitasyon çalışmalarının verimli bir şekilde yapılması gereksinimi sebebiyle orman yollarına olan ihtiyaç günden güne artmaktadır. Bununla birlikte yangın anında olay yerine hızlı ve etkin bir şekilde müdahale etmek yangının hızlı bir şekilde önlenmesi adına çok önemlidir. Orman yollarının tasarım, yapım ve yönetim aşamalarında teknik elemanlara kılavuzluk etmesi amacı ile farklı ülkelerin kendine özgü yönetmelikleri ve kılavuzları bulunmaktadır. Kullanılan bu kılavuzlar genel olarak orman yollarının başlıca özellikleri olan; etüt, aplikasyon, yol standartları, sanat yapıları, üstyapı ve tamir bakım yöntemlerine ilişkin standartları ve uygulama yöntemleri hakkında bilgiler vermektedir. Bu çalışmada Türkiye'de orman yollarının yapım, tasarım ve yönetimi kılavuzu olan Orman Genel Müdürlüğü'nün 292 Sayılı Tebliğinde yer alan orman yol tipleri ve standartları, Coford Orman Yolları Kılavuzu ve Kolorado Orman Yolları El Kitabındaki bilgiler incelenerek karşılaştırılmıştır.

Anahtar Kelimeler : Türkiye Orman Yol Tipleri, Coford, Colorado Orman Yolları

GIRIŞ

Orman arazilerinin artması ile birlikte, rehabilitasyon çalışmalarının etkili ve verimli bir şekilde yapılması, yangın anında olay yerine hızlı ve etkin bir şekilde müdahale edilmesi amacıyla ve işletmeye açılan ormanlardan elde edilen emvallerin her türlü taşıma aracına uygun olacak şekilde, ekonomik ve en kısa sürede taşınması amacıyla orman yollarına olan ihtiyaçlar her gün geçtikçe daha da artmaktadır.

Ülkemizde mülkiyeti devlete ait yaklaşık 21,7 milyon Ha. Orman alanı içerisinde toplam 21.375 orman köyünde 7.095.650 kişi yaşamakta olup, kırsal kesimde yaşayanlarında % 40'ı orman köyünde yaşamaktadır (OGM, 2012). Ayrıca ülkemizde orman yol şebeke çalışmaları 1979 yılında genel hatları ile tamamlanmıştır ve her yıl ortalama 1.000 km yeni orman yolu ilave edileceği ve yine yaklaşık 1.000 km uzunluğundaki standardı düşük orman yollarının, büyük onarımı yapılacağı belirtilmektedir (Çağlar ve Acar, 2006; OGM, 2006).

Orman yolları, ormanların işletmeye açılmasına hizmet eden, tekerlekli araçların bütün yıl nakliyat yapmasına yönelik, orman içi ve orman dışı bağlantıyı sağlayan tek şeritli yollar, olarak tanımlanabilir. Her türlü modern ormancılık faaliyetlerinin yapılabilmesi için ormanlarımızın iyi bir orman yol ağıyla kaplı olması gerekir. Orman yol şebekesinin düzenli ve kapsamlı olması halinde başta koruma olmak üzere, ormana yapılacak her türlü bilimsel ve teknik müdahalelerle yıllık cari artım üzerinde etkili olmak ve her türlü orman ürünü orman dışına taşıyarak

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kıymetlendirilmesini sağlamak mümkün olmaktadır. Ayrıca orman içi açıklıkların ağaçlandırılması ve yangın anında ormana müdahalenin tam ve zamanında yapılabilmesi, tamamen yol ağına bağlıdır (Erdaş, 1997).

Orman yol planlaması, etütü, aplikasyonu, standartları, yapımı, tamiri, bakımı ve sanat yapıları gibi özellikleri her bir orman sahası için ayrı ayrı yorumlanmalıdır. Her bir alanın tasarım aşaması tamamlandığı zaman gerekli şartname belgeleri hazırlanarak yolun yapımına geçilmelidir. Dünyanın farklı ülkelerinde, farklı iklim koşullarına maruz kalan orman yollarıyla ilgili birçok farklı kanunlar, tebliğler, kılavuzlar vb. kaynaklar kullanılmaktadır. Bu çalışma kapsamında Türkiye'nin kullanmakta olduğu, "292 Sayılı Tebliğ, Orman Yolları Planlanması, Yapımı ve Bakımı", İngiltere'de kullanılan Coford "Orman Yol Kılavuzu, Orman Yolları Tasarımı, Yapısı ve Yönetimi için Kılavuz İlkeleri" ve Amerika Orman Yolları Yapımında da faydalanılan "Kolorado Orman Yolları El Kitabı" kaynakları incelenmiştir. Ülkemizde kullanılmakta olan tebliğ Orman Genel Müdürlüğü (OGM) tarafından 2008 yılında, İngilterede kullanılan kılavuz 2004 yılında İrlanda tarafından ve Amerika'nın da yaygın olarak başvurmuş olduğu Orman Yol Kılavuzu ise 2011 yılında Kolorado Orman Departmanı tarafından hazırlanmıştır.

TÜRKİYE ORMAN YOLLARI TİPİ VE STANDARTLARI

Orman yolları, orman ürünlerinin en kısa ve en güvenli şekilde taşınması için önemlidir. Orman yollarının uygulama alanına göre yol standartlarına karar verilmelidir. Uygulama alanlarının koşulları, bölgeler arasında farklılıklar gösterdiğinden dolayı ülkemizde ve diğer dünya ülkelerinde orman yolları farklı sınıflara ayrılmıştır. Ülkemizde Orman Genel Müdürlüğü, 292 Sayılı Tebliğ Orman Yolları Tipi ve Standartları Tablo 1'de verilmiştir.

Tablo 1. Orman Yolları Geometrik Standartları (OGM, 2008)

YOLUN TİPİ	BİRİMİ	ANA ORMAN YOLU	TALİ ORMAN YOLU				TRAKTÖR YOLU
			A - TİPİ	B - TİPİ			
				SBT	NBT	EBT	
Taşınacak Emval	M3	> 50.000	25.000 – 50.000	< 25.000			-
Trafik İşaretlemeleri		Zorunlu					
Platform genişliği	M	7	6	5	4	3	3,5
Şerit sayısı	Adet	2	1	1	1	1	1
Azami eğim	%	8	10	9	12	12	20
Asgari kurp yarıçapı	M	50	35	20	12	8	8
Şerit genişliği	M	3	3	3	3	3	3
Banket genişliği	M	0,50	0,50	0,50	0,50	0.50	
Hendek genişliği	M	1,00	1,00	1,00	1,00	0.50	
Üst yapı genişliği	M	6	5	4	3	3	
Köprü genişliği	M	7+(2x0,6)	6+(2x0,6)	5+(2x0,6)		4+(2x0,6)	

Orman Yolları, bir yılda üzerinden taşınacak emval miktarları, yapılış gayeleri, trafik yoğunluğu, seyir halindeki araçların büyüklüğü ve tonajları dikkate alınarak üç ana gruba ayrılmıştır. Sırasıyla; Ana orman yolları, tali orman yolları (A tipi tali orman yolu ve B tipi tali orman yolu) ve traktör yollarıdır. Bu yolların konumları ve geometrik standartları aşağıdaki tabloda gösterilmiştir. B Tipi orman yolları Standartları Yükseltilmiş B-Tipi Tali Orman Yolu (SBT), Normal B-Tipi Tali Orman Yolu (NBT): ve Ekstrem B-Tipi Tali Orman Yolu (EBT) olarak üç gruba ayrılmıştır. Şekil 1.'de Kayseri-Develi arası bir B Tipi Tali orman yolu görülmektedir.

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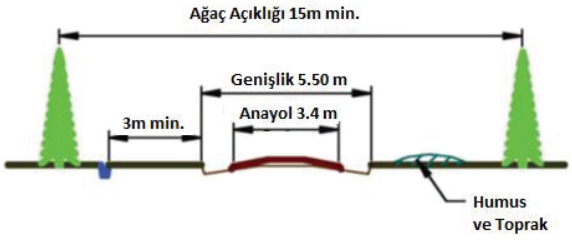
Şekil 1. Kayseri-Develi B Tipi Tali orman yolu

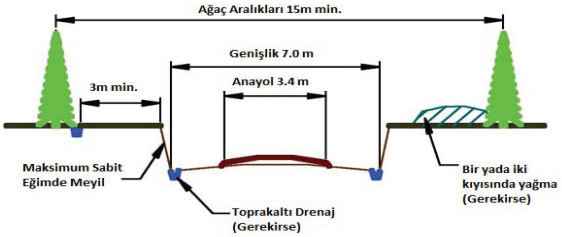
COFORD – ORMAN YOLLARI KLAVUZU ORMAN YOLLARI TASARIM STANDARTLARI

Coford orman yol kılavuzunda orman yol tasarımında, araç boyutları göz önüne alınarak optimum yol geometrisi ile trafiğin karşılanması ilkesi benimsemiştir. Ayrıca orman yolları tasarımı yapılırken inşaat maliyetini minimumda tutacak tasarım, belirlenen araç hızları ve sürücü güvenliğini sağlamak durumundadır.

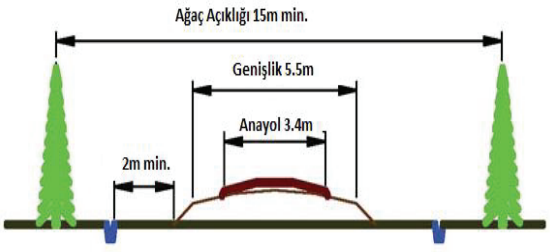
Bu kılavuza göre tasarımcılar, orman yollarının tasarımını yaparken, orman yollarının birincil yapım amacının, kereste çıkarılması ve taşınması olduğunu göz önünde bulundurmak durumundadır. Orman yolları, toprak türlerine ve eğimli yamaç sınıflarına göre sınıflandırılmaktadır. Toprak tipleri Mineral Topraklar, Sığ turbalar (Derinliği 2 m'den az olanlar) ve Derin turbalar (Derinliği 2 m veya daha fazla olanlar) olarak, yamaç eğimleri ise hafif eğimli (1:7 düşey:yatay oranı) yaklaşık %14,3 eğim'den daha az eğimli) ve eğimli (1:7 (düşey:yatay oranı) yaklaşık %14,3 veya daha fazla eğimli) olarak belirlenmiştir. Bu sınıflandırmalar birleştirildiğinde 5 orman yol sınıfı çıkarılabilir. Bunlar; Mineral Topraklı-Hafif Eğimli, Mineral Topraklı-Eğimli, Sığ Turba-Hafif Eğimli, Sığ Turba-Eğimli, Derinliği 2 m'den fazla olan derin turbalar. Şekil 2.'de toprak cinsi ve eğim durumuna göre Coford tarafından önerilen yol tipleri görülmektedir.



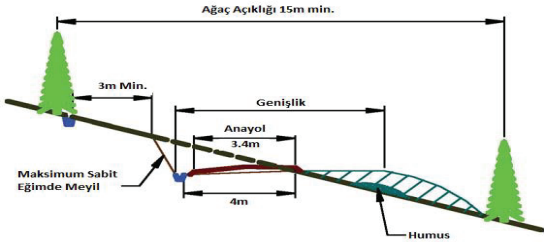
a. Mineral Topraklı-Hafif Eğimli Tipik Orman Yolu



b. Mineral Topraklı-Eğimli Tipik Orman Yolu



c. Bentler İçin Tipik Orman Yolu



d. Eğimli Alanlarda Tipik Orman Yolu

Şekil 2. Coford tarafından önerilen yol tipleri (Coford, 2004)

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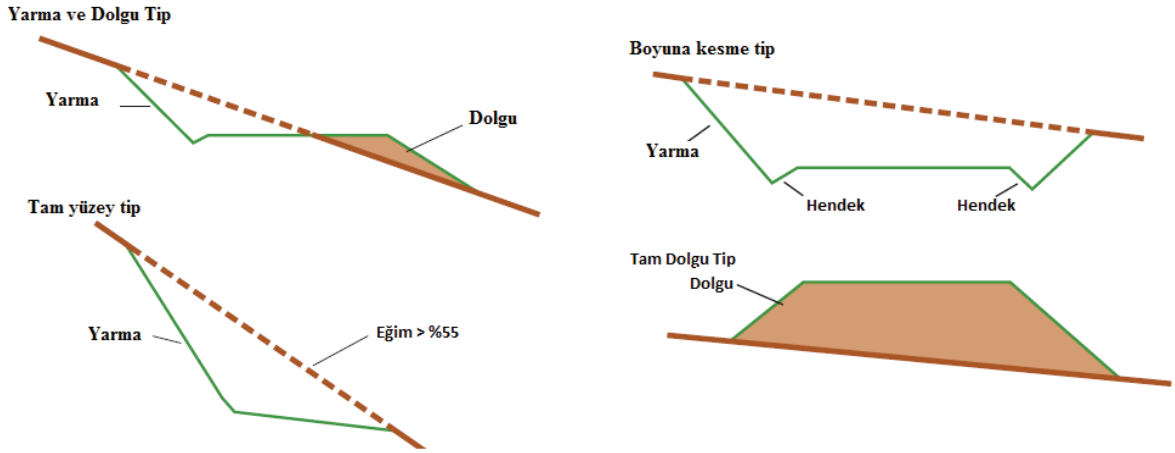
Yatay Kurplar için asgari standart yarıçapı 20 m olarak belirlenmiş olup, fiziksel ve ekonomik faktörlerin izin verdiği yerlerde doğal olarak daha büyük bir yarıçap kullanılabilmektedir.

COLORADO – ORMAN YOLLARI EL KİTABI ORMAN YOL TİPLERİ

Bu orman yolu el kitabında çeşitli arazi sınıfları için yol tipleri bulunmaktadır. Bunlar, karışık tip kesit (Yarma ve Dolgu), Tam Dolgu, Boyuna Yarma ve Boyuna Dolgu tip kesitleridir. En yaygın kullanılan karışık tip kesitler, %45-55 eğimli yamaçlarda (toprak tipine bağlı olarak) kullanılır. % 45-55 eğimden büyük yamaçlarda genellikle Tam yarma yüzey tip yollar kullanılır. Boyuna yarma tip yollar, aşırı dik yol bölümlerinde ve yarma gerektiren yol kesimlerinde kullanılır. Boyuna Dolgu tip yollar; çapraz drenaj alanlarında, suyun bulunduğu düz arazi ya da sulak alanlarda kullanılır. Şekil 3.'de Colaroda orman yolu el kitapçığında önerilen yol kesit tipleri görülmektedir.



Şekil 3. Colaroda Orman Yolu El Kitapçığı Önerilen Yol Kesit Tipleri

Yol yüzeyinin geometrik şekli, çatı eğimli, içbükey, dışbükey ve şekilsiz olarak ayarlanmaktadır. Burada amaç yol yüzeyinin üzerindeki akış suyunun tahliye edilmesidir. Çatı eğimli yol yüzeyleri, yolun her iki tarafında da yüzey sularını taşırlar. İç bükey yollar, yolun iç (ya da yokuş aşağı) kısımlarında yüzey sularını taşırlar, çatı eğimli yollarda olduğu gibi, yol yatağı altında su kanalı yapılır veya yolun yokuş aşağı tarafında, su akışını sağlamak amacıyla hendek çukurları kullanılmalıdır. Dış bükey yollar, yokuş aşağı yüzey sularını dökerler ve genellikle yokuş yukarı taraflarında hendek yoktur. Karşılaşılan bir başka özel orman yol şekli de hiçbir geometrik şekle sahip olmayanlardır. Bu yollarda etkili su tahliyesi yoktur ve belirli bir yüzey geometrisine sahip yollara göre; bu yollara farklı su yönlendirme teknikleri ve bakımları yapmak gerekir

Yüzey şekli ne olursa olsun, yarma ve dolgu yollarda belirli bir miktar kazı yapılmaktadır. Tablo 2'de farklı toprak/kaya koşulları için bazı ortak eğim oranlarını verilmiştir.

Tablo 2. Değişik toprak ve kaya koşulları için ortak eğim oranları (Colorado, 2011)

Toprak/Kaya Kondisyonları	Yamaç Oranları (Yatay:Düşey)
Çok kayalık	1/4:1 - 1/2:1
Çok topraklı	3/4:1 - 2:1
Çok çatlaklı kaya	1:1 - 1/2:1
Gevşek, iri taneli topraklı	1/2:1 - 3:1
Ağır killi topraklar	2:1 - 3:1
Yumuşak, kil bakımından zengin bölgeler veya ıslak sızıntı alanları	2:1 - 3:1
Çok topraklı dolgular	1/2:1 - 3:1
Sert köşeli dolgular	1/3:1 - 1.5:1
Düşük kesme ve dolgular (<6-10 m yükseklik)	2:1 veya daha yüksek

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Bu kılavuzda orman yolu yapımında kullanılacak malzeme özellikleri hakkında detaylı bilgiler verilerek, yüksek oranda silt ve/veya kile sahip toprak grupları yol yapmak için yeterli olmadığı, bununla birlikte doğru oranda silt ve/veya kil karışımlı toprakların uyumlu ve dayanıklı bir yol yüzeyi sağlayabildiği belirtilmiştir. Benzer şekilde, topraktaki genel kohezyon ve nem miktarı, bir orman yolu için mevcut toprak temelinin yeraltı uygunluğunu belirlemektedir. Bu da agrega veya çakıl kaplama veya jeotekstil serilmesi ile yapılan diğer alternatif yolları gerektirebilmektedir.

Genel olarak orman yol eğimleri, %0-1 arası düz, %2-4 arası hafif eğimli, %5-8 arası orta sınıf eğimli, %9-12 arası dik ve eğimi %12'den büyük olan yollar ise çok dik yollar olarak sınıflandırılmıştır. Bununla birlikte asgari yol ve hendek eğiminin yeterli drenajı sağlayabilmesi için ± %2 olması, aşağı yönde maksimum eğimin %-10'u, yukarı yönde ise maksimum %+12'yi geçmemesi tavsiye edilmektedir. Yatay kurp yarıçapı için minimum 50 m istenmektedir. Genel olarak bir yolda 12 m genişlik, günlük işlerde kullanılan araçlar için yeterli olduğu kabul edilmiştir. Tablo 3'de farklı yol kullanımları için yol genişlikleri verilmiştir.

Tablo 3. Colorado Orman Yolu El Kitabı Farklı Yollar için Genişlikler (Colorado, 2011)

Yol Kullanımı	**Maksimum Genişlik**	**Tercih Edilen Genişlik**
Geçici yollar	18 m	12 m
Toplayıcı yollar	22 m	16 m
Anayola mesafeli yollar	30 m	24 m

YOL TİP VE STANDARTLARININ DEĞERLENDİRMESİ

Ülkemizde kullanılan 292 sayılı tebliğe göre; yol genişliği minimum olarak traktör yollarında 3,5 m önerilirken, ana orman yollarında minimum 7 m önerilmiştir. Yani yol genişlikleri 3,5 m ile 7 m arasında değişmektedir. Coford'a göre; az eğimli yollarda ve yamaçlarda 5,5 m önerilirken, eğimli yollarda 7 m olarak önerilmiştir. Yani yol genişlikleri 5,5 m ile 7 m arasında değişmektedir. Kolorado, orman yolları el kitabına göre; geçici yollarda tercih edilen yol genişlikleri 12 m olarak önerilirken, ana yola uzak olan yollarda tercih edilen genişlik 24 m olarak önerilmektedir. Yani yol genişlikleri 12 m ile 24 m arasında değişmektedir. Bu yol genişlikleri karşılaştırılacak olursa, ülkemizde kullanılan 292 sayılı tebliğ ile İrlanda da hazırlanan Coford neredeyse aynı değerlere sahipken, Kolorado orman yolları el kitabı tercih edilen yol genişliklerini daha yüksek tutmuştur.

Ülkemizde kullanılan 292 sayılı tebliğe göre; yol eğimleri tali orman yollarında maksimum %12 önerilirken, ana orman yollarında maksimum %8 olarak önerilmiştir. Yani önerilen yol eğimleri %8 ile %12 arasında değişmektedir. Coford' a göre; yolun düz bölümlerinde maksimum eğim %10 olarak belirlenirken, yolun kavisli bölümlerinde maksimum eğim %8,3 olarak belirlenmiştir. Yani önerilen yol eğimleri %8,3 ile %10 arasında değişmektedir. Kolorado, orman yolları el kitabına göre; en uygun yol eğimi %2 ile %8 arası olurken, zorunlu koşullarda boyuna maksimum eğim %12' e kadar çıkabilmektedir. Dönemeçli yollarda ise maksimum eğim %5 olarak belirlenmiştir. Yani önerilen yol eğimleri %5 ile %12 arasında değişmektedir. Bu yol eğimleri karşılaştırılacak olursa, ülkemizde kullanılan 292 sayılı tebliğ ve Kolorado orman yolları el kitabı, maksimum yol eğimlerini %12 ile aynı önerirken, İrlanda da hazırlanan Coford maksimum yol eğimini %10 olarak önermiştir. Ayrıca her üç ülke de her orman yolunda, yol yüzeyi üzerinde drenajı sağlamak için, minimum %1-2 yol eğimi yapılmasını önermiştir.

Ülkemizde kullanılan 292 sayılı tebliğe göre; minimum kurp yarıçapı normal tip tali orman yollarında 12 m, ana orman yollarında 50 m olarak önerilmiştir. Yani önerilen kurp yarıçapı 12 m ile 50 m arasında değişmektedir. Coford' a göre; minimum kurp yarıçapı keskin kurplarda 12 m olarak önerilirken, normal tip yollarda minimum 20 m olarak önerilmiştir. Yani önerilen kurp yarıçapı 12 m ile 20 m arasında değişmektedir. Kolorado, orman yolları el kitabına göre; kurp yarıçapı minimum 50 m olarak önerilmiş olup, hatta büyük, yüklü kamyonlarda göz önüne alınarak minimum kurp yarıçapının 60-75 m civarlarına kadar çıkarılması önerilmiştir. Bu yol minimum kurp yarıçapları karşılaştırılacak olursa, ülkemizde kullanılan 292 sayılı tebliğ ile İrlanda da hazırlanan Coford kavisli alanlarda ya da tali yollarda minimum kurp yarıçapını aynı önerirken, ana orman yollarında; minimum kurp yarıçapını 292 sayılı tebliğ 50 m önererek daha yüksek bir değer önermiştir. Kolorado, orman yolları el kitabı ise tüm orman yollarında minimum kurp yarıçapını, ülkemizde kullanılan 292 sayılı tebliğin ana orman yollarında önerdiği gibi mimimum 50 m önererek, diğer kılavuzlara göre daha güvenlikli bir yol amaçlamıştır.

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Tablo 4 . Orman Yolu Tip ve Yapım Şartnamelerinin Özet Karşılaştırma Tablosu

	292 Sayılı Tebliğ	Coford	Colorado
Yol Genişlikleri	3,5 m – 7 m	5,5 m – 7 m	12 m – 24 m
Yol Eğimi	%8 - %12	%8,3 – 10 m	%5 - %12
Kurp Yarıçapı	12 m – 50 m	12 m – 20 m	50 m – 75 m

SONUÇLAR

Bu çalışmada orman yolu inşaatında önemli rol oynayan; Orman yollarının genel özellikleri, geometrik standartlar değerlendirilmiş, bu konuda çalışma yapmış iki ülkenin standartları ile Türkiye'nin orman yol kitapçığı karşılaştırılmıştır. Orman yollarının tipleri ve geometrik özellikleri açısından Türkiye'de geçerli olan şartname ile İngiltere ve Amerika'daki kabul gören kılavuzlar incelendiğinde;

- Orman yolu yapım maliyetlerini, üstyapı giderlerini ve kesilecek ağaç sayılarını artırmasına rağmen; sürücü güvenliğini sağlamak, yangın anında uzun ve geniş araçların dönüşlerini kolaylaştırmak ve kesimden elde edilen emvalleri taşıyan tırların hareketlerini kolaylaştırması amacıyla Colorado Orman Yolları El Kitabının önerdiği şekilde yol genişliklerinin 12 m'den daha geniş olacak şekilde (yaklaşık 24 m) yapılması uygun olacaktır.

- Maksimum eğim %12 olarak önerilse de yol eğiminin çok zorunlu arazi şartları olmadığı sürece, yokuş yukarı %8'den fazla olmaması önerilmektedir. Kurp yarıçapı ise orman yollarında kullanılan geniş nakliye araçları düşünülerek her ne kadar 292 sayılı tebliğde minimum 12 m olarak önerilmiş olsa da, uygulamada olabildiğince geniş yapılması, hatta maksimum yarıçap olan 50 m'nin her kurpta yapılmasının uygun olacağı düşünülmektedir.

Orman yollarının tasarım, yapım ve yönetimi ile ilgili çalışma yapan teknik personele rehberlik etmesi amacıyla hazırlanan bu çalışma ile orman yolları ile ilgili farklı kaynakların karşılaştırılması ve değerlendirilmesi faydalı olacaktır. Orman yolunu kullanacak taşıt özelliklerinin değişmesi ve yol yapım teknolojilerinin gelişme durumlarına göre Türkiye'deki orman yolu şartnamesinin çağın gereklerine uygun hale getirilmesi gerekmektedir.

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COMPARISON OF QUALITY PARAMETERS FOR RING AND OPEN-END ROTOR SPUN YARNS

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Abstract: Spinning is a major part of the textile manufacturing process where among all these are ring spinning and open-end rotor spinning which are widely used in production of textiles. In this study, cotton (CO) and polyester (PES) fibers were used with various blends to produce both ring and open-end rotor spun yarns. These 3 different blends (33/67% PES/CO, 50/50 % PES/CO and 67/33 PES/ CO) of Ne 30/1 yarns were later knitted on a plain knitting machine. The physical properties of these produced spun yarns were studied i.e. evenness, hairiness, breaking strength and elongation with additionally pilling properties of the produced fabrics. It was observed that as the blend ratio of the PES fiber increases within the yarn structure the both breaking strength and elongation gets higher on the ring-spun and open-end rotor spun yarns. Among all these produced blended spun yarns, the highest breaking strength and elongation is 21.79 cN/tex and 8.96% respectively. Evenness test results showed that ring spun yarns presented better values than the open-end rotor spun yarns; the lowest %CV %90 was obtained on the %67/33 PES/CO ring spun yarns. Both imperfection values and hairiness gets better as the PES ratio increases within the both yarn types. On the other hand, better pilling resistance was obtained on the OE-rotor spun than the ring spun yarns. The pilling values also indicate that as the PES fiber ratio increases within the open-end rotor spun yarns it shows better pilling (pilling scale 4-5).

Keywords: Ring, Open-end, Rotor, Imperfections, Mechanical properties, Hairiness

Introduction

Staple yarns are constructed from the bundle of fibers, which are twisted together during the spinning process. The widely used ones are ring spinning and open-end rotor spinning technologies. If one would like to have a brief look to these techniques are given below:

The ring spinning machine was first invented by Thorp in 1828 and later Jenk added the traveler rotating around the ring in 1830. In the intervening period of more than 170 years the ring spinning machine has undergone considerable modification in detail, but the basic concept has remained the same. For many years any noteworthy further development hardly seemed possible, yet a significant process of evolution took place during this time (Ahmed, 2016). The principle of ring spinning is illustrated in Figure 1. A bundle of parallel fibers which are roving slivers fed to the drafting zone. The difference in surface velocity are obtained with the help of roller speeds; the front roller is faster and back roller is slower ones, hence drafting rollers will attenuate the roving to a thinner strand of parallel fibers, under the control of the double aprons. The thin strand of parallel fibers emerging from the front rollers is then simultaneously twisted and wound onto a yarn package (i.e., cop) mounted on a driven spindle. The twisted thin strand of fibers, now called a yarn, is threaded through a traveller and a yarn guide and balloons out between these two elements during spinning. The twisted yarn is then wound onto the bobbin or yarn package (Tang, 2006).

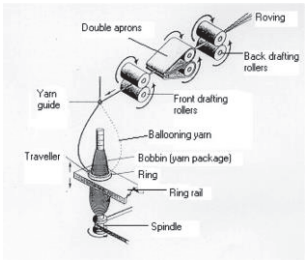

Figure1. The ring spinning process (Tang, 2006)

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On the other hand, commercial open end-rotor spinning was first developed in 1967 in Czechoslovakia. Open-end rotor spinning has been characterized from the outset by incomparably higher production potential than ring spinning. This potential has been increased by the higher rotor speeds and winding up speeds and also there is no need for roving process. Therefore, rotor-spun yarns are also can manufactured much cheaper than the ring-spun yarns. Rotor spinning combines in two process stages namely spinning and winding at the same single machine. Additionally the rotor spinning system is able to process carded or draw frame slivers directly. Last but not least, the rotor spinning system has benefited from the fact that operator functions on the rotor spinning machine were much easier to automate than those on the ring spinning machine. After the sliver has been opened on the opening roller are fed through the fiber transport channel individually to the collecting groove of the rotor itself. The rotor itself is also a twisting device of this spinning system. Since the individual fibers are released from a compact fiber bundle to the individually ones, this can here refer to an open-end yarn. This brief explanation of the process is also presented in the Figure 2.

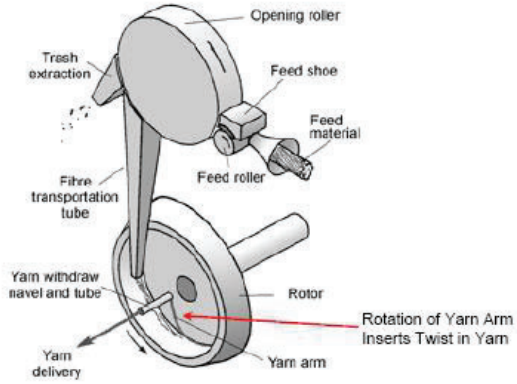

Figure 2. Principle of Rotor spinning (Sheikh and Emeritus, 2013)

One of the major distinctions between OE-rotor-spun yarns and ring spun yarns is the difference between the hairiness in the yarn. This was also studied by Tyagi et. al.(Tyagi, 2009) and they observed that open-end rotor spun yarns show less hairiness than the ring spun yarns which is related to twist factor. Strumillo et. al. (Strumillo, 2007) worked on quality parameters that may affect from different linear densities of cotton yarns on both ring and open-end rotor spun yarns; they determined various mathematical models on tenacity, elongation at break, unevenness, hairiness and the number of faults on the yarn's linear density.

Materials and Methods

In this study, polyester and cotton fibers and its different blends (PES/CO 33/67% -PES/CO 50/50 % - PES/CO 67/33%) were used at twist constant of α_e 3.3 and Ne 20 ring-spun carded yarns and open-end rotor-spun yarns were produced. The yarn tests were carried out at 20 ± 2 ^{0}C, 65% ± 2 RH conditions after the samples reaching equilibrium. The fibers properties of these materials are measured on the Spinlab HVI 900 and their results are given in Table 1, the specification of the machines are all presented in Table 1-5. The produced yarns were then knitted on the Dubied knitted machine with a knitting structure of supreme fabrics.

Table 1: Fiber parameters

Measured fiber parameters	Fiber used in the study	
	Cotton	Polyester
Cotton fiber fineness (micronaire)	4.74	-
Fiber length (ML) (mm)	28.2	-
Fiber strength (g/tex)	32.9	-
Fiber elongation (%)	9.4	-
(UR%)	50.4	-
Polyester fiber fineness (denier)	-	1.4
Fiber length (mm)	-	38

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Table 2: Carding machine specifications

Technological/machine set parameters	Values
Main cylinder speed (rpm)	650
Production rate (m/min)	210
Sliver count (Ne)	0.120

Table 3: Draw-frame machine specifications

Technological/machine set parameters	Values
Rotor speed (rpm)	86000
Total draft	8
Roller Distance in break-draft zone (mm)	52
Number of fed slivers	8
Sliver count (Ne)	0.120

Table 4: Ring machine specifications

Technological/machine set parameters	Values
Ring yarn type	Conventional
Spindle speed (rev/min)	14500
Ring diameter (mm)	42
Type of traveler and ISO No	C1 UL udr and 31.5
Theoretical twist coefficient (α_e)	3.5
Theoretical twist (turns/inch)	19

Table 5: OE-Rotor machine specifications

Technological/machine set parameters	Values
Rotor speed (rev/min)	86000
Rotor diameter (mm)	32
Nozzle	Plain with 8 groves, ceramic (KK8K)

Results and Discussion

1. Yarn count, twist parameters, yarn breaking tenacity and elongation

In this study, 3 different blends of materials were produced on the ring and OE-rotor spinning machines with the total of 6 yarns at the same your count Ne 30. Table 6 presents the parameters of these produced yarns.

Table 6: Yarn parameters

Yarn abbreviations	Yarn count	Production type	Yarn types
M	Ne 30	Ring	PES/CO (33/67%)
N			PES/CO (50/50%)
O			PES/CO (67/33%)
P		OE-Rotor	PES/CO (33/67%)
R			PES/CO (50/50%)
S			PES/CO (67/33%)

Yarn counts, twist parameters and yarn breaking tenacity with elongation are tabulated in the Table 7. Breaking tenacity and elongation of these yarns were determined according to TS 245 standard by using Uster Tensojet 4.

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All tests were carried out in the standard atmosphere conditions (20 ± 2 C^0 and % 65 ± 2 RH) after 48 hours of equilibrium was reached.

Table 7: Yarn specifications

Yarn type	Abbreviations	Measured yarn count (Ne)	Measured yarn twist (turns/inch)	Measured breaking strength (cN/tex)	Measured elongation (%)
Ring	M	30.6	19,4	15.20	6.01
	N	30.4	19.8	19.39	7.54
	O	30.8	19.6	21.19	8.96
OE-Rotor	P	30.7	-	11.80	5.04
	R	30.5	-	12.10	7.02
	S	30.6	-	12.92	8.02

It can be seen from the results that as the PES ratio increases the breaking strength and elongation gets better. It is thought that PES is much stronger fiber than the cotton, therefore as the PES ratio increases within the blended yarns the overall fiber length also increases.

2. Yarn irregularity, imperfections and hairiness

Yarn irregularity, imperfections and hairiness were tested on the USTER TESTER 3. All samples run through the tester at 400 m/min. The results of these yarns are listed in the Table 8.

Table 8: Yarn irregularity, imperfections and hairiness values

Yarn type	Yarn Abbreviations	Mean linear irregularity, (U)	Thin places, (-50%)	Thick places, (+50%)	Neps,	Hairiness, (H)
Ring	M	12.92	11	208	250	4.64
	N	12.52	10	148	151	4.24
	O	12.18	8	102	120	3.94
OE-Rotor	P	14.80	230	300	988	4.44
	R	13.96	150	213	902	4.00
	S	13.18	105	185	671	3.77

It can be seen from the results that as the PES ratio increases the imperfections, irregularity and the hairiness of the yarns have shown improved parameters; this is due to the PES fiber length increment which is all same lengths of bundle in the blended yarns of cotton/polyester.

3. Fabrics production and pilling

The knitted supreme fabrics were measured on the Nu-Martindale tester for their pilling. The samples were conditioned under the standard atmosphere for 48 hours. Testing period was set 2000 rubs and later the samples were compared with the K3 EMPA Standard photographs [SN. 1985-25] for their pilling. Pilling values of the knitted fabrics are classified from worse to best as 1-3, 2-3, 3-4, 4-5 and the images of these samples are given as an example at the Figure 3. The pilling test results of these samples are given in Table 9.

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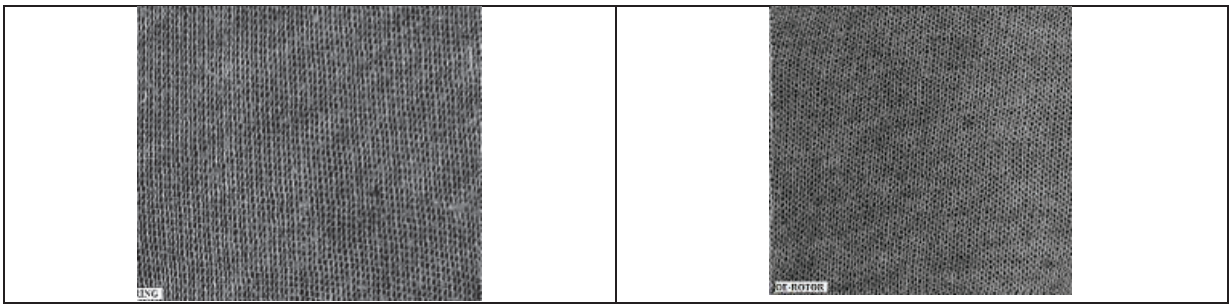

Ring knitted fabric OE-Rotor knitted fabric

Figure 3. 67/33 % PES/CO ring and OE-rotor knitted fabric pilling images

Table 9: Pilling data of the knitted fabrics

Yarn type	Yarn Abbreviations	Pilling values
Ring	M	1-2
	N	1-2
	O	2-3
OE-Rotor	P	3-4
	R	3-4
	S	4-5

From both Figure 3 and Table 9, it can be seen that as the PES ratio increases the hairiness of the yarns gets less hairy therefore the fiber protruding ends are much lesser on the surface of the yarn structure and this leads to less pilling on the knitted fabric surfaces.

Conclusion

The overall results are presented at the following conclusions:

1. Generally, as the PES ratio increases slight lower values occur on the linear irregularity of the yarns. This indicates that the produced yarns improved in means of regularity.

2. Overall ring and OE-rotor yarns presented enhance imperfection results as the PES ratio increases within the blends of the yarns.

3. All the ring and OE-rotor yarns offered an increase on both breaking strength and elongation of the samples as the PES ratio increases within the blends.

4. Ring yarns have lower irregularity than the OE-Rotor yarns.

5. Ring yarns have lower thick places (+ 50%), thin places (-50%) and neps than the OE-Rotor yarns.

6. Both ring and OE-Rotor yarns presented low hairiness values as the PES ratio increases.

7. Both ring and OE-Rotor yarns offered low neps values as the PES ratio increases.

8. Ring yarns produced better breaking strength and elongation values than the OE-rotor yarns.

9. OE-Rotor yarns presented better pilling than the ring yarns.

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10. Both ring and OE-Rotor yarns show higher pilling values as PES ratio increases within the blends; this points out that the knitted fabrics do present better pillings.

Acknowledgements

The authors would like to thank to BAPKO (Scientific Research Project Commission of Marmara University) for funding the project FEN-D-070617-0386.

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SN1985-25.: Empa Kumaş Boncuklanma(pilling) Standartları

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COMPARISON OF THE VIBRATION PROPERTIES OF MATERIALS AA2124/SiC/25p and ALUMINUM 6061-T6

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Abstract: Vibration characteristics of 2124A/SiC/25P metal matrix composites and aluminum 6061-T6 materials are compared with FEA. These materials, which are widely used in the aircraft industry is different vibration characteristics. These materials are usually subjected to dynamic loadings in aerospace. Vibration analysis that is determined from stress and frequency is important vibration analysis is important. Therefore, in this study, vibration response of two different materials were examined. Vibration analysis using a distributed point and forced damped was performed in the MSC ACTRAN program. Metal matrix composites according to the aluminum alloy were found to be more stable against vibration resistance.

Keywords: Metal Composite, Analyses, Vibration

Introduction

Aluminum and its alloys are used commonly in aerospace and transportation industries because of their low density and high strength to weight ratio. Especially Al-based Metal Matrix Composites (MMC) exhibit high strength, high elastic modulus, and improved resistance to fatigue, creep and wear; which make them promising structural materials for many industries (Kurt, 2011). The high cost of current MMCs compared to aluminum alloys has inhibited production on a large industrial scale (Kevorkijan, 1998). Aluminum 2124 alloy is a high strength wrought alloy generally used in aerospace industry for making structural components. Addition of high wear resistant ceramic particles, such as SiC, Al_2O_3, AlN, B_4C, TiC to the alloy is expected to increase the mechanical properties considerably. These MMCs suffer from the disadvantage of low ductility which is due to different reasons, like brittle interfacial reaction products, poor wettability, particle-matrix deboning or presence of porosity or particle clusters [Bauri, 2011; Uyyuru, 2006).

Composites are much sought after materials for a variety of industrial applications owing to their improved mechanical properties over the conventional alloys and materials. MMCs are the forerunners amongst different classes of composites. Al-based MMCs are well known for their high specific strength, hardness and wear resistance. During sliding against metals and abrasives, many studies have reported that MMCs exhibit better wear resistance than the un-reinforced alloys (Wai, 2000).

Table 1. AA2124/SiC/25p and ALUMINUM 6061-T6 composition

Cu	Mg	Mn	Si	Al
3.86	1.52	0.65	0.17	93.8

The plates used in this study are AA2124-T4 alloy matrix MMC strengthened with 25 % SiC particles (AA2124/SiC/25p-T4). This material was supplied by Aerospace Metal Composite Limited (UK) in form of billet with size of 400 mm × 260 mm × 50 mm. The MMC material was produced by powder metallurgy and mechanical alloying techniques followed by hot forging and tempering to T4 condition (solution heating at about 505 °C for 1 h, quenching in 25 % polymer glycol solution and room temperature aging for >100 h). The ultimate tensile strength of the base AA2124/SiC/25p-T4 MMC is of 454 MPa. The chemical composition of the AA2124/SiC/25p-T4 MMC is shown in Table 1. MMC plates of 130 mm × 50 mm × 3 mm size were cut from this billet by electro-discharge machining (EDM) technique with a feding rate of 2 mm/min. The microstructure of AA2124/SiC/25p MMC is shown in Fig. 1. In the AA2124 alloy matrix consists of an almost uniform distribution of the SiC reinforcement. In the longitudinal and transverse directions, the SiC particle-free regions

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are observed in AA2124/SiC/25p MMC. These particle-free regions were elongated along the forging direction. The forging process did not induce cracking in the reinforcement or at the interface SiC particles/matrix.

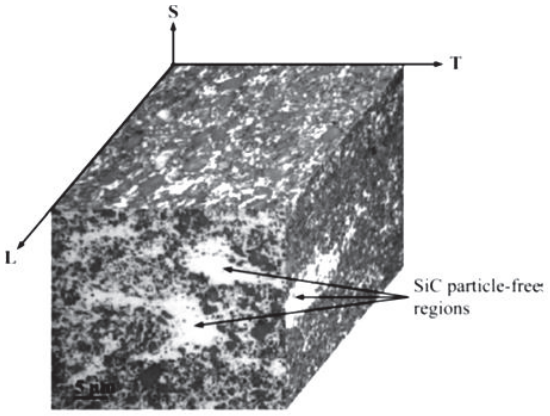

Fig 1. The AA2124/SiC/25p MMC microstructure in the longitudinal (L), transverse (T) and short transverse (S) directions after forging (Donskoy, 1998)

These MMC materials are using in aerospace industrial. The use of composite materials has been increasing consistently in aerospace applications due to their high specific stiffness and strength. However, the mechanical properties of composite materials.

Modal analysis is the most important part of the dynamic analysis. We can investigate natural frequencies and mode Shapes by using this modal analysis. Therefore, Finite Element Analysis (FEA) is commonly used for performing modal analysis. In this study presents a FEA for vibration properties of materials AA2124/SiC/25p and Aluminum 6061-T6.

Acoustic and vibration effect to cause various defects such as cracks, deboning, fatigue, and etc. lead to anomalous high levels of nonlinearity as compared with flawless structures. Actually, as long as the vibration function is known, the degraded image can be simulated with an original image. And by contrast of the theoretical features and the measured features of degraded images' spectrum, reliability of the simulation method can be validated. The Finite element methods and the simulation algorithm can control the degradation parameters accurately and flexibly and provide great convenience to the restoration of the degraded images (Tang, 2011; Wang, 2017; Tester, 2004).

In aerospace design and calculated, researcher have used software for expensive and nonrepeating application. As Circumferential, turbofan and structural geometrics object. ACTRAN is commonly acceptable in acoustic and vibration analyses software. And a lot of aerospace projects have been used for acoustic and vibration analyses (Asghar, 1993; Edward, 1994).

In this paper, using material in aircraft industry compression with new generation material. These results include only Finite element analyses. In future these results according to experimental results.

Materials and Methods

As we know finite element analysis have been used frequently for vibration analysis. Therefore, this study uses MSC.ACTRAN software for vibration properties of two materials which are AA2124/SiC/25p and aluminum 6061-T6. In the finite element modeling procedure, a simply sheet modeling was prepared 130x50x3 mm and meshed in MSC.ACTRAN program. This plate is connected to a single edge as cantilever beams. Applied force point selected random away from connected side (Fig. 3). Selected point used for two materials analyses. Also this analysis used total number of elements is 520 in FEM model. The properties of the materials used were given in Table 2.

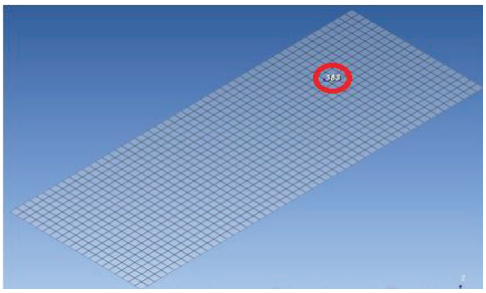

Fig 3. Location of applied frequency

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Table 2. Material properties used in the analysis

	Elastic Module [GPa]	Poisson ratio	Density [g/cm3]
2124A/SiC/25p	115	0,3	2,88
Aluminum 6061-T6	69	0,33	2,7

The response of point and distributed forced damped vibrations applied to the plate was measured. Applied frequencies range is 0-5000 Hz.

Results and Discussion

In the analysis, it was detected natural frequency of the two different materials. Natural frequency of the AA2124/SiC/25p material is larger than the aluminum 6061-T6 (Fig. 3.). The material having a high natural frequency is known to be more rigid. This shows us that AA2124/SiC/25p material was later to undergo resonance and strength of the material.

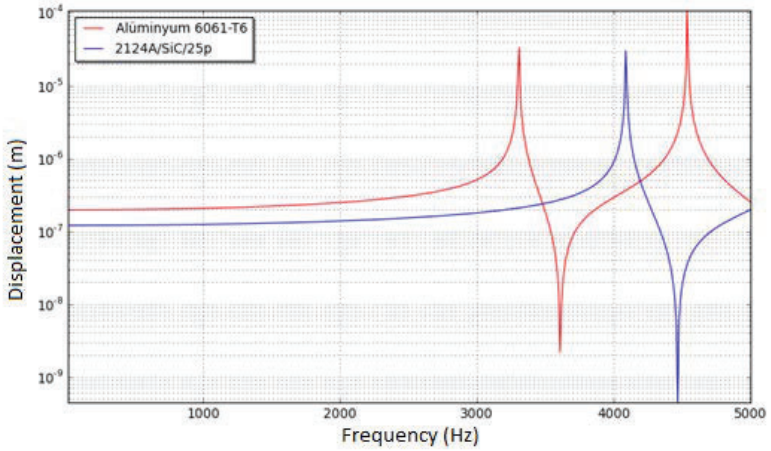

Fig. 3 Response of the plate against Point forced damped vibrations.

Figure 4 shows that when examined, there are two modes aluminum 6061-T6 plate because of applied frequencies range is 0-5000 Hz. But AA2124/SiC/25p material has only a natural frequency. Referring also to Figure 4, the displacements occurring in the material subjected to the same load the remaining two are different from each other. Displacement on MMK plate is considered to be less than aluminum plate.

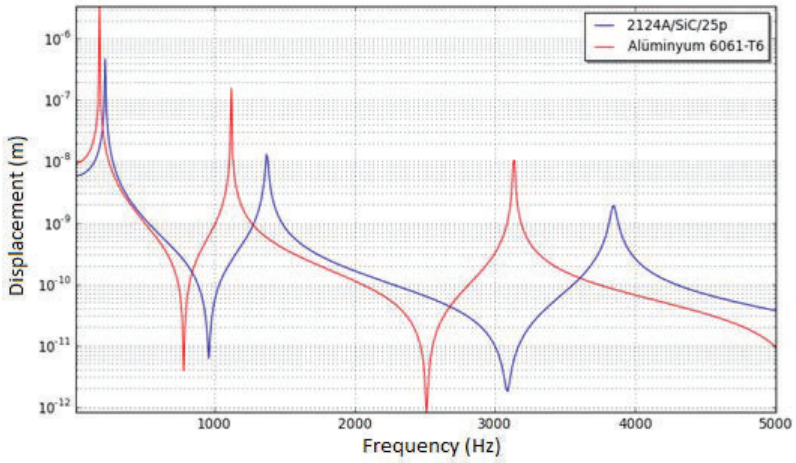

Fig. 4 Response of the plate against distributed forced damped vibrations.

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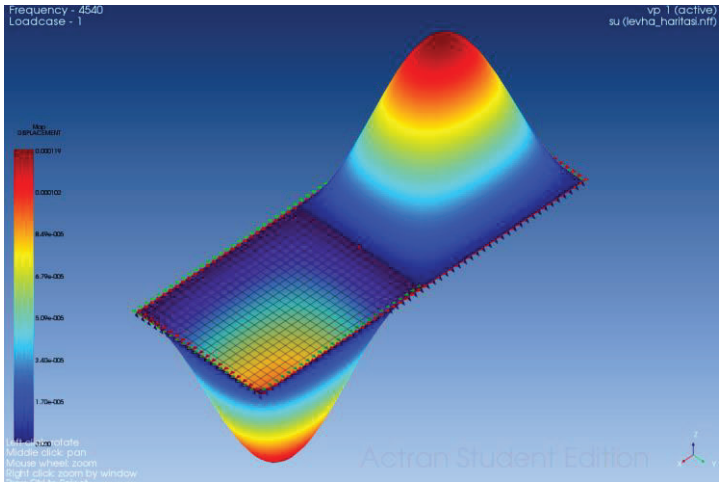

Fig. 5 Modal shape of aluminum 6061-T6 at 4540 Hz

Conclusion

In this study, AA2124/SiC/25p and aluminum 6061-T6 materials used in the aerospace industry have been compared to the vibration behavior. According to the analysis results, natural frequency value of AA2124/SiC/25p material is greater than the aluminum 6061-T6 materials. This shows us that this material is more resistant to dynamic loads. The aluminum 6061-T6 material has been shown to lower frequencies in change mode. Due to the properties owned by the AA2124/SiC/25p material is particularly important in terms of the aluminum 6061-T6 materials used in the aerospace industry.

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CONVERSION PROCESS OF VISUAL-RELATED PRAISES OF WOMEN DURING YEŞİLÇAM PERIOD OF TURKISH CINEMA TO VISUAL CODES OF CULTURE AS EMBODIED BY TÜRKAN ŞORAY

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Abstract: Human is a kinesthetic creature first, then auditory and then visual. This order is in line with the way physical development is accomplished in a mother's womb. That being the case, among our sense organs, eye is still the most credible and reliable organ despite all the perception managements… That is evident in the sayings that are popular in the society such as "I won't believe if I do not see it myself" "I believe what my eyes see". On the other hand, 21st century human has been designed primarily as a visual creature as it has never been before. Capitalist system has generated a new type of human which is supported also by the creative side of the digital age: human who obsessively consumes, believes they become anything they want by consuming, think that consumption is the meaning of their life, who build their self-confidence on consumption and therefore who do not think… If they take the time to think, they will not consume that much; if they take the time to think, they will not be the pawns in the game of divide and rule. It seems like every medium which is not related to the action of reading or which reduces the action of reading to the lowest level and which is based on visuality will become even more prominent in the upcoming years.

So it can be inferred that a human's rate of interaction with visual materials changes depending on being less or more mindful. This must be true for the whole world. We cannot claim that education is the only way that leads to mindfulness. For example there are some literacy trainings which specifically focuses on certain mediums… Cinema was introduced to Turkey even before printing, has not been radically interrupted and has been loved a lot. Cinema has naturally and intrinsically played a positive role in this fast development. It appeals to more than one sense, primarily sight, which is mostly analyzed once seen and therefore has a universal language; which alternates between dreaming, delusion and life's realities and which is independent…

In Turkish cinema of Yeşilçam period, female visuality came first. Visuality is a concept which encompasses attractiveness for a woman and is equivalent to beauty. Adjectives used for women such as beautiful eyes, full-figured body, slim waist, long hair are the reflections of the values of the general society about liking on female artists. One of these artists is Türkan Şoray: She has enabled conversion of praises of female appearance as embraced and supported also by women in Turkish culture with her eyes, eyelashes, looks, hair and full-figured body to a cultural code as done by women.

The purpose of this manifesto is to investigate and present how this process has started, worked and was converted into codes of visual culture.

Key words: Türkan Şoray, Visual Culture, Semiology, Face Reading, High-Set Eyes and Ears, Yeşilçam.

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Introduction

It has been established by science that human babies know the sense of touch first which is followed by sense of hearing and eyesight which is the last sense to develop. Human fetus is able to open their eyes as of the twenty seventh week in the womb and tell day from night. An infant is able to clearly see up to thirty-cm distance immediately after their birth. As modern psychology, modern philosophy and some of the alternative philosophies assert that the time fetus spends in the mother's womb, the moment and aftermath of birth are of importance for human development and psychology, the period during which a human baby is born might be analyzed again in terms of each cultural texture. Perhaps findings of such researches may contribute to rise of utterly different awareness that is based on birth trauma in order to solve humans' shameful/shameless/discriminatory/egocentric violence policies towards female gender and their own species overall. Ultimately, the hypotheses which assert that human baby learns the attitudes and behaviors which are nurtured by cultural codes induced by human judgement as early as when it is in the womb and their existence on earth is shaped by this knowledge may become more important in near future.

This is surely not the subject of the manifesto but all of these aspects can be associated with the effort to seek an answer to the question of why cinema is and will be so effective on people by looking into the phase during which an infant starts to know the world. A mother's womb can be compared to a type of movie theater: infant mostly hears the sounds in the womb but is also able to see the light starting from the twenty seventh week. A movie theater might function as a medium which takes humans back to a phase which is very familiar for them and let them enjoy the eyesight with which an infant meets later than the other senses. In this sense, 21st century will continue to be visual in every medium but it can be foreseen that the most effective one among such mediums will be the movie theater where movies directed by talented and skillful directors who are visionary enough to reach a wide audience or the productions which enable simulation that feels like cinema. Today the reason why cinema is not effective might be the rareness of the movie makers who are able to find the elements which would appeal to the human identity which is lost in the changing digital mediums and to the humans who are lost but who are also incredibly informed about everything and who is satisfied with and almost bored of different and new things. All of these visual human definitions are applicable for wide social communities and majority of educated people whose academic background has been shaped by the capitalist understanding.

How Does Türkan Şoray Show Sympathy?

(Now let's take a look at the process during which Türkan Şoray's eyelashes turned into a knitting model)

You can understand from Türkan Şoray's looks (spiritual, emotional world), posture (body language) that she shows sympathy. For example, a semiological study may reveal to what extent a star is effective in creating the meaning of a movie. In such a study, star is one of the means of creating the meaning of a movie." (Büker; Uluyağcı, 1993:11) "… a visual presentation which is worth a thousand words … (Zileli, 2009:63) Türkan Şoray easily does this through her personality, character, surely her ability to convey meaning and especially through the way she looks. She already experiences those feelings. As soon as Türkan Şoray is on screen, she is easily grasped

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by the audience with her entire attitude and behaviors, in other words, audience can easily analyze and internalize her. Even this is enough for her to be successful.

One does not become a star by coincidence. Star is born when physical beauty unites with a stereotype, a character which appeals to the audience for a certain period of time. Stars are born out of needs. For different reasons, audience seeks an idol who embodies certain qualities. They need the idol. When they meet once, it is a necessity to maintain this relationship because star has a psychological and sociological function now." (Büker; Uluyağcı, 1993:20) Şoray is one of the rare actresses who is able to build this link both psychologically and through her body language. Is it possible to tell spiritual language from body language? Some people can put on and take off their masks easily, which means that the bond between their inner and outer world is already broken. Şoray maintains this bond all the time; the reason might be that she can keep her integrity while most people cannot. It should be noted that humans always long for kindness and honesty at heart. On the other hand, Şoray has always fears, reservations, never-ending modesty and shyness (Dorsay, 2013: 6) and these characteristics of her will always appeal to large masses and she will deserve the title of Sultan.She was sixteen years old when she was first introduced to Yeşilçam. She had a fully-figured body and therefore her face looked childish because of her age and wider because of her weight. Her eyes are ready to make its rightful impression on such a wide face. A little bit of dental aesthetics: the front teeth; and the eyebrows must be plucked but still look natural and the beauty of her eyes will be spectacularly evident when she loses weight. The fact that her face and body have a golden ratio contributes significantly to her being accepted as a symbol of beauty. People find golden ratio beautiful although they are not aware of it. Şoray has quite a symmetrical face.


rdeşi Nazan ve annesi Meliha Şoray'la birlikte.

Atilla Dorsay writes in the anecdote that belongs to Türker İnanoğlu: "Her eyes used to penetrate deeply into one's heart. They were extremely beautiful. Cinema had not seen a more beautiful woman than her so far. I was so impressed by this brunette lady that I opened up to the producer Zeki Çan that night. She was exactly whom we were looking for the role. She was much better for the role than Emel Yıldız and, on top of it, she was younger and more beautiful than her." (Dorsay, 2013: 6). This anecdote reveals both working principles of Yeşilçam and the popular male attitude towards women in the society regardless of whether men are educated or not. An attitude which is based on the idea that women exist for men.

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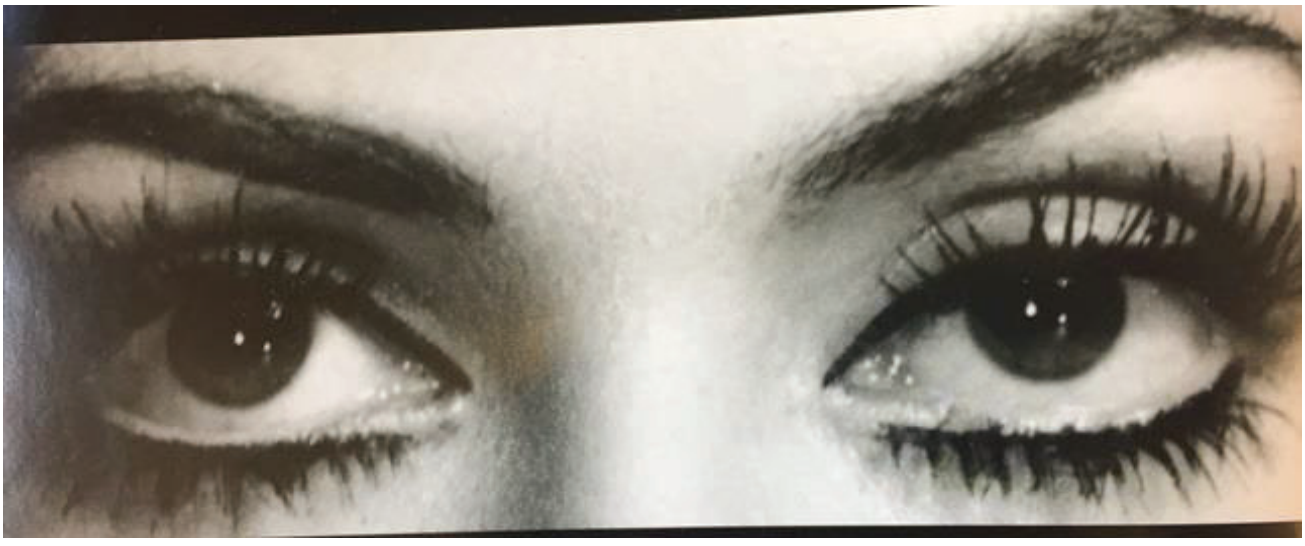
However; the idea that women are created for themselves must prevail. Can women be reduced to a means of ensuring survival of human species? The period when she becomes even younger, more beautiful, reaches the age when her beauty is at the top level and the beauty of her eyes become evident follows that. That must be what they call star quality. Ümit Çeliker reminds the words of an elderly journalist: "There is not a single Turkish man who does not find Türkan Şoray beautiful… That is not possible." (Büker; Uluyağcı, 1993:29) Perhaps the dominant male attitude inclined to define shy, timid, obviously in need of protection (economically disadvantaged), innocent but who are definitely younger and more beautiful women as having 'eyes which penetrate deeply into one's heart.

Eyes, Eyes, Eyes, Eyelashes Each of Which is As Penetrating As an Arrow…

The Sultan's Eyes

Lights went of in the darkened halls
We held our breathes in expectation
Our bodies on edge
The silver screen shuddered from our gaze
It was the Sultan's eyes
Inviting us to great dreams
Telling us Tales
From the big times of the heart
……..
Murathan Mungan



Praises of Türkan Şoray's eyes, eyebrows and eyelashes which turned into the on-screen symbol of female beauty complimented by Turkish people of literature for centuries also imply the inclination which exists both in folk literature and divan literature and therefore inherited into genetic codes of the society.

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Women designed the knitting model out of the model of her eyelashes starting from the 1960s and taught it to one another. Her long and rich eyelashes which open like a ray continue to inspire the false lash websites today.



Türkan Şoray type of eyelashes / I am learning to knit / Bakı; people use this knitting model to use with both needle and crochet hook. There is a model called Zeki Müren's teeth which can be knitted only with a needle of Zeki MürenEyelashes which are the ornaments of eyes became one of the means of promotion to increase the sales of digital market starting from &0s: http://urun.gittigidiyor.com/kozmetik-kisisel-bakim/turkan-soray-kirpigi-diyoruz-



Arch brows, losing weight, a slim face made her high-set eyes evident, which are called cute in society. High-set eyes in the eye hole: "if whites of eyes are visible on the sides and below the iris, it means they are high-set in the eyehole (Brown, 2002:41). High-set eyes may enable one to have deep and meaningful eyes but the main factor that makes eyes beautiful is their size because big eyes are the symbol of ideal beauty. One wears make-up to make their eyes look bigger (Brown, 2002:41). Şoray's face is symmetrical and round-shaped. In society, the adjective of two-faced is used to indicate that right and left side of one's face is distinguishably different from one another. According to the science of face-reading which is prevalent in Far East Asia and which has started to become popular also in the West, an honest face is symmetrical. A round-shaped face implies a wide face in general. It is related especially to the width between two temples. People with such a face are stable. Their behaviors are usually balanced and they use their common sense to solve problems (Brown, 2002:25). Evident cheeks are also the indicator of people who love to share their feelings (Brown, 2002:46).

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Briefly: It is not a coincidence that she has become a symbol of beauty of Yeşilçam screen. Her star quality, physical and spiritual characteristics appealed to a large mass, were approved and even blessed. Her straight eyes took the shape of an arch in time, her slightly crooked nose was fixed with an aesthetic operation, she lost weight, her wide face became slimmer, her childish face became more formed in time; the fact that she has thin wrists and ankles, her posture is good-looking, her body is not unattractive, she has shy and naïve eyes so Şoray has managed to become a successful means of expressing emotions and behaviors of Turkish people even with her existence.



Although her childhood pictures reveal that she was able to use her eyes to express herself even when she was a child, the actress tells that she has learned to give meaning to the way she looks in time especially from a director.

Conclusion

Şoray who believes at heart that women exist for themselves and who have maintained her relationship which started when she was eighteen years old for a long period of time in a society that is bound by some traditional rules and who has even become a subject of an column written by Rauf Tamer who said that if Türkan Şoray does it, it is called love stated that Şoray has a privileged place in this society woman is weak in this society: Rüçhan Adlı is the man who was possessive towards her, who protected her, took care of her and her wellbeing and who called her Sultan. It seems inevitable not seeing the existence of a man in the eyes of a woman, who values her in the society where she was born and lives.

We should look at the fact that Hürrem Erman who made great personal efforts and contributed significantly to the increase in the number of viewers in Yeşilçam's success and in the Turkish movies recently, the enhancement of domestic and foreign markets. (Kara, 2006:8)

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For Halit Refiğ "West's insulting attitude which looks down on the cultures which are different from their own is an important issue which is not acceptable at all, must be criticized and struggled with strongly. It is the clear indication of the reason why she has become an idol. She has not acted like the Westerners and has not insulted and looked down on her society like a small bird which has just hatched. That was contrary to the general inclination on this country because generally they generally insult and look down on large masses instead of understand and finding solutions for them. She did not do that.

In the 60s, American cinema introduced the whole world a new life style and new car models which they had not seen ever before. A new thing which was not seen and could not even be imagined by people… "it seems inevitable that some conditions are met for people to have greater interest in a movie. Advertising, famous people, easily understandable narrative and a certain plotline with ups and downs… "it is normal that commercial movies which provide an opportunity for people to escape from their own reality or which make them see the reality from a safe distance, which are easy and not exhausting attract more viewers.": (Ceylan, 2012:55) If movie theaters have lost their earlier effect, that is the problem of those who control this industry… Cinema will always exist thanks to those mindful people who have a good command of the age's characteristics and human nature.

Atilla Dorsay: "A life becomes deep and meaningful only when it is addressed with other lives around it and life stories of other people who accompanied that life." It should not be ignored that it changes depending on the personal characteristics of the person.

Attention: Special attention has been paid to make sure that this article does not contain any sexist words which push women into the background. Although I make sure that my articles do not contain such words, this is the first that I have been using this expression; in this regard, I am its patent holder and I foresee that more and more articles will start to be written this way within a short period of time.

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CREEP BEHAVIOR PREDICTION OF ALUMINUM-TITANIUM DIBORIDE (Al-TiB_2) METAL MATRIX COMPOSITE USING FINITE ELEMENT SIMULATION

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Abstract: Metal matrix composites are widely preferred for engineering applications, especially aluminum is used as a matrix because of its unique mechanical properties in naval and aerospace industries. In the present paper, the creep behavior of an aluminum based metal matrix composite reinforced with TiB_2 particles was studied for various over temperature range and stress levels. Aluminum 6061 was selected to be the metal matrix which has high strength to weight ratio and it is reinforced with TiB_2 which has extremely thermal stability. TiB_2 powder is added into the aluminum by varying the percentage of the powder by volume in order of 3,6 and 9 percent, respectively. The finite element analysis software package ANSYS® is used to obtain the creep behavior of the composite material. The influence of the over temperature rates, stress levels and volume of the TiB_2 powders on the creep behavior were studied by using simple finite element model. Using such a simple composite model, remarkable savings in time and identifying the correct combination of the TiB_2 powder can be obtained for creep conditions.

Keywords: Finite Element Simulation, Creep Prediction, Metal Matrix Composite, Al-TiB_2 Reinforcement

Introduction

Metal matrix composites (MMCs) are widely used because of their superior properties as compared to those of most conventional materials. They have high specific strength, wear resistant and stiffness. Nowadays, main focus is given to aluminum alloy because of using for commercial applications in the construction, engineering industries and transportation. Especially, aerospace industries raise the demand for the new materials which perform efficiently in very tough environment. Although a variety of matrix materials used for making metal matrix composites (MMCs), the biggest emphasis is on the development of lighter metal matrix composites using aluminum and titanium alloys. Because they have the significant potential in the weight ratio and at the same time the material posses low density, high thermal conductivity, low thermal expansion and high modulus for the aerospace and space engines. The aluminum-based metal matrix composites serve these purposes and also new light aluminum alloys have received considerable attention in the literature (Ioannidis et al., 1989, McShane et al., 1990). Despite of the superior properties of the MMCs, they have lower ductility and fracture toughness than unreinforced alloys (Lloyd, 1994, Srivatsa et al., 1991).

The employ of intermetallic particles (such as titanium aluminides) as suitable reinforcement for aluminum and titanium alloys were proposed as least two decades (Yamada and Unakoshi, 1983, Larrouy et al., 2001). Ceramic particles contribute a pure structural build up for the metal matrix composites. The addition of ceramic particle such as SiC, Al_2O_3, TiB_2 to an aluminum matrix doesn't considerably change the density of the material but instead it leads to a major rise in specific strength and modulus of composite and this plays a good role use in structural applications (Yue et al., 1999). The physical properties such as friction resistance, friction co-efficient and thermal conductivity also changes. This due to fact that TiB_2 have outstanding features such as high elastic modulus (530 x 10^3 GPa) , high melting point (2790°C), high hardness (86 HRA or 960 HV) and good thermal stability (Tjong et al., 2005, Mandal et al., 2007, Kumar et al., 2010, Lakshmi et al., 1998). TiB_2 particles don't react with molten aluminum, thereby avoiding formation of brittle reaction products at the reinforcement-matrix interfaces. So the Al-TiB_2 composites have certain useful and unique characteristics. For example; the wear resistance of the aluminum matrix reinforced with titanium diboride (TiB_2) increases as the volume fraction of the TiB_2 increased, when compared to the pure aluminum (Popoola et al., 2010). The tensile and ultimate strength of the Al increases with increase in the amount of TiB_2 (Suresh et al., 2014). The addition of TiB_2 particles increases the hardness value when the formed TiB_2 particles have a mix up of cubic, spherical and hexagonal shaped particles (Rajan et al., 2013).

Relationship between microstructure and mechanical property for TiB_2 reinforced aluminum have been studied by

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various authors, however in literature it has lack of study about at the behavior of the Aluminium-Titaninum Dibordine (Al-TiB_2) metal matrix composites the high temperatures. For example, creep is an inelastic response of materials loaded at high temperatures. It has important effect on deformation because defect of microstructure rearrangement process is accelerated at high temperatures. So this process tends to soften material they counteract the hardening produced by plastic deformation. Creep can be resembled viscoelasticity behavior because the resulting strain at constant applied stress is a function of time, but in contrast with viscoelastic behavior permanent deformation remains following creep. Additionally, elasticity and plasticity are mechanical responses to loading which is independent of the time. When the load is applied, the corresponding level of strain set in. But, during creep behavior the mechanical response is time dependent.

The aim of the present study is to investigate the creep behavior of Aluminum-Titanium Dibordine (Al-TiB_2) metal matrix composite over a temperature range at various stress levels. Aluminum 6061 and TiB_2 were selected to be the metal matrix and reinforcement materials respectively. The TiB_2 powder was added to the aluminum matrix a 3%, 6% and 9% vol. The influence of these volume rations, over temperatures rates and stress levels on the creep behavior were investigated. The principal aim of the contribution is to define and describe a simple model of metal matrix composite for the numerical simulation and prediction of creep behaviors. For this purpose, finite element models were developed using ANSYS® software and using this model, saving time and identifying the correct combination of TiB_2 can be obtained.

Description of the Aluminum-Titanium Diboride (Al-TiB_2) Metal Matrix Composite

In this work, Aluminum 6061 was selected to be the metal matrix. Different metal matrix composites are obtained by mixing TiB_2 powder with different percentages of reinforcing particles. The mixtures obtained are aluminum with 3, 6 and 9% in volume of TiB_2. The properties of the metal matrix composites not only depend on the matrix and the volume fractions, but also on distribution of reinforcing particle on the matrix. In practically, there is no doubt that achieving homogeneous distribution is difficult. But in the present MMCs, a certain number of fibers are considered to be unidirectional oriented in the z direction, as shown in Figure 1.

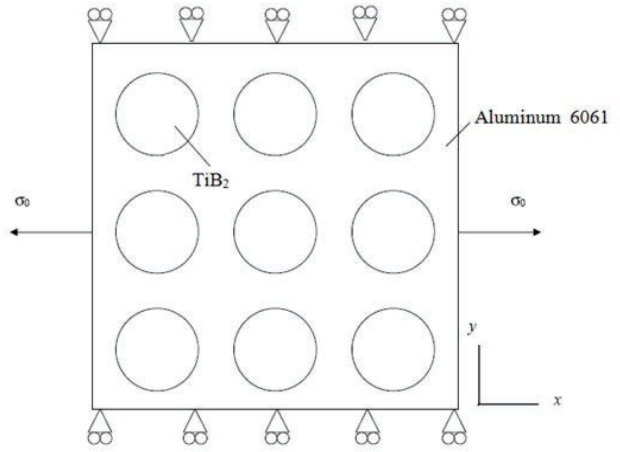

Figure 1. Loading and boundary conditions of Aluminum-Titanium Diboride (Al-TiB_2) metal matrix composite.

The material properties of the matrix Aluminum 6061 and reinforcing particle TiB_2 powder are shown in Table 1.

Table 1: Mechanical properties of Aluminum 6061 and TiB_2 powder (Suresh et al., 2012) [15].

Matrix (Aluminum 6061)	Fiber (TiB_2)
E = 56000 MPa	E= 530000000 MPa
υ = 0.33	υ = 0.33

The standard tension test can be applied to investigate the mechanical response of composite materials deforming at high temperatures. In the present paper the two different high temperatures values were used, they were 232°C and 288°C. The easiest to perform is tension test at constant load and temperature. Using constant loads and temperatures values in this study can be seen in Table 2.

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Table 2: Constant temperatures and load value parameters.

Parameters	Temperature (°C)	Load (MPa)
1	T = 232 °C	σ = 27.6 MPa
2	T = 288 °C	σ = 13.8 MPa
3	T = 288 °C	σ = 20.7 MPa
4	T = 288 °C	σ = 27.6 MPa

The resulting strain is measured as a function of time. In this study, time was selected as 2.5 hours (150 minutes). In the creep test, the resulting strain-time curves are called creep curve. The curve in Figure 2 shows the idealized shape of a creep curve. The slope of this curve (de/dt) is referred to as the creep rate. The curve B (dashed line) shows the shape of a constant-stress creep curve. In engineering it is generally the load not the stress that is maintained constant, so a constant-load creep test is more important, but fundamental studies of the mechanism of creep should be carried out under constant-stress conditions.

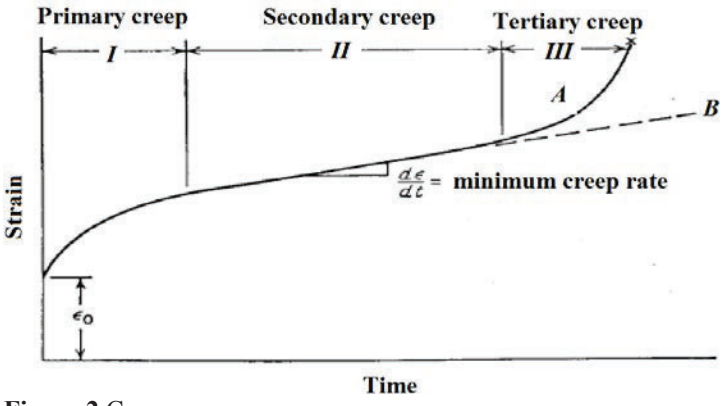

Figure 2. Creep curve.

Strain-time curves obtained from the creep tests at constant load and long periods of time often exhibit three different characteristic stages. These can be defined as below:

- **Primary Creep, I, (Transient Creep);** Following the setting in of the instantaneous elastic strain (ε_0), the material deforms rapidly but at a decreasing rate. The duration of the stage is typically relatively short in relation to the total creep curve.
- **Secondary Creep, II, (Steady-State Creep);** The creep strain rate reaches a minimum value and remains approximately constant over a relatively long period of time.
- **Tertiary Creep, III;** In this stage, the creep strain rate accelerates rapidly.
- **Rupture;** The material in unable to withstand the load anymore and breaks.

In this paper, the matrix (Aluminum 6061) which is a function of tension makes primary (transient) creep and secondary creep (steady-state creep) movement. When an external load is applied, present metal matrix composite materials samples undergoes elastic deformation and then these internal stresses cause creep behavior for the matrix. In calculations, it is assumed that usually only the matrix has been creep and the elastic shape of the fibers has changed but has not been creep behavior. This situation creates creep resistance in the fiber direction. Creep behavior, like other thermo mechanical properties in unidirectional composites, is anisotropy. This is too small in longitudinal direction and can be negligible, but it is worth taking in to account for transverse direction.

Creep Analysis of the Aluminum-Titanium Diboride (Al-TiB_2) Metal Matrix Composite Structure

Finite element models can be simply thought based on to be cylinders placed in the middle of a cube. So the metal matrix composite is modeled as circles arranged symmetrically in a square. An edge length of the square is taken as 1000 units. Finite element analyses were performed using ANSYS® commercial programme. Finite element model of the metal matrix composite structure can be seen in Figure 3(a) and the geometry were meshed by using Plane 182 can be seen in Figure 3(b). Plane 182 element type is used for two dimensional modeling of solid

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structures. This element is defined by four nodes having two degrees of freedom at each node: translation in the nodal x and y directions. This element is very suitable for studying creep behavior because it can be used in plastic, hyper elastic stress, large deformation and large unit elongation analyses. The ANSYS® package program has 12 different creep relationships that model creep behavior, in this paper it has accepted that matrix material makes both primary and secondary creep movements. The correlation to be used in this model should be appropriate for this type of behavior. So the creep behavior given in 11th place in the ANSYS package program was chosen suitably.

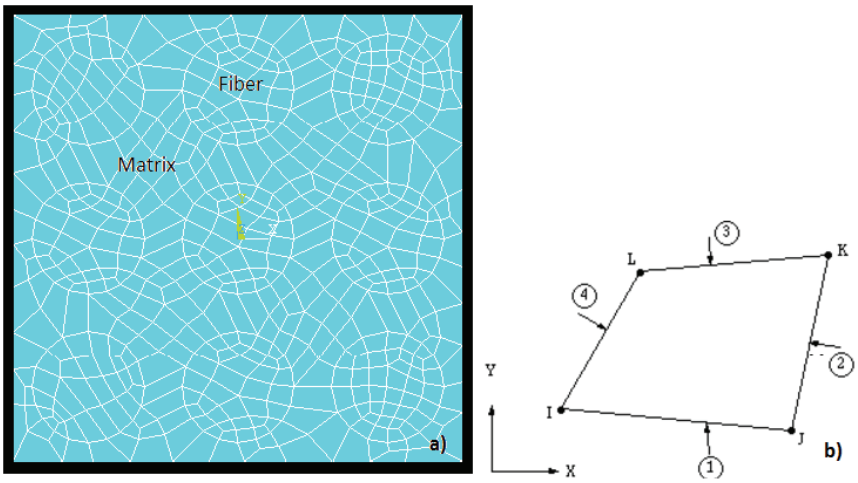

Figure 3.a) Finite element model of the metal matrix composite b) Plane 182 element type.

Analysis Results and Discussion

In this paper, the creep behavior of the aluminum-titanium diboride (Al-TiB_2) metal matrix composite in 150 minutes was investigated. Figure 4 and Figure 5 show the result of the creep analysis performed with the ANSYS at various stress and temperature conditions. Stress is one of the major factors that affect the creep strain. Figure 4 shows that effect of the stress on the creep behavior for the 6% volume of TiB_2. As seen in Figure 4, the creep strain value is 0.027 for T= 288°C, σ = 13.8 MPa conditions. At the same temperatures, when the stress increases 13.8 MPa to 20.7 MPa, the creep strain value increases approximate 2.61 times. Similarly, the creep stain increases nearly 5.38 times when the stress increases 13.8 MPa to 27.6 MPa at the 288°C.

Also, creep behavior for the aluminum-titanium diboride (Al-TiB_2) metal matrix was affected by temperature. At constants 27.6 MPa stress, when 232°C was applied for 6% volume of TiB_2 the creep strain is 0.0017. When the temperature increases from 232°C to 288°C, the creep strain value increases nearly 81.8 times. As seen in Figure 4, the creep strain is 0.1455 for T= 288°C, σ = 27.6 MPa conditions. These result presented that the creep strain of the aluminum-titanium diboride (Al-TiB_2) metal matrix affected for both stress values and temperatures values. Finally, the creep behavior can be significantly controlled by selecting the stress and temperatures as a parameter.

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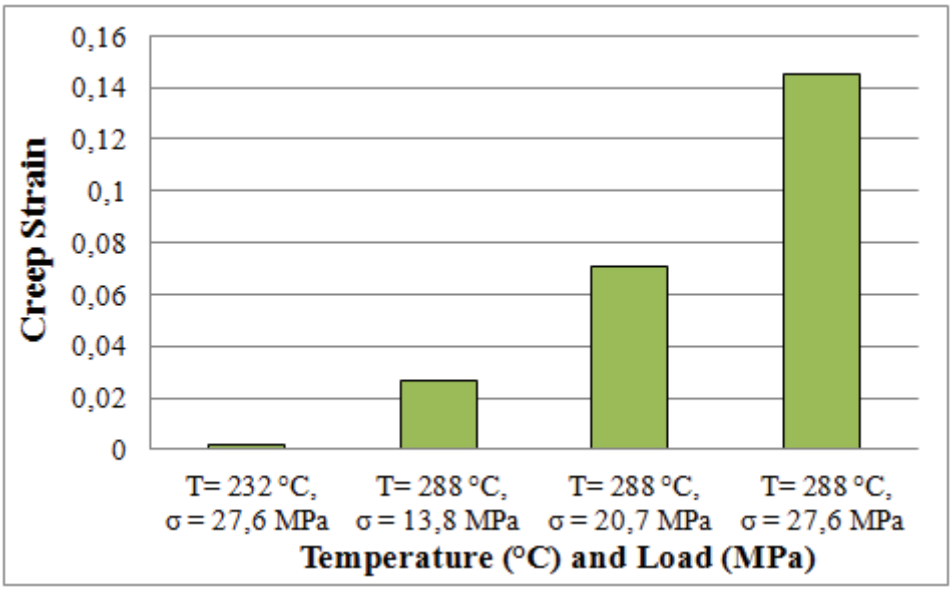

Figure 4. Effect of the temperatures and stress on the creep strain for 6% volume of TiB_2.

From the numerical results, the creep strain of the aluminum-titanium diboride (Al-TiB_2) metal matrix were measured for different design composition of % volume of TiB_2. The plot in Figure 5 clearly shows the benefit provided by the change of the % volume TiB_2. The creep strain values compared for the percentages of TiB_2 volume ratio in Aluminum 6061 in the T= 232°C, σ = 27.6 MPa conditions in Figure 5(a). In Figure 5(b) shows that the creep strain decreases as 30.29% when the percentages of volume ratio of TiB_2 is raised from 3% to 6% for T= 288°C, σ = 13.8 MPa conditions. The maximum change reflecting the differences of the TiB_2 ratio is seen in case of vol. 3% to vol. 9%. For example, in Figure 5(c) for the T= 288°C, σ = 20.7 MPa condition shows that the creep strain decreases nearly 106%. Similarly, when the percentages of volume ratio of TiB_2 is raised from 3% to 9%, the creep strain decreases as 117%, it can be seen in Figure 5(d). These results revealed that composition of the volume %TiB_2 plays a major role in the creep behavior on aluminum-titanium diboride (Al-TiB_2) metal matrix composites. As the % volume ratio of TiB_2 increases, the creep strain values decreases. In other words, the creep resistance can also be said to increase.

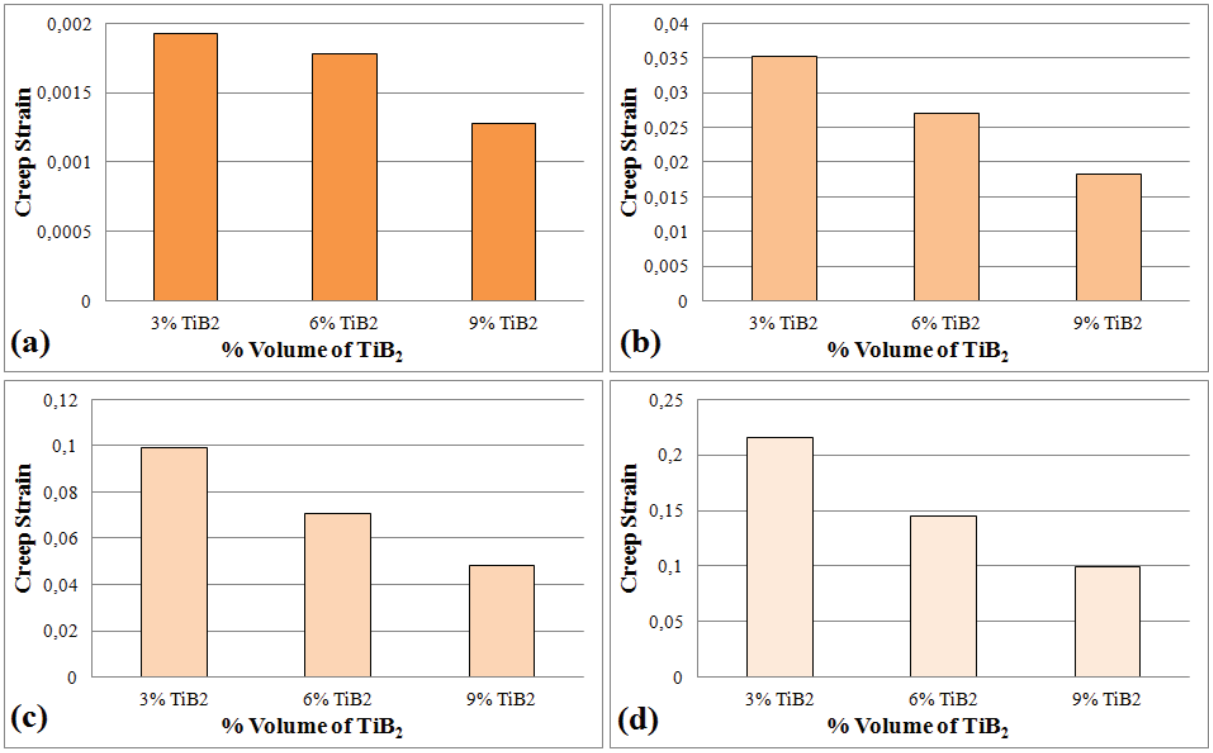

Figure 5. Effect of the volume ratio TiB_2 on the creep strain, a) T= 232°C, σ = 27.6 MPa, b) T= 288°C, σ = 13.8 MPa, c) T= 288°C, σ = 20.7 MPa, d) T= 288°C, σ = 27.6 MPa.

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Conclusion

In this study, finite element model was used to estimate the creep behavior of the aluminum-titanium diboride (Al-TiB_2) metal matrix composite for investigating the creep strain values. Firstly, different percentages of reinforcing particles (TiB_2) were chosen as 3, 6 and 9% in volume for obtained different metal matrix composites mixtures and also two different high temperature constant value (232°C and 288°C) were used. Three various stress value (13.8 MPa, 20.7 MPa and 27.6 MPa) were also used for measuring the creep strain which is a function of time. Time was selected as 2.5 hours in this paper. Comparing the obtain results from the numerical investigation, it is seen that the creep strain increases when the temperatures and stress values increase. Also finite element model were investigated for three different percentages of reinforcing particles TiB_2 for obtain the creep behavior. As the % volume ratio of TiB_2 increases, the creep strain values decrease and also it is mean that as the % volume ratio of TiB_2 increases, the creep resistance of metal matrix composite increases. The results indicate that a useful aluminum-titanium diboride (Al-TiB_2) metal matrix composite can be achieved by selecting proper design parameter as a reinforcing particle TiB_2 for high temperatures.

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CULTURAL EXTINCTION: THE FULANI SHARO FESTIVAL IN NORTH EASTERN NIGERIA

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Abstract: The Fulani people are one of the major ethnic groups in north eastern part of Nigeria. Sharo festival is a prominent festival used by the Fulanis as a demonstration of bravery, and to induct the young men into manhood. It is a colourful flogging event with dances as site attraction. This festival used to pull thousands of tourists to the north eastern part of the country. However, personal observations have shown that the festival is gradually fading as the festival is no more observed again. This study is aimed as examining the reasons why the sharo festival is going into extinction and how the festival can be revived. Personal interview and survey questionnaires were administered. Findings show that civilization, health concern, insecurity and religion are the major reasons that led to the death of the festival. It is recommended that the fulanis should be enlightened on the importance of them upholding their culture, adequate security and safety measures should be provided during the festival. Culture is one of the major tourism attractions in Nigeria; therefore, sustaining the attractions in our culture will not only preserve it but will boost tourism in the north eastern part of the country.

Keywords: Cultural Extinction, Sharo, Fulani, Festival

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ÇELİK YAPILARDA AZALMIŞ VE AZALTILMAMIŞ KESİTLERDE GERİLME VE DEFORMASYONLARIN İNCELENMESİ

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Özet:1994 Northridge depreminin sonrasında çelik yapılarda moment aktaran çerçevelerde geliştirilen süneklik düzeyi yüksek birleşimlerden bir tanesi de azaltılmış kiriş kesitlerine sahip kolon kiriş birleşimleridir. Bu birleşimde plastikleşecek bölge kiriş kesitinde yapılan azaltma ile belirlenmektedir. Deprem yönetmeliğinde süneklik düzeyi yüksek birleşimlerde, Birleşim en az 0.04 radyan Göreli Kat Ötelemesi Açısını (göreli kat ötelemesi/kat yüksekliği) sağlayabilecek kapasitede olacaktır. Bunun için, deneysel ve/veya analitik yöntemlerle geçerliliği kanıtlanmış olan detaylar kullanılacaktır. Bu çalışmada 1 katlı 1 açıklıklı, 1 katlı 3 açıklıklı, 2 katlı 1 açıklıklı, 2 katlı 3 açıklıklı, 4 katlı 1 açıklıklı, 4 katlı 3 açıklıklı, 6 katlı 1 açıklıklı, 6 katlı 3 açıklıklı farklı çerçeveler azaltılmış ve azaltılmamış olarak analizleri yapılmıştır. Bu analizlerde tüm kolon ve kirişler shell olarak modellenmiştir. Birleşimin tüm detayları modellerde dikkate alınmıştır. Bu analizler sonucunda azaltılmış ve azaltılmamış kesitlerin deformasyon ve gerilmeleri incelenmiştir.

Anahtar Kelimeler: Sünek yapılar, azaltılmış kesitler, plastik mafsal

GİRİŞ

17 Ocak 1994 tarihinde Episantır noktası Los Angeles şehir merkezine 32 km uzakta San Fernando vadisindeki Notridge de 6.7 şiddetinde bir deprem oldu. Bu depremde çelik çerçeve sistemlerinden oluşan binalarda herhangi bir göçme ve can kaybı olmamıştır. Çelik çerçeveli yapılarda mimari sebepler ve yangın güvenliği açısından çelik taşıyıcı elemanların alçıpan ve benzeri malzemelerle kaplanmış olması nedeniyle ilk bakışta fark edilemeyen hasarlar, depremi takip eden günlerde çelik çerçeveli yapılarda detaylı yapılan incelemelerde, kolon kiriş birleşimlerinin kaynaklarında ve kaynağa yakın çelik malzemede bazı çatlakların oluştuğu görülmüştür. Nortridge depremi sırasında, asıl şokta az hasarlı olarak değerlendirilen çelik yapılar, asıl şoktan çok, artçı şoklarda hasar görmüştür. Nortridge depreminden sonra yapılan hasar taramasında, en çok rastlanan hasarlar kiriş alt başlığında ve buraya yakın bölgelerde oluşan çatlaklardır. (Şekil 1).

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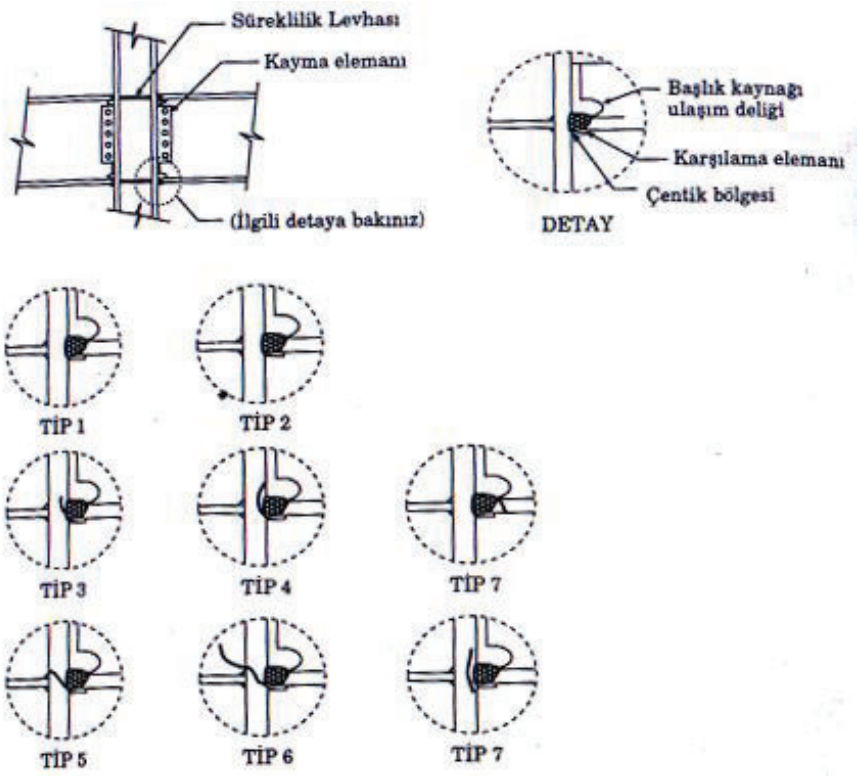

Şekil 1. Northridge depreminde en çok karşılaşılan çatlak tipleri.

Nortridge depreminin sonrasında, bu depremde görülen problemlerin çözümü için çok sayıda çalışma yapılmış ve çözümler geliştirilmiştir.

Birleşim problemlerinin çözümü için en temel iki strateji,

a) Birleşimlerin yük taşıma kapasitelerinin arttırılması

b) Birleşime giren kirişlerin yük taşıma kapasitelerinin azaltılması

Bu iki temel stratejinin amacı plastik mafsal oluşumunun kolondan uzaklaştırılmasıdır.

Araştırmacılar tarafından çeşitli tiplerde bulonlu ve kaynaklı süneklik düzeyi yüksek kolon kiriş birleşimleri geliştirilmiş ve yönetmeliklerde yer almıştır. Yönetmeliklerde yer alan bu birleşimler "AISC Seismic Provisions for Structural Steel Buildings" isimli standardın (AICC.S.P.S.S.B, 2010) öngördüğü en az 0.03 radyan plastik dönme kapasitesine sahip oldukları yapılan testlerle belirlenmiştir. Bu tip kolon-kiriş birleşimlerine ait bilgiler, "FEMA 350 – Recommended Seismic Design Criteria for New Steel Moment Frame Buildings (2000)" [3] isimli raporda yer almıştır. Bu birleşimler "Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik (2007) " , (D.B.Y.B.H.Y, 2007). standartının Bölüm 4 " Çelik Binalar için Depreme Dayanıklı Tasarım Kuralları " bölümünde yer almaktadır.

Bu çalışmaya konu olan zayıflatılmış en kesiti birleşim detayı 1992 yılında bir çelik üreticisi tarafından geliştirilerek patenti alınmıştır. 1994 Nortridge depreminden sonar tüm telif haklarından vazgeçerek bu birleşimin kullanılması ve araştırılması için destekte bulunmuştur.

Birçok araştırmacı tarafından zayıflatılmış en kesiti birleşimlerle ilgili çok sayıda çalışma yapılmıştır (Han, Moon & Stojadinoviç, 2009; Maleki &Tabbakhha, 2012; Han, Moon, Hwang &Stojadinovic, 2012).

ÇALIŞMADA KULLANILAN METOD PROGRAM VE ÇERÇEVE TİPLERİ

Bu çalışmaya Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik (2007) yönetmeliğine göre zayıflatılmış kiriş enkesitlerin hesabını yapan bir program tasarlanarak başlandı. Program Visiual Studio C# programlama diliyle hazırlanmıştır. Programın ekran görüntüleri Şekil 2-3-4-5 verilmiştir. Çalışmanın devamında 8 metre açıklıklı 4 metre yükseklili 1 katlı 1 açıklıklı, 1 katlı 3 açıklıklı, 2 katlı 1 açıklıklı, 2 katlı 3 açıklıklı, 4 katlı

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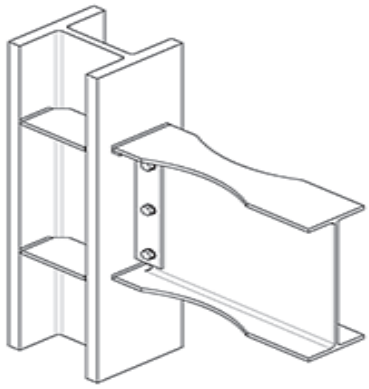
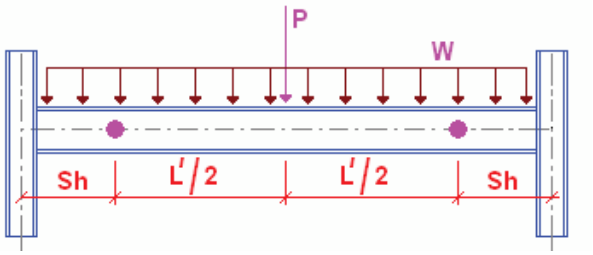
1 açıklıklı, 4 katlı 3 açıklıklı, 6 katlı 1 açıklıklı, 6 katlı 3 açıklıklı farklı çerçeveler azaltılmış ve azaltılmamış olarak analizleri yapılmıştır. Şekil 7 de analiz için kullanılan çerçeveler görülmektedir. Bu analizlerde tüm kolon ve kirişler shell olarak modellenmiştir. Birleşimin tüm detayları modellerde dikkate alınmıştır. Çerçeve elemanlarının boyutlandırılması düşey ve deprem yüklerini içeren yönetmelikteki yük kombinasyonlarına göre yapılmıştır. Bu aşamada elemanlar Sap2000 programı kullanılarak çubuk olarak modellenmiştir. İlk analiz sonucuna göre belirlediğimiz kolon kiriş kesitleri Solidwork katı modelleme programıyla modellenmiştir, buradan LSDYNA sonlu elemanlar analiz programına aktarılmıştır. LSDYNA programında malzeme ve yükler girilerek analizleri tamamlanmıştır. Nonlineer time history analizleri yapılmıştır. Analizlerde kullanılan çelik malzemesinin gerilme birim şekil değiştirme diyagramı (σ-ε) Şekil 8'te verilmiştir. Bu analizler sonucunda azaltılmış ve azaltılmamış kesitlerin deformasyon ve gerilmeleri incelenmiştir.

ZAYIFLATILMIŞ KİRİŞ ENKESİTLERLE İLGİLİ TASARIM KOŞULLARI



Şekil 2. Zayıflatılmış kiriş en kesiti.



$$M_{pr} = 1.1 \cdot D_a \cdot W_p \cdot \sigma_y$$

	D_a
Fe çeliğinden imal edilen hadde profilleri	1.2
Diğer yapı çeliklerinden imal edilen hadde propilleri	1.1
Yüm yapı çeliklerinden imal edilen levhalar	1.1

Tablo 1: D_a Arttırma Katsayıları

ARTTIRILMIŞ DEPREM ETKİLERİ

Gerekli görülen yerde çelik yapı elemanlarının ve birleşim detaylarının tasarımında arttırılmış deprem etkileri göz önüne alınacaktır.

$$1.0 \cdot G + 1.0 \cdot Q \pm \Omega_0 \cdot E$$
$$0.9 \cdot G \pm \Omega_0 \cdot E$$

Taşıyıcı Sistem Türü	Ω_0
Süneklik Düzeyi Yüksek Çerçeveler	2.5
Süneklik Düzeyi Normal Çerçeveler	2.0
Merkezi Çelik Çaprazlı Perdeler (Süneklik Düzeyi Yüksek veya Normal)	2.0
Dış Merkez Çelik Çaprazlı Perdeler	2.5

Tablo 2: Büyütme Katsayıları

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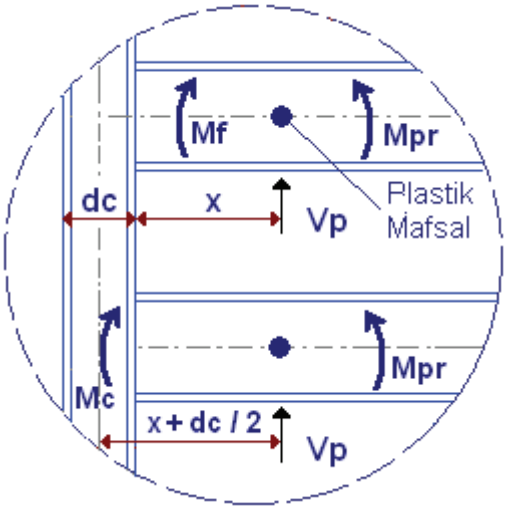
Kolon başlık yüzeyindeki moment (M_f): $M_f = M_{pr} + V_p \cdot X$

Kolon ağırlık ekseni üzerindeki moment (M_c): $M_c = M_{pr} + V_p \cdot \frac{d_c}{2}$

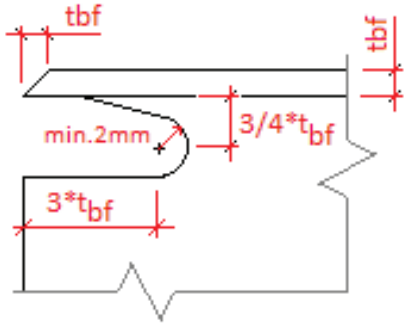


Şekil 3. İlk plastikleşecek bölgeler.

Birleşim Detay Parametreleri	Uygulama Sınırları
Kiriş ve Kolon için izin verilen malzeme Sınıfı	S355JR (St 52) ve Üzeri
Kiriş enkesit yüksekliği	≤1000 mm
Kiriş birim boy ağırlığı	≤ 450 kg/m
Kiriş açıklığı / enkesit yüksekliği oranı	≥ 7
Kiriş başlık kalınlığı	≤ 45 mm
Kolon enkesit yüksekliği	≤ 600 mm
Kaynak ulaşım deliği	gerekli
Başlık levhası kaynağı	Tam penetrasyonlu küt kaynak
Plastik mafsalın kolon eksenine uzaklığı	dc/2 + a + b/2

Tablo 3: Zayıflatılmış, kaynaklı kolon-kiriş birleşimi

Minimum 0.03 radyan plastik dönme kapasitesi için zayıflatılmış, kaynaklı kiriş-kolon detayının taşıması gereken özellikler.



Şekil 4. Kiriş için kaynak ağzı detayı.

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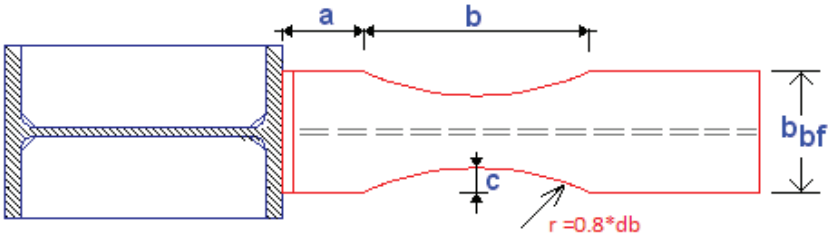
TASARIM YÖNTEMİ

1) a, b ve c değerlerinin bulunması



Şekil 5. Zayıflatılmış kiriş detayı

$$a \approx (0.50\text{'den } 0.75\text{'e kadar}) \cdot b_{bf} \qquad (b_{bf} : \text{kiriş flanş genişliği})$$
$$b \approx (0.65\text{'den } 0.85\text{'e kadar}) \cdot d_b \qquad (d_b : \text{kiriş yüksekliği})$$
$$c \approx (0.20\text{'den } 0.25\text{'e kadar}) \cdot b_{bf}$$

2) Flanş genişliği azaltmasının değerinin hesaplanması

a) $c = 0.20 \cdot b_{bf}$ olduğunu kabul edelim.

b) $W_{pl,ac}$ azaltılmış kiriş kesitinin plastiklik modülü değeri hesaplanır.

c) Kolon başlık yüzeyindeki (M_f) ve kolon ağırlık ekseni üzerindeki (M_c) momentleri hesaplanır.

$$M_{pr} = 1.1 \cdot Da \cdot W_{pl,ac} \cdot \sigma_y \qquad C_{pr} = 1.1$$
$$M_f = M_{pr} + V_p \cdot X \qquad \text{(Kolon başlık yüzeyindeki moment)}$$
$$M_c = M_{pr} + V_p \cdot \frac{dc}{2} \qquad \text{(Kolon ağırlık merkezi üzerindeki moment)}$$

d) Eğer $M_f < C_{pr} \cdot D_a \cdot V_p \cdot \sigma_y$ ise boyutlandırma kabul edilebilir. Da arttırma katsayısıdır. Eğer Mf limit değerinden büyük ise C değeri arttırılır. Yalnız C'nin değeri aşağıda verilen sınırı aşmamalıdır.

$$C \le 0.25 \cdot b_f$$

3) Eğer Mf ve Mc momentleri, azaltılmış kiriş kesit hesabı sonucuna dayalı olarak tekrar hesaplanır. Burada Mf kolon flanş düzlemi hizasındaki, Mc ise kolon ekseni hizasındaki momentlerdir.

4) Kolon flanş düzlemi hizasındaki kesme kuvveti hesaplanır.

$$V_f = 2 \cdot \frac{M_f}{L - d_c} + V_g$$

V_g : Gravitasyonel yüklerden dolayı kesme kuvveti

d_c : Kolon profil yüksekliği

5) Kolon – kiriş birleşimlerinde kesme kuvvetini aktaran kayma levhası, bunun kolon flanşına birleşimini sağlayan kaynak, kayma levhasını kiriş gövdesine bağlayan bulonlar Vf kesme kuvvetine göre boyutlandırılır.

6) Panel bölgesinin boyutlandırılması:

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a) Kayma bölgesinin V_{ke} kesme kuvveti dayanımı, düğüm noktasına birleşen kirişlerin, kolon flanş yüzeyindeki eğilme moment kapasiteleri toplamının 0.80 katından meydana gelen kesme kuvvetine eşit olarak alınacaktır.

$$d \cdot H_{ke} = 0.80 \cdot V \sum_{p} \left(\frac{M_b}{\ } \right)$$

H_{ort} : Ele alınan birleşim noktasının üstündeki ve altındaki kat yüksekliklerinin ortalaması

b) kesme kuvveti kapasitesi'nin hesaplanması

$$V_n + 1 \cdot \cdot \sigma_y = 0.6 \cdot d_c \cdot t_p \left(\frac{3 \cdot t_{cf}^2}{d_b \cdot d_c \cdot t} \right)$$

t_p : Birleşim kayma bölgesi toplam et kalınlığı (takviye levhaları dahil, cm) : Kolon kesit yüksekliği, cm

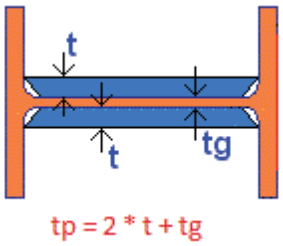
d_c

b_{cf} : Kolon başlık genişliği, cm :

t_{cf} Kolon başlık kalınlığı, cm : Kiriş kesit yüksekliği, cm

d_b

σ_y : Akma sınır gerilmesi, t/cm 2



Şekil 6. Kolon gövde takviyesi detayı.

c) Kayma bölgesi et kalınlığı

Kolon gövdesi ve eğer kullanulmışsa, takviye levhalarından her birinin t kalınlığı, aşağıda verilen koşulu sağlamalıdır.

$$u = 2 \cdot (d + v_z) \quad t_z \geq \frac{u}{180}$$

7) Süreklilik levhaları:

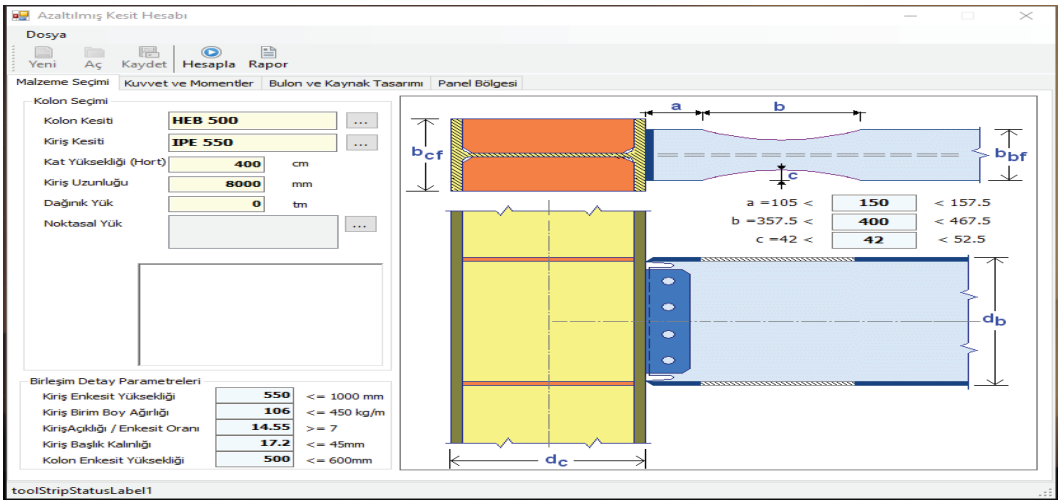
$t_{cf} < 0.4 \sqrt{1.8 \quad b_{bf} \quad b_{bf}}$ $t_{cf} < \frac{b_{bf}}{6}$ eşitsizliğini sağlaması durumunda süreklilik levhaları kullanılır.

Kullanılacak süreklilik levhası kalınlığı, kirişin kolona tek taraftan bağlanması durumunda kiriş başlık levhası kalınlığının en az yarısı kadar; kiriş kolona her iki taraftan bağlanıyorsa, her iki kiriş başlık kalınlığından en büyüğü kadar olacaktır.

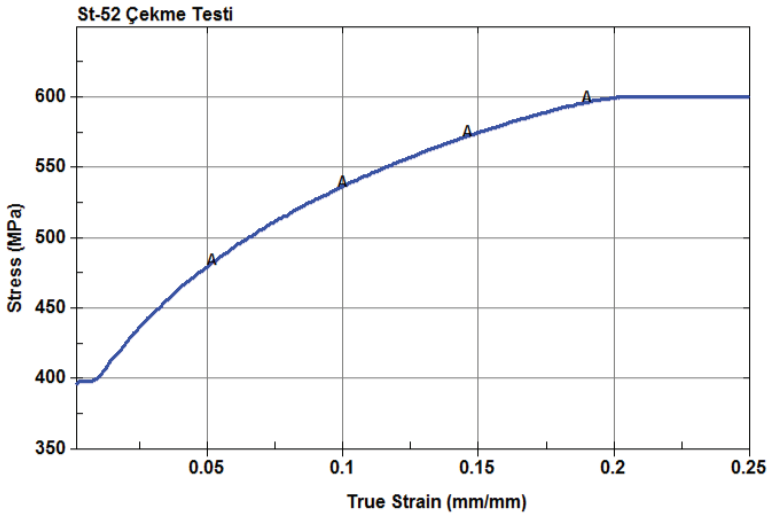
ZAYIFLATILMIŞ KİRİŞ EN KESİTİ İÇİN HAZIRLANAN PROGRAM

Zayıflatılmış enkesitli kirişlerin hesabını yapan Visual Studio C# programlama dilinde program hazırlanarak kesitlerin uygunluğu yapıldı. Program ''Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik (2007) " [1] standartının Bölüm 4 " Çelik Binalar için Depreme Dayanıklı Tasarım Kuralları " dikkate alınarak hazırlandı. Programın Görüntüsü şekil 7 de verilmiştir.

$\cdot b \cdot t$ veya



Şekil 7. Visual Studio C# programlama dilinde, zayıflatılmış kiriş kesit programının ekran görüntüsü.



Şekil 8. Analizlerde kullanılan malzemenin gerilme-birim şekil değiştirme diyagramı.

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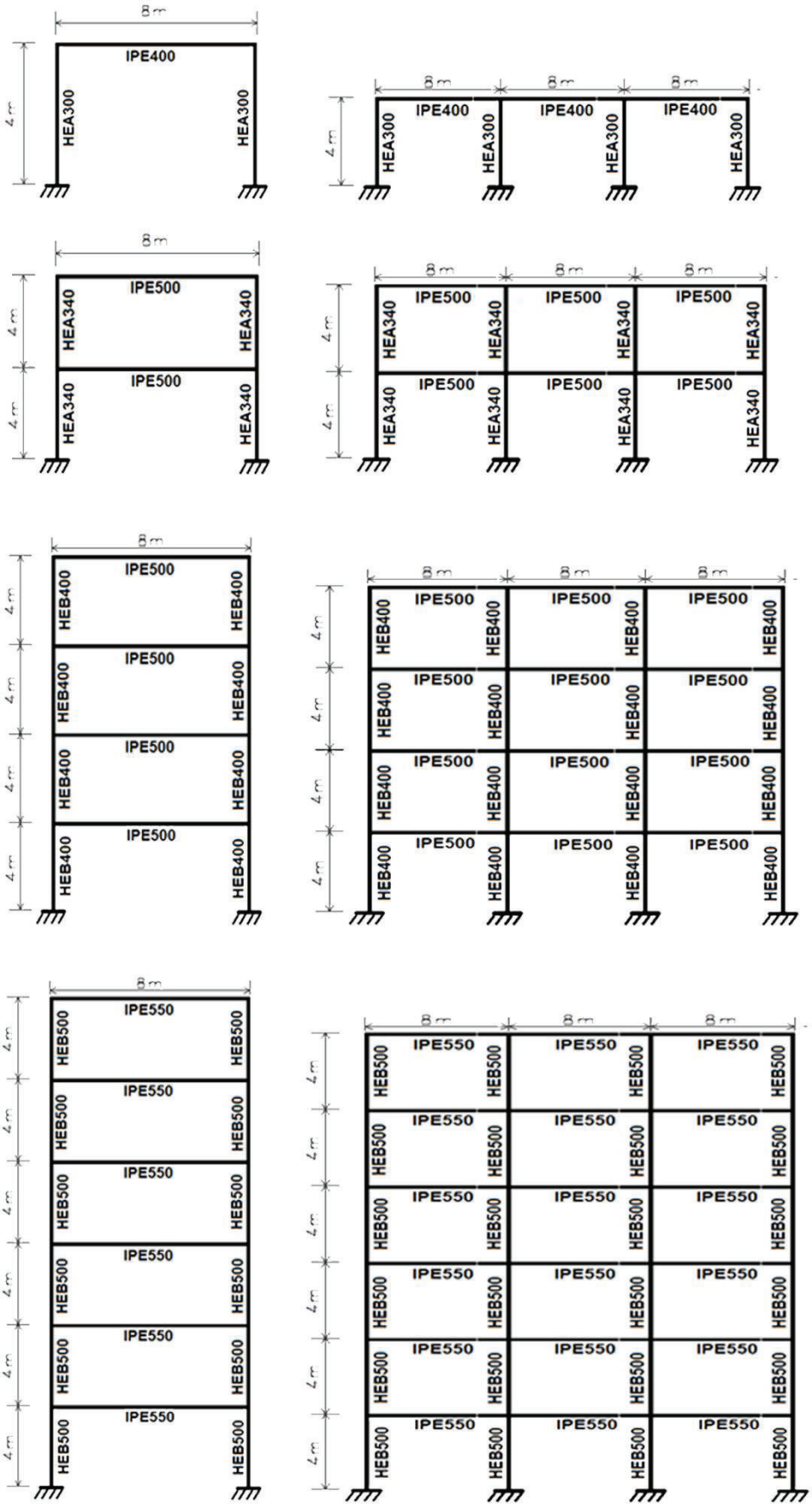

Şekil 9. Analizlerde kullanılan çerçeveler.

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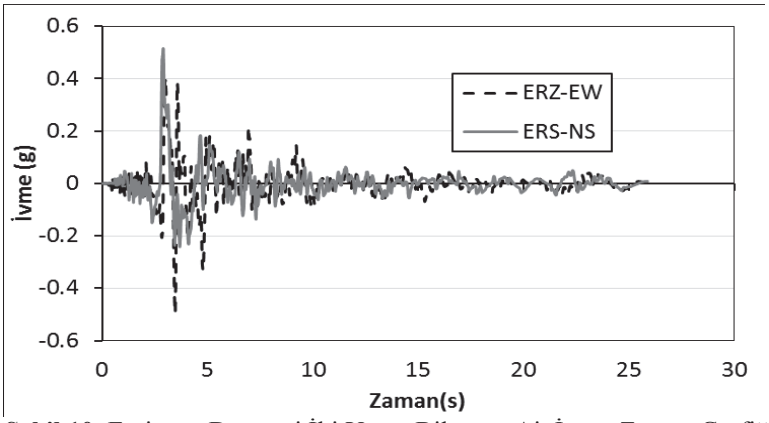
DEPREM KAYITLARININ SEÇİLMESİ

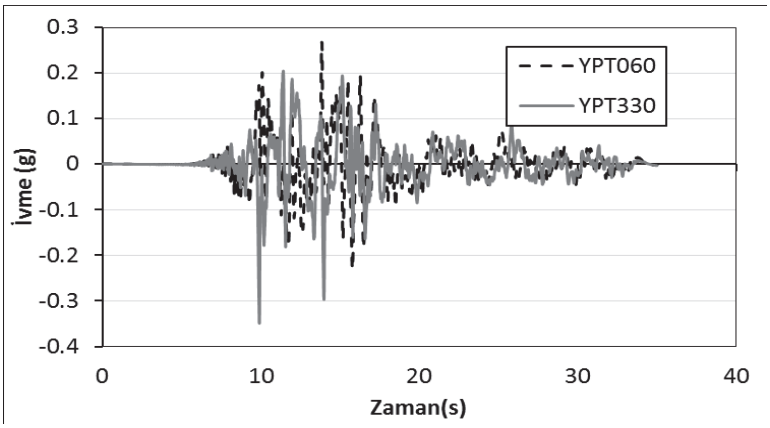
Toplam 3 adet deprem ivme kaydı PEER NGA [11] den alınmıştır. 2007 Deprem Yönetmeliğinde [1] tanımlanmış Z4 türü zemin sınıfına uygun ve %5 sönüm oranı için üretilmiş spekral ivme eğrisi esas alınmıştır. İvme genliği olarak PGA=0.4g, yapı önem katsayısı olarak da I=1.0 kullanılmıştır. Kullanılan deprem ivme kayıtlarına ait önemli özellikler Tablo 4 de verilmiştir.

Deprem İsmi	Tarih	Ms	İstasyon	Component	Faya Uzaklık (km)	PGA (g)	PGV (cm/s)	PGV (cm)	Katsayı
Düzce	12.11.1999	7.3	Düzce	DZC180	8.2	0.348	60	42.09	1.5
Düzce	12.11.1999	7.3	Düzce	DZC270	8.2	0.535	83.5	51.59	1.5
Erzincan	13.03.1992	6.9	Düzce	ERZ-NS	2	0.515	83.9	27.35	1.5
Erzincan	13.03.1992	6.9	Düzce	ERZ-EW	2	0.496	64.3	22.78	1.5
Kocaeli	17.08.1999	7.8	Yarımca	YPT060	2.6	0.268	65.7	57.01	1.5
Kocaeli	17.08.1999	7.8	Yarımca	YPT330	2.6	0.349	62.1	50.97	1.5

Tablo 4: Deprem ivme kayıtlarının özellikleri



Şekil 10. Erzincan Depremi İki Yatay Bileşene Ait İvme-Zaman Grafiği



Şekil 11. Kocaeli Depremi Yarımca İstasyonu Kaydı İki Yatay Bileşene Ait İvme-Zaman Grafiği

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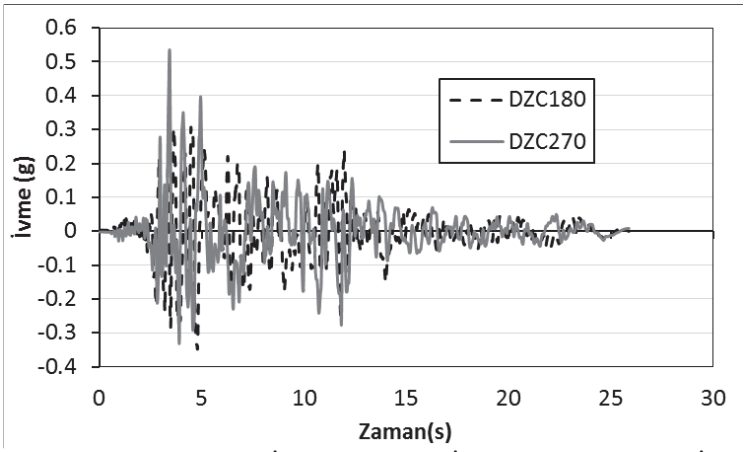
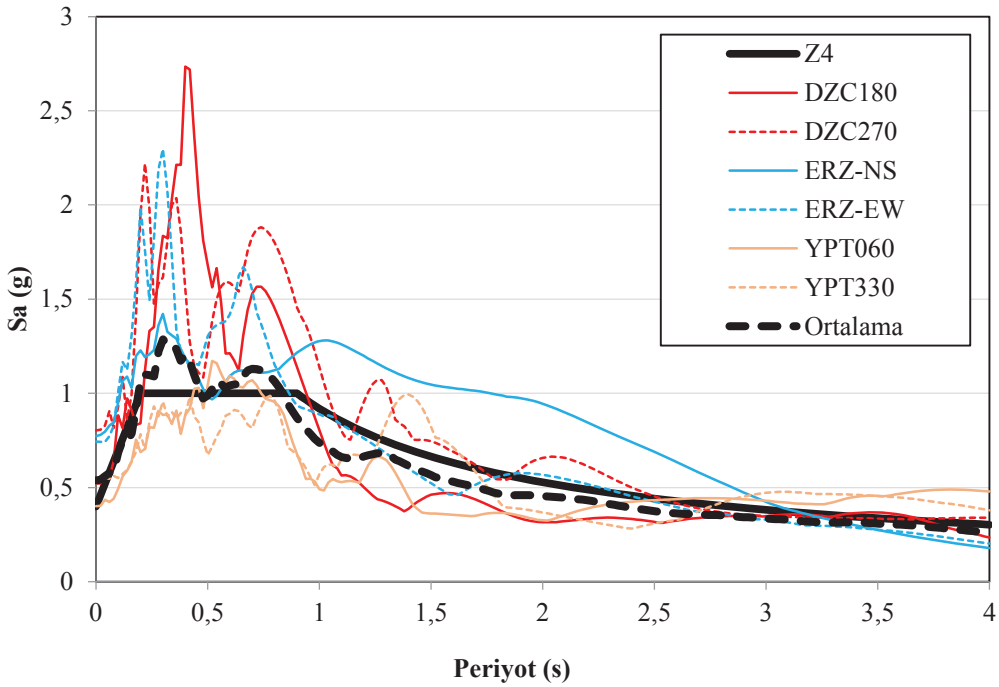


Şekil 12. Düzce Depremi Düzce İstasyonu Kaydı İki Yatay Bileşene Ait İvme-Zaman Grafiği



Şekil 13. Elastik ivme spektrum eğrileri (Z4 Türü Zemin İçin)

Seçilen deprem ivme kayıtlarının Z4 türü zemin ve PGA=0.4g ivme düzeyi esas alınarak ölçeklendirilmesi sonrasında, %5 kritik sönüm oranı esas alınarak üretilen elastik ivme spektrumu Şekil 13 de verilmiştir. Siyah sürekli çizgi Deprem Yönetmeliğinde tanımlanmış hedef spektrumu, siyah kesikli çizgi ise seçilen kayıtların ortalamasını göstermektedir.

ANALİZ SONUÇLARI

Çerçevelerin analiz sonuçlarına göre frekans, 1.mod titreşim peryodu, gerilme, plastik deformasyon bilgileri tablo 5 te verilmiştir. Yapılan analiz sonuçları plastik deformasyonların zayıflatılmamış kesitlerde maksimum değerlerin kolonlarda ve kirişlerde çıkabildiği fakat inceltilmiş kiriş kesitli çerçevelerde maksimumların kirişlerin azaltılmış bölgelerinde yoğunlaşarak kolonlarda bariz bir şekilde azaldığı görülmektedir. Yapı içerisinde plastikleşme bölgelerinin kolonlardan önce kirişlerde olması sünek davranış açısından çok önemli olduğundan, zayıflatılmış kiriş kesitine sahip kesitli çerçevelerin yapı sünekliğini arttırdığı görülmektedir. Aşağıdaki LS-DYNA analiz sonuçlarının görüntüleri zayıflatılmış kiriş enkesite sahip çerçevelerin kolonlardaki gerilmelerin ve plastik deformasyonların azaltılmasındaki etkisini net bir şekilde göstermektedir. Burada tüm deprem ve çerçeve türleri için benzer durum oldugundan görüntülerin bir kısmına yer verilerek sonuçlar Tablo 5 ve Tablo 6 da özetlenmiştir.

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Maksimum Plastik Birim Şekil Değiştirmeler (Düzce Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	0.0031167	0.00295811
	3	0.0257956	0.0187231
2	1	0.0454756	0.0396997
	3	0.0735433	0.0508359
4	1	0.00583139	0.0139554
	3	0.0128247	0.019364
6	1	0.003605853	0.0159031
	3	0.0262193	0.025403
Maksimum Plastik Birim Şekil Değiştirmeler (Erzincan Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	0.00117549	0.00198401
	3	0.0266419	0.0189307
2	1	0.0421997	0.0374517
	3	0.0508359	0.0494531
4	1	0.00764563	0.0195729
	3	0.0098274	0.0227631
6	1	0.00631713	0.0194907
	3	0.0230501	0.0230608
Maksimum Plastik Birim Şekil Değiştirmeler (Kocaeli Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	0.00951548	0.00785049
	3	0.0140168	0.00816521
2	1	0.00256647	0.00262223
	3	0.00655105	0.00648274
4	1	0.021042	0.0463719
	3	0.0397951	0.0482497
6	1	0.0208682	0.045903
	3	0.0220482	0.0463428

Tablo 5. Maksimum Plastik Birim Şekil Değiştirmeler

Maksimum Efektif Gerilme (Düzce Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	397.477	397.327
	3	437.614	421.288
2	1	472.454	463.165
	3	509.331	505.167
4	1	398.408	410.443
	3	407.727	422.610
6	1	397.860	415.395
	3	438.493	436.555
Maksimum Efektif Gerilme (Erzincan Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	396,415	396,742
	3	439,218	421,673
2	1	467,323	459,466
	3	480,654	478,811
4	1	398,410	423,099
	3	400,304	431,358
6	1	398,410	422,877
	3	431,892	431,951
Maksimum Efektif Gerilme (Kocaeli Depremi)			
Kat Sayısı	Çerçeve Sayısı	Normal Kesit	Azaltılmış Kesit
1	1	166,658	398,407
	3	410,421	398,409
2	1	397,030	397,085
	3	398,367	398,409

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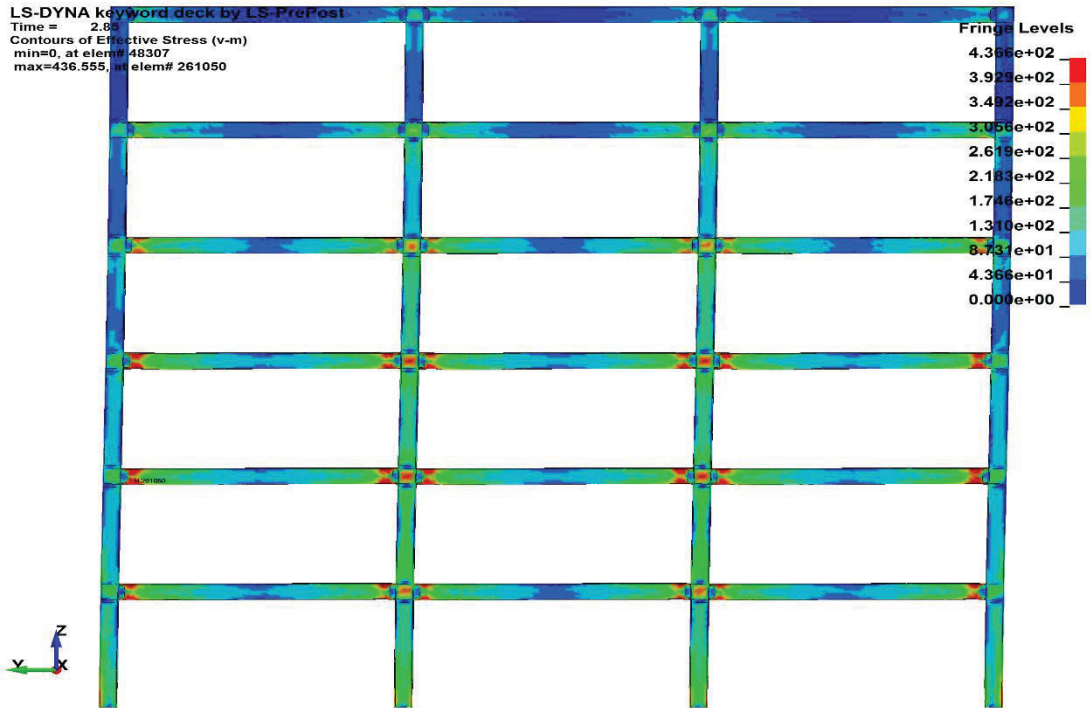
4	1	426,969	473,952
	3	463,326	476,121
6	1	426,334	473,303
	3	429,482	4 73,912

Tablo 6: Maksimum Gerilmeler



Şekil 14. Azaltılmış kesitte maksimum gerilmeler (Düzce Depremi)

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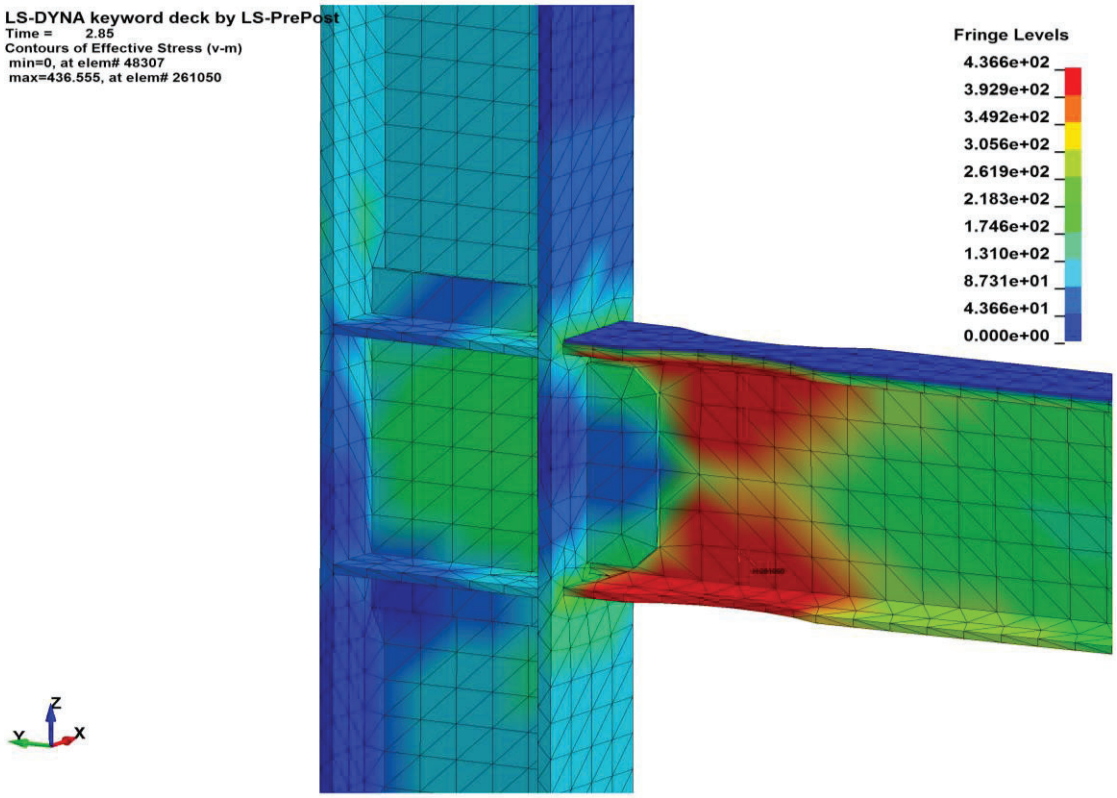
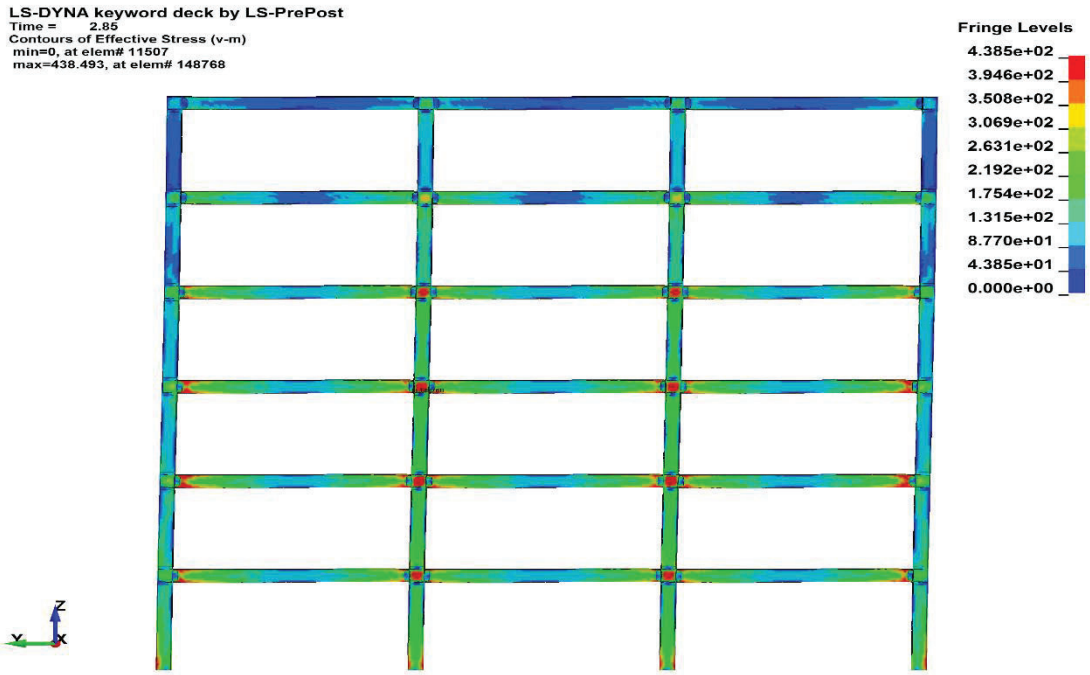


Şekil 15. Azaltılmış kesitte birleşimde maksimum gerilme.



Şekil 16. Normal kesit maksimum gerilmeler (Düzce Depremi)

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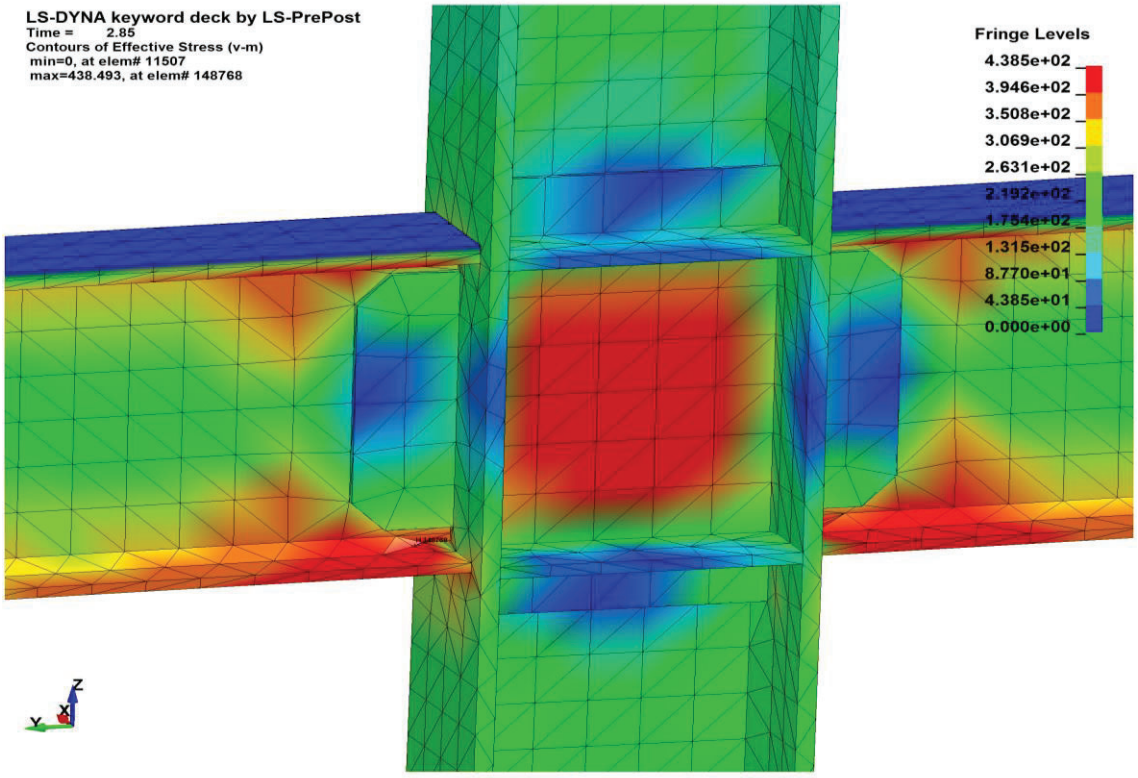

Şekil 17. Normal kesit birleşiminde maksimum gerilmeler.

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DESIGN, MANUFACTURING AND EXPERIMENTAL INVESTIGATION OF ORGANIC RANKINE CYCLE APPARATUS

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Abstract: Turkey has a variety of heat sources between 90 and 125 ˚C which are not suitable for power generation. These sources are waste sources or used only for heating purposes. Whereas these sources can be used to produce electricity with Organic Rankin Cycle (ORC) so that economic recovery may be obtained. Because of technical difficulties and non-economic situation to utilize low temperature heat traditionally constitutes challenging. Traditionally, steam turbine is used in power generation. But it requires high temperature and pressure for proper operation. Preferred technology at low temperatures is the Organic Rankin Cycle (ORC). The ORC technology uses liquids which boils at lower temperatures than water, less risk of corrosion and high molecular weight instead of high pressure water and steam. In this study, low-temperature waste heat source ORC system is designed, produced and used in power generation. Experimental studies were performed using R134a and R22 refrigerant in the produced system. At the end of the experimental studies, the performance of the system were determined.

Keywords: Energy analysis, ORC, Power Production, Waste Heat

Introduction

Demand for energy increases due to technological developments and population rise every passing day. Today, energy is considered to be a criterion of development in all countries. As Turkey is just at the threshold of development, its energy need increases every passing day. However, although it has a great variety of energy sources, its current sources cannot meet its energy need for consumption. Incapability to use domestic sources in energy generation shows Turkey's external dependence. External dependence in energy increases every passing year. Hence, a big move has to be made in energy generation through domestic sources. If such move is not made, such external dependence is likely to rise to above 80s% in the forthcoming periods. Therefore, Turkey has to make use of its energy sources in the most economical and efficient way and utilize alternative energy sources (Türkyılmaz, 2014). In this regard, organic Rankine cycle (ORC) appears as a strong alternative. Although ORC technology has a long past, it is a new energy generation method for Turkey. Today, there are ongoing new studies aimed at generating stronger energy and providing more efficient working conditions in ORC systems. In general, ORC systems are designed and used based on waste heat, geothermal energy, and solar energy (Ergün, Özkaymak & Kılıçaslan, 2016; Ergün 2014). Agahi et al. (2011) conducted a study about optimal air-cooled condenser sizing in geothermal ORC (binary) systems. They proposed a new methodology for an air-cooled condenser optimization and used a registered simulation software to evaluate the performance of the geothermal power plant by changing the condenser design parameters. Based on the data obtained from the simulation, they determined the economical factors and the optimal design parameters of the air-cooled condenser. Yılmaz et al. (2015) made energy and exergy analyses by examining a solar ORC system run by R-410a organic fluid according to the solar power data of Isparta province. They determined the thermal efficiency and exergy efficiency of the system to be 10% and 70% respectively and stated that rise in turbine inlet pressure and boiler pressure increased the thermal efficiency and exergy efficiency. Özden and Paul (2011) examined Denizli, Sarayköy geothermal power plant where electricity is generated through ORC technology and provided information about selection of the working fluid, installation of the system, and advantages of the ORC system. Etemoğlu et al. (2006) analyzed the usability of geothermal energy in Bursa province and its surrounding and used and explored ORC technology in a geothermal source with the inlet conditions of 161 kPa and 102.2 ˚C. In the system in which isopentane was used as a working fluid, the biggest irreversibility was found to be in the vaporizer (43%). Eyidoğan et al. (2016) made the technical and economic analyses of ORC systems in Turkey and indicated the areas of application in detail. In their study in which they gave information about the incentive programs of the government, they made the feasibility analyses of a biomass-supported 1MW ORC power plant as an example and found the payback period to be approximately 2.7 years. Kavasoğlu and Cihan (2015) made the energy and exergy analyses of a conventional refrigeration cycle run by an ORC system using waste hot water as heat source. They used R123, R600, R245fa, R141b, and R600a fluids in the system and investigated the exergy efficiency, performance coefficient, and exergy destruction values of the system and found R141b to be the most appropriate fluid. Zheng et al. (2015) used one-kilowatt rotating type piston expander and the R245fa working fluid to explore the dynamic testing of the expander. They established an experimental system and used a hot water boiler as a source at low temperature. They explored and analyzed experimental results such as the mass flow of the fluid, expander inlet-outlet temperature and pressure,

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the obtained power, and rotational speed. At the end of the experimental study, they found out that the expander worked in the range of 350-800 rpm and had a maximum output power of 0.35 kW at 90°C source temperature. Based on such information, they calculated the maximum expander isentropic efficiency to be 43.3% and ORC efficiency to be 5%. Eyidoğan et al. (2015) made the energy and exergy analyses of a biomass-based ORC system obtained from forestry products. They used real system data and employed biomass-based hot oil boiler as the source temperature of the ORC unit. They made energy and exergy analyses on the evaporator, condenser, and turbine, which are the main equipment of the ORC system, under two different working conditions. They also investigated the effects of the condenser pressure on energy and exergy efficiency. Under the first working condition, they found energy efficiency to be 12.57% and exergy efficiency to be 33.26%. Under the second working condition, they found energy efficiency to be 13.2% and exergy efficiency to be 35.5%. The distribution of exergy destruction in the system equipment in a descending order was found to be as follows: evaporator, condenser, turbine, regenerator, and pump. Dai et al. (2009) examined a waste-heat recovery ORC system by using different working fluids. They analyzed the effects of thermodynamic parameters on ORC performance and optimized thee parameters for each fluid. Quoilin et al. (2011) carried out the thermodynamic and thermoeconomic optimization of small-size water-heat recovery ORC system. They examined the cycle performances determined through R245fa, R113, n-butane, n-pentane, and R1234yf organic fluids and different equipment sizes. For n-butane fluid, they determined a specific cost of 2136 €/kW, a net output power of 4.2 kW, and a system efficiency value of 4.47% for thermoeconomic optimization. Thermodynamically, they determined the system efficiency to be 5.22% for the same fluid. Al-Sulaiman et al. (2013a,b) conducted a two-part study. In the first one, they provided equations and calculations related to the thermodynamic optimization of a fuel cell, biomass, and solar power trigeneration system integrated with three new ORCs. In the second part, they made the calculations of three new systems whose equations they showed. In the end, they found the highest trigeneration exergy efficiency to be 38% in the fuel cell ORC system. It was followed by the biomass system (28%) and the solar power system (18%).

In the present study, power was generated by designing and manufacturing an ORC system based on low temperature waste heat working according to the organic Rankine cycle principle. In addition, experiments were carried out in this ORC system by using the R-134a and R-22 working fluids, thereby making the performance and efficiency analyses of the system.

Materials and Methods

ORC systems are the systems which have quite a similar working to the known Rankine cycle, but use the organic fluids passing to the vapor phase at lower temperatures instead of working fluid. The layout of a simple ORC system is seen in the Figure 1 below.

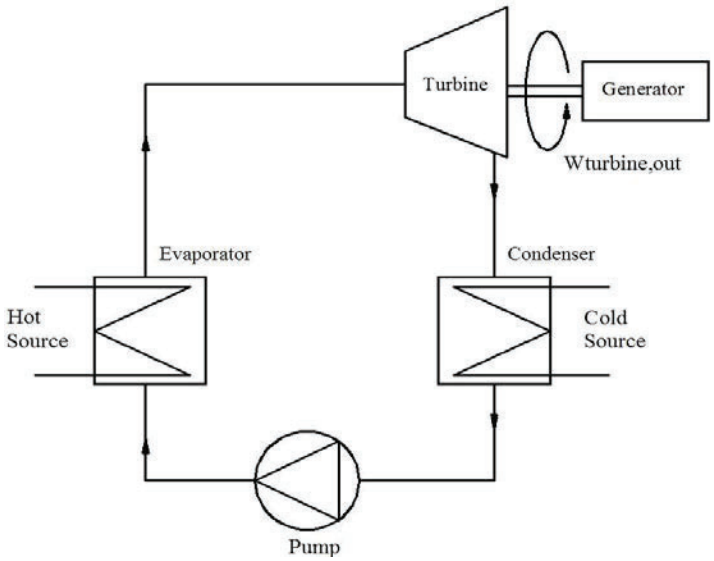

Figure 1. Organic Rankine cycle (ORC) layout

As is known, a fossil-origin fuel is burnt, thereby turning the fluid into superheated vapor in Rankine cycle. In the ORC system, on the other hand, superheated vapor is obtained at lower temperatures without burning any fuel with an external heat source. The fluid pressurized with the pump is converted into mechanical work in the turbine. It turns into the liquid phase in the condenser. The cycle of the system goes on in this way.

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In this study, a system working according to the organic Rankine cycle principle was defined and manufactured. The designed and manufactured system is showed in the Figure 2 below in detail.

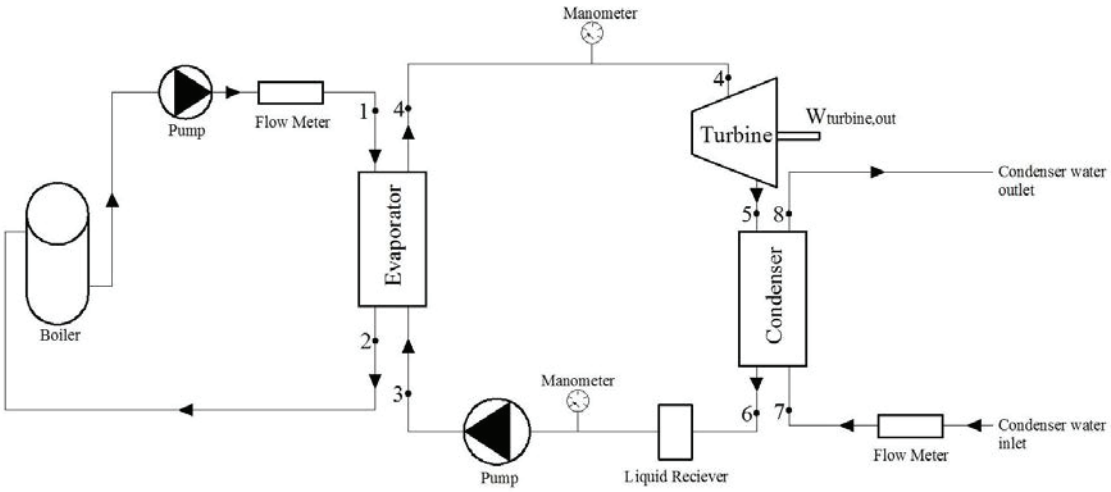

Figure 2. The Designed and Manufactured System

In the system, two plate heat exchangers (to be used as evaporator and condenser), Sanden scroll compressor (as turbine), and a magnetic pump (for the circulation of the organic fluid) were used. In addition, a 15-liter capacity boiler was designed as the heat source (evaporator) of the system. It was manufactured in a way allowing control via thermostat. A 50 W pump was used for the circulation of the boiler water. City water was connected to the heat exchanger for the cold source of the system (condenser). Evaporator and condenser water flows were determined via float type flow meters. In the system, pressure values were checked via manometers while temperature values were checked via Picolog data logger.

Thermodynamic Analysis of the System

The organic fluent flow in the system can be determined by writing energy equation for the heat exchanger used as an evaporator.

$$Q_{su} = Q_{oa} \quad (1)$$

$$m_{water} \times c_{p_{water}} \times \Delta T_{water} = m_{oa} \times c_{p_{oa}} \times \Delta T_{oa} \quad (2)$$

The energy entering the system is equal to the difference between the enthalpy in the entrance of the hot water obtained in the boiler and the enthalpy in its exit multiplied by mass flow. It is expressed with the Equation 3.

$$Q_{entering} = m_{hot,water} \times (h_1 - h_2) \quad (3)$$

The mechanical work obtained from the system is equal to turbine work. It is showed in the Equation 4 below.

$$W_{turbine} = m_{oa} \times (h_4 - h_5) \quad (4)$$

The network obtained from the system (Wnet) is calculated by subtracting the pump powers from the power obtained in the turbine. The powers of the pumps used in the system were taken as 300 and 50 Watt from the catalog. This values shows the net power to be used while calculating the energy efficiencies. It is calculated with the Equation 5.

$$W_{net} = W_{turbine} - W_{pump} \quad (5)$$

The thermal efficiency of the system is calculated through the Equation 6.

$$\eta_{Termal} = \frac{W_{net}}{Q_{entering}} \quad (6)$$

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Results and Discussion

In the present study, data were obtained by carrying out five experiments for each one of the R134a and R22 fluids at the intervals of 10 minutes. The data obtained through the equations given above are presented in graphs.

The mass flows calculated by using the Equation (2) based on the values measured during the 50-minute experiment are graphically showed for both fluids in the Figure 3.

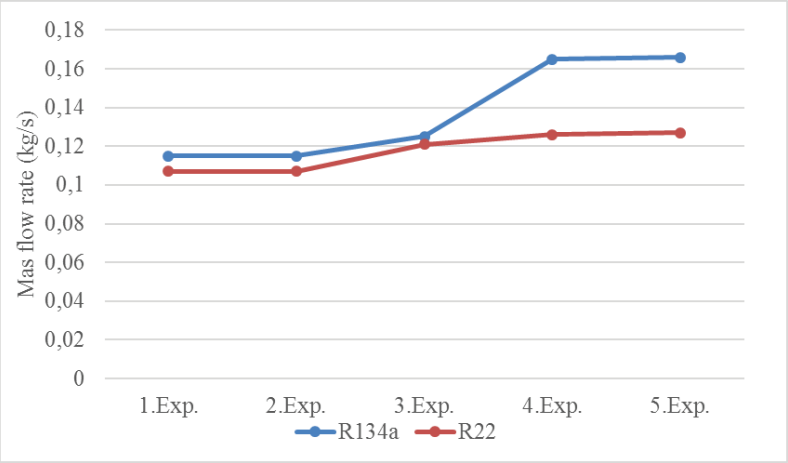

Figure 3. The flow values of the R134a and R22 fluids

Figure 4 and Figure 5 show the change in net work changing depending on the source temperature and turbine inlet temperature in the system for the R134a gas. As is seen in the figure also, as source temperature and turbine inlet temperature rise, the net work produced increases as well.

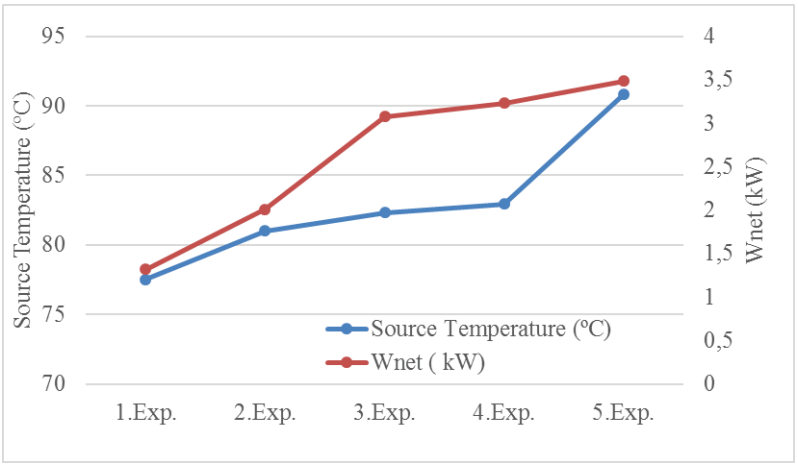

Figure 4. The net work produced based on the source temperature

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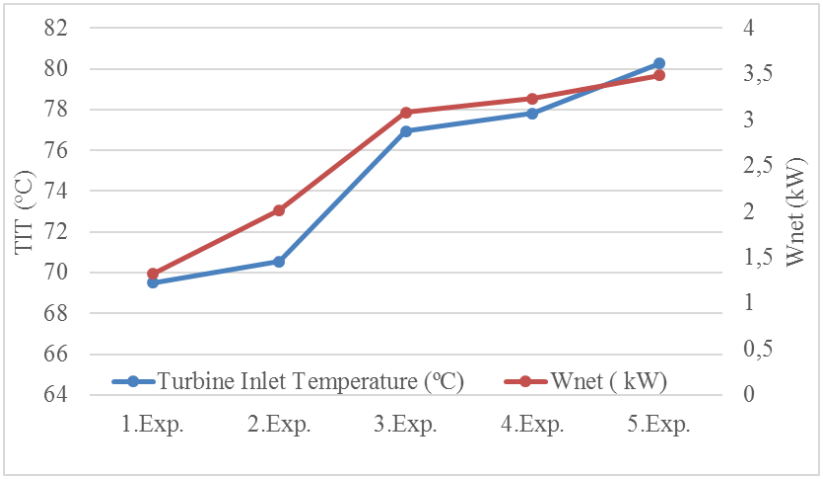

Figure 5. The net energy values produced by the R134a fluid based on the turbine inlet temperature

Figs. 6 and 7 show the change in net work based on the source temperature and turbine inlet temperature for the R22 gas. In a similar way to the R134a fluid, net work increased as the source temperature and turbine inlet temperature rise.

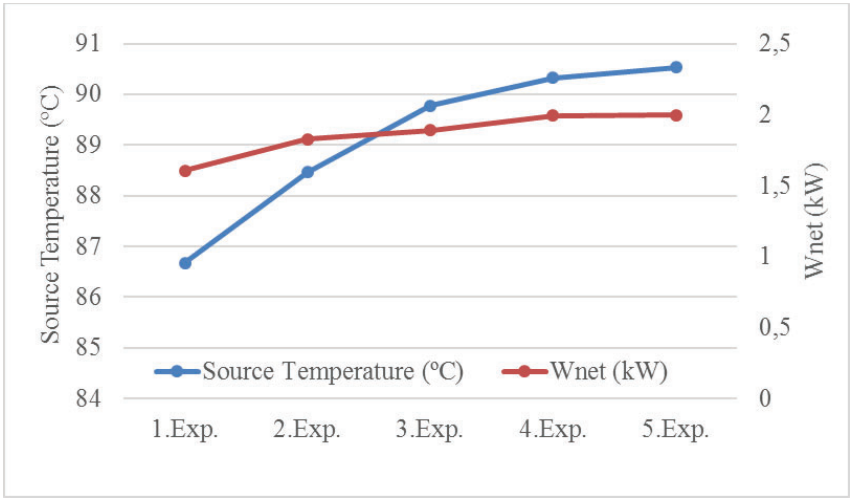

Figure 6. The energy values produced by the R22 fluid based on the source temperature

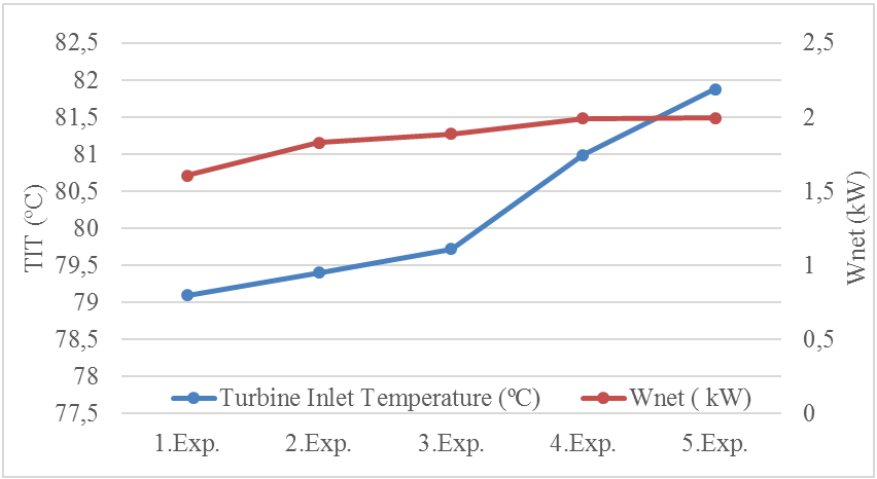

Figure 7. The energy values produced by the R22 fluid based on the turbine inlet temperature

Figs 8 and 9 provide efficiency and net work comparisons for the two fluids. The net work and efficiencies are higher for R134a fluid.

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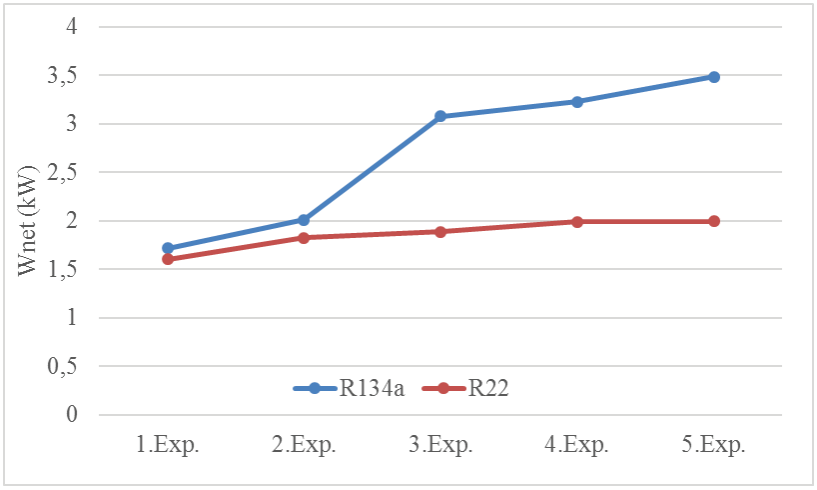

Figure 8. Comparison of the net work generated by the R134a and R22 fluids through the turbine

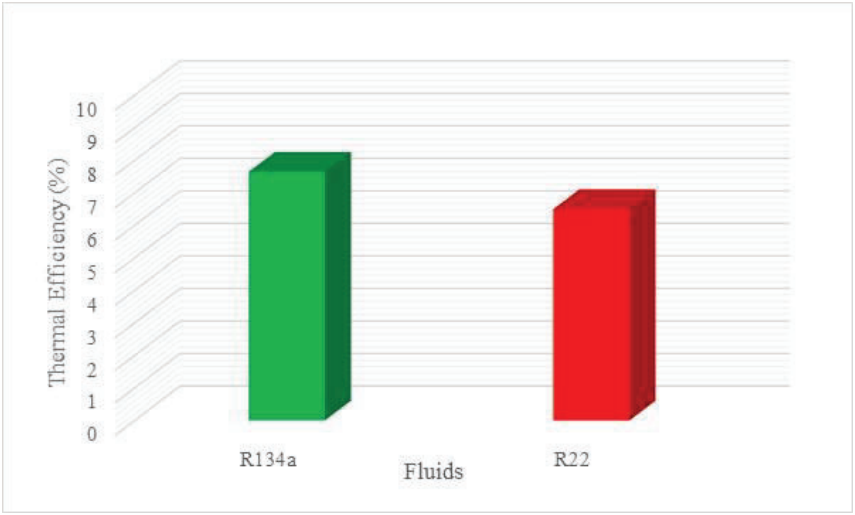

Figure 9. Comparison of the efficiencies

Conclusion

In the present study, the following findings were obtained based on the experimental data:

- Especially waste-heat recovery and geothermal systems working according to the organic Rankine cycle principle are suitable for continuous electricity production. The use of these sources stands as an alternative solution that can reduce Turkey's external dependence in energy.
- Source temperature is very important in ORC systems. The higher the source temperature is, the higher net work and efficiency are.
- Besides the source temperature, the turbine inlet temperature of the organic fluid is one of the most critical parameters. Transferring the source temperature to the organic fluid with minimum loss possible will enhance the efficiency of the system. Hence, the design of the heat exchanger used as evaporator is of great importance.
- The R134 gas used in the system provided more efficient working conditions. The main criterion in these kinds of power generation plants is the net power generated. It is reported in the literature that calculating exergy efficiency rather than thermal efficiency yields more accurate results in the comparison of ORC systems. Therefore, it is recommended to make exergy analysis of these systems besides their thermal analysis.

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DETECTION AND MOLECULAR CHARACTERIZATION OF *HSP90* GENES IN CUCUMBER GENOME

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Abstract: Plants as sessile organisms are subjected to consistently changing stress factors such as drought, salinity, cold and hot temperatures. Plants could not change their sites to avoid such stresses, but adapt morphologically and physiologically by some other mechanisms. Heat shock proteins, also called as stress proteins, found in all living organisms. They are produced by cells under normal and stress conditions. These proteins play also crucial roles for cell growth and survival. The primary role of heat-shock proteins is to direct folding and refolding mechanisms of proteins which are newly synthesized or denatured. Hsp90 is one abundant cellular chaperone essential for folding of a vast array of client proteins, including protein kinases and transcription factors, which are involved in the signal transduction process. Like other classes of HSPs, the levels of Hsp90 are upregulated into several folds upon induction to stress in order to protect the conformational flexibility of its client proteins. Cucumber (*Cucumis sativus* L) is a model plant, which belongs to Cucurbitacae family. Although cucumber genome was published in 2009, Hsp90 protein family members have not been determined yet. In this study, 7 Hsp90 protein family members were detected in *C. sativus* genome. The lengths of determined proteins were between 221 and 817 amino acids. Their molecular weights varied between 25.2 and 93.6 kDa. *CsHsp90* genes were mapped on 7 chromosomes of cucumber. The highest number of *Hsp90* genes were located on Chromosome 1 and 3 with the number of 2 for each. The phylogenetic tree of CsHsp90 proteins displayed 3 district classes which were compatible with their motif compositions and gene structure. Both motif compositions and gene structure have 3 predominant patterns. Predicated 3D structures of CsHsp90 proteins mainly displayed alfa-helix structure for 7 CsHsp90 proteins which showed high homology. Cucumber Hsp90 proteins were especially found in cell or organelle parts. Cellular process and response the stimulus were their predicted biological function. Their mode of action was binding activity and structural molecule activity. This kind of gene identification studies open new perspectives to analyze functions of Hsp90 protein family members in plants.

Keywords: Cucumber, Hsp90, Genome-wide identification, Bioinformatics analysis

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DETECTION OF CARDIAC PATHOLOGY BY NEURAL NETWORKS

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Abstract: Ventricular diseases are a major public health problem and are the leading cause of death in the world. An electrocardiogram (ECG) is a recording of the electrical activity of the heart as a function of time. Due to its effectiveness and reliability for diagnosis, the electrocardiogram has an important efficiency in monitoring by diagnosing patients, while the ECG performs only when it is recorded over a long period of time. Analysis of such recording requires methods of parameter extraction and automatic heartbeat detection.

We used neural networks specifically a multi-layer perceptron network (MLP) for its ability in detecting cardiac pathology, using the MIT-BIH arrhythmia database to detect pathology. The results obtained showed the good performance of the MLP algorithm.

Keywords: bouchrakaidslimane

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DETERMINATION OF HEAVY METALS IN SAPANCA LAKE, TURKEY WITH MICROWAVE ASSISTED DIGESTION AND ICP-MS METHODS

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Abstract: In the present work, the aim is to determine seasonal changes in the concentrations of Cd, Cr, Cu, Fe, Pb, Mn, Ni and Zn in the water of Sapanca Lake and to determine the water quality. Sapanca is one of lakes which can be used as the resource of drinking water in Turkey. In addition, Sapanca Lake is one of the most important drinking water sources for the province of Sakarya and its surroundings [1]. Ten different stations were chosen as sampling points. Water samples were collected from these stations in January 2016, April 2016, July 2016 and October 2016. The samples were digested with the use of a microwave digestion procedure. The heavy metal analysis of samples was carried out using ICP-MS. In general, heavy metal concentrations in the lake water decreased in the following sequence: Fe > Mn > Zn > Cu > Ni> Cr > Pb > Cd. Concentrations of the heavy metals Cd, Cr, Cu, Fe, Pb, Mn, Ni, and Zn in the water of Sapanca Lake are at acceptable levels according to WHO (World Health Organization) and TS 266 (Turkish Standard) water standards.

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Acknowledgement

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Keywords: Sapanca Lake, heavy metals, seasonal changes, microwave assisted digestion, ICP-MS.

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DETERMINATION OF SIDEROPHOREGENIC BACILLUS SPP. ISOLATED FROM NATURAL MEDIUM AND EVALUATION OF PROBIOTIC CHARACTERISTICS

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Abstract: Although it is not an criteria for probiotic characteristics, it is important for human health that the strain is probiotically isolated or determinated from natural medium, stabil against table salt, acid, enzyme and oxygen, able to attach to intestinal mucosa, able to colonize in gastrointestinal tract and able to prevent the development of pathogen bacteria by producing antimicrobial materials. Siderophore, a peptide molecule that binds to ferric ions, has various application areas in medicine and agriculture. Iron is essential in physiological activities in the life of humans, plants, animals and microorganisms. Excess or incompleteness of iron may cause different illnesses. For these reasons, siderophore has some potential applications in treatment of human diseases. Siderophores arouse interest in the field of medicine since they are one of the largest known Fe^{+3} binders. Furthermore, they are especially important in metal chelate treatment.

The goal of this study is to compare siderophoregenic features and evaluate probiotic usage potential of the strain with the highest siderophoregenic capacity in *Bacillus* sp., isolated in a variety of environments. In this study 22 *Bacillus* sp. strain identified with API masses that are isolated from different soil extracts are used. According to data collected by the evaluation of probiotic usage potential of 3 strains that produced maximum amount of sideophore, *Bacillus brevis* M4 coded strain is high in antimicrobial activity and is more resistant in antibacterial susceptibility compared to others. It is determined that this strain produced 44,21 mg/l EPS. For this reason, it can be concluded that B. *brevis* M4 coded strain may have the potential of probiotic usage.

Keywords: Probiotic, EPS, Bacillus sp., Siderophore

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DETERMINATION OF SOIL PROPERTIES USING MASW AND MICROTREMOR METHODS: ADAPAZARI EXAMPLE

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Abstract: Our country is located in a tectonically active earthquake belt, and in history it is a region where great earthquakes frequently occur. In this respect, it is very important to predict the effects of strong movements on the ground to minimize the damage. The effect of 1999 Izmit Earthquake (M_W=7.4), which occurred in the recent past, on structures built on weak grounds clearly shows the importance of this situation. During the last two decades after the 1999 Izmit and Düzce Earthquakes, Sakarya and its surroundings are in a rapid urbanization . Whereas, there is no study on the determination of soil properties in Sakarya University Campus and its near vicinity, which is selected as a study area. The geophysical method, MASW (multi-channel analysis of surface waves) is one of the most effective methods used to obtain the Vs30 (the average shear wave velocities for the top 30 m) data used by national and international soil classification criteria. Another geophysical method, the single station microtremor method (Nakamura spectral ratio, H/V), is a fast and economical technique used to determine site amplification and dominant vibration period. As a result of the measurements performed at 34 points, site amplification was found at 1-11.7 and fundamental frequency was found at 1.3-6 Hz in microtremor analysis. Whereas, as a result of the analysis made with MASW method, while class B and C soils were observed dominantly in the study area, D class ground information was obtained in some areas on the local scale.

Keywords: Microtremor, Surface waves, Vs30, Adapazarı

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Development of a complete AUTOSAR 4.0 Software Project with the AUTOSAR Education Environment

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Abstract: The automotive industry introduced the AUTOSAR standard for the development of software for automotive electronic control units. With the availability of the AUTOSAR Education Environment, students have the possibility to work with AUTOSAR-related hard- and software. This article gives information about the realisation of a first complete AUTOSAR 4.0 Software Project at Institut für Regelungs- und Steuerungstechnik (Institute of Automatic Control Engineering) of Universität Siegen.

Keywords: AUTOSAR Education Environment, AUTOSAR 4.0 Software Project

Introduction

The term AUTOSAR stands for **AUT**omotive **O**pen **S**ystem **AR**chitecture and is an international standard of the automotive industry. AUTOSAR describes a reference architecture for the software of electronic control units. The goal of this standardisation is to keep the growing amount of software with increasing complexity manageable (Kindel & Friedrich, 2009).

Besides the standard itself, the term AUTOSAR is used for the international development partnership that develops the standard as well. Vehicle manufacturers, their suppliers and other companies from the electronics, semiconductor and software industry are members of this partnership.

This development partnership maintains the website https://www.autosar.org/ where the standard can be downloaded for informational purposes. The commercial use of this information is restricted to AUTOSAR-members.

In order to give students the possibility to work with AUTOSAR-related hard- and software the company Vector Informatik (from Stuttgart, Germany), an AUTOSAR-member, has developed the AUTOSAR Education Environment. The hardware included in the Education Package is an automotive electronic control unit (ECU) and a Hardware Debugger for transferring the developed software to the microcontroller in the ECU and of course for debugging the developed program code. The customer can either directly connect his own hardware or has the choice between two different breakout-boxes. On the software side the Education Environment includes parts of Vector Informatik's own AUTOSAR implementation and several software tools for ECU software development and debugging.

We at the Institut für Regelungs- und Steuerungstechnik (Institute of Automatic Control Engineering) of Universität Siegen bought the AUTOSAR Education Environment. Software development for microcontrollers is not something new to us – we did it several times for microcontrollers of different manufacturers. However, since the development of software according to the AUTOSAR standard is very domain specific, several things were new to us. Therefore, the goal of our first student project was to develop a complete AUTOSAR 4.0 Software Project and to document the complete workflow that is necessary to set up the project. The created documentation cannot replace the support if one has a specific problem but it is good basis for further projects.

The first part of this document will cover information that is more general and gives a brief overview of the basic ideas and concepts of the AUTOSAR standard. It introduces the reader to the workflow that is established with the standard – the so-called AUTOSAR-Methodology as well.

The second part of this document will give an overview of the realised AUTOSAR 4.0 Software Project at Universität Siegen.

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Part I: Overview of the basic ideas and concepts of the AUTOSAR standard

This part of the document has no claim to give a complete overview of the AUTOSAR standard. Instead, a brief explanation of some basic ideas and concepts are shared for a good understanding.

The implementation of a layered architecture

AUTOSAR implements the so-called AUTOSAR Layered Software Architecture (Kindel & Friedrich, 2009). This architecture describes several abstraction layers for software of an ECU: The Application Layer, the Run-Time Environment and the Basic Software. The Basic Software is the layer directly above the ECU-Hardware. Figure 1 (b) shows the structure of this architecture. In such architecture, the interfaces between the layers are well defined. One layer uses the functionality provided by the layer below and itself provides functionality to the layer above. If an error has to be corrected in one of the layers, only the implementation of that specific layer needs correction since the interfaces between the layers remain unchanged. The layer architecture therefore supports the modularity of the software.

Preliminary to the introduction of AUTOSAR, there was not necessarily a layered architecture present in the software of an ECU. This is illustrated in Figure 1 (a).

The layered architecture may remind one of the OSI reference model from the International Organization for Standardization (ISO) (Meinel & Sack, 2012). The OSI reference model is commonly used for explaining the structure of the Internet protocol (TCP/IP). The intension behind both reference models is comparable: The Interfaces between the different layers are defined and hardware dependence decreases as you move up the layers.

The Basic Software (BSW) can be regarded as an operating system that is responsible for hardware abstraction. The Application Layer contains the Software Components with the Application related Code and the Run-Time Environment (RTE) implements the communication between the different Software Components and between Software Components and the Basic Software.

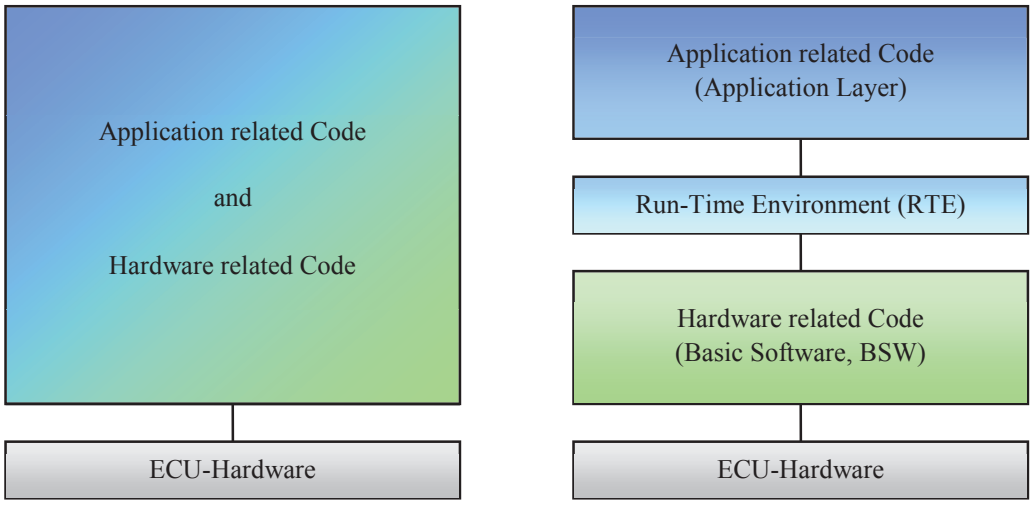

Figure 1. Comparison of the software structure in a Classical ECU (a) and an AUTOSAR-ECU (b) (see also Figure 3-2 in Kindel & Friedrich (2009)).

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The procedure to get executable code for an ECU: The AUTOSAR-Methodology

Several companies deliver the electronic control units in a vehicle. In order to manage and to parallelise the development of these control units for the vehicle the AUTOSAR-Methodology was introduced (Kindel & Friedrich, 2009), (AUTOSAR, 2008). The Methodology describes a procedure or a "Work Product Flow" to get executable code for an ECU. The necessary information for the work product flow is usually stored in xml-files. Normally software tools intensively support the work steps and a by hand modification of the xml-files should not be necessary. Figure 2 gives a simplified overview of the AUTOSAR-Methodology.

The Methodology consists of three views: The System View (red), the ECU View (blue) and the Component View (green). The System View with the System Configuration (1) contains descriptions about all Software Components, ECUs, communications links and system restrictions of a vehicle. The Software Components will be assigned to a certain ECU when the system is configured (2). From the resulting System Configuration Description (3), one can conclude which data has to be exchanged between the ECUs. Since not all ECUs and Software Components come from the same supplier, ECU Views and Component Views can be extracted (4) from the System View. The different views allow a parallelization of the complete development process for all ECUs and Software Components. Software Components that have been developed with the help of the Component View and in parallel to everything else can be integrated into an ECU (14) as binary code.

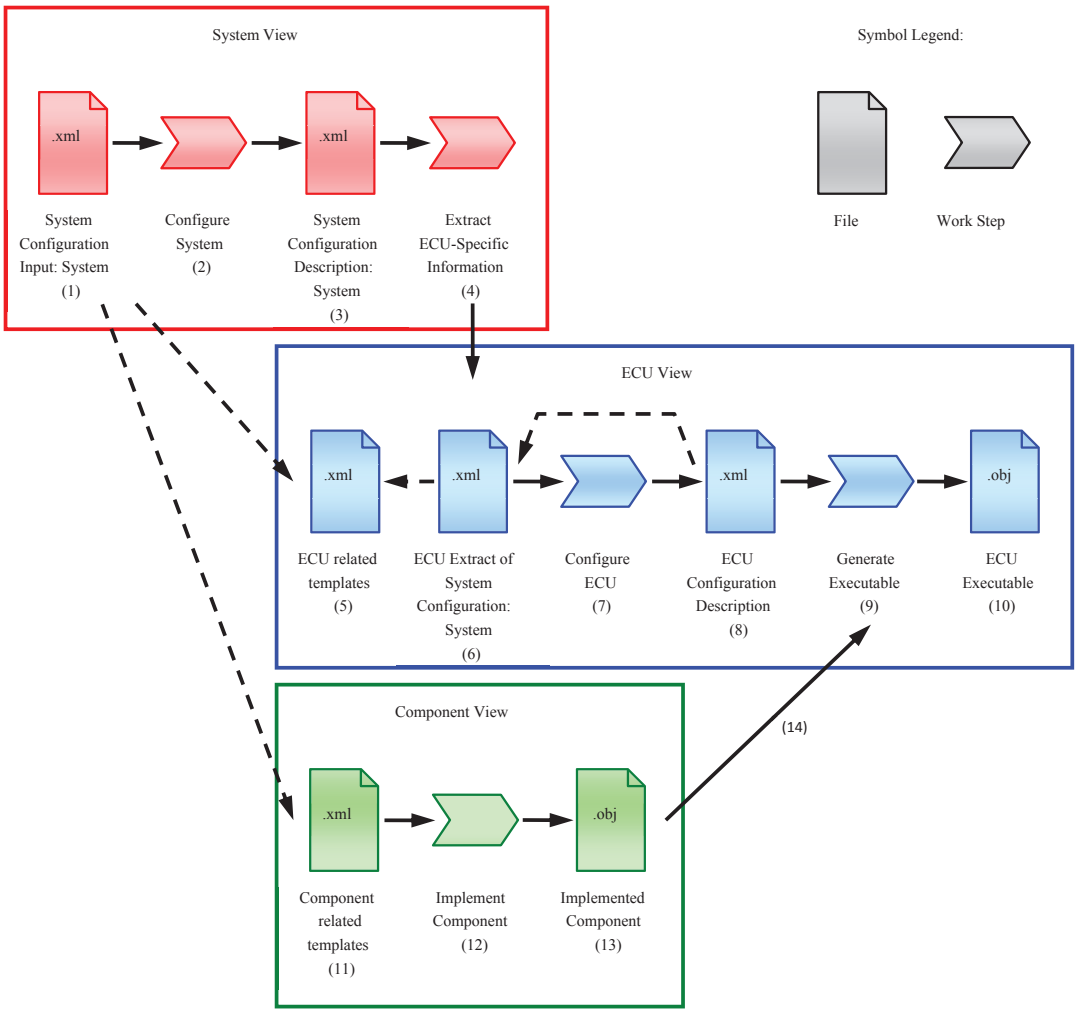

Figure 2. Simplified overview of the AUTOSAR-Methodology (see also Figure 5-10 in Kindel & Friedrich (2009)).

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With the help of the ECU related templates (5) and the ECU specific extract of System Configuration (6) one ECU can be developed. If this information is given, the ECU can be configured (7) in the next step. This configuration step includes for example the selection and configuration of the modules of the Basic Software that are needed to realise the functionality and the configuration of the task scheduler of the operating system. The result of the configuration step (7) is the ECU Configuration Description (8). The work step generate executable (9) includes the generation of source code (for example for the Run-Time Environment or the Basic Software), the compilation of the source code (for example of the generated source code or of the Software Components that are given form of source code) and finally linking all the object files together to an executable program (10).

With the help of the Component related templates (11) a Software Component or several versions of a Software Component can be implemented (12). The implemented Software Component is an object file (13) that can be integrated into an ECU (14) in link stage of the executable generation (9).

The Communication between Software Components and the Virtual Functional Bus

The Virtual Functional Bus (VFB) describes abstract communication relations between Software Components (SW-C) in the System View (Kindel & Friedrich, 2009), (AUTOSAR, 2010). During the System Configuration, all Software Components will be assigned to the respective ECUs. According to the AUTOSAR-Methodology, the Configurations of all ECUs (No. 6 in Figure 2) are extracted (No. 4 in Figure 2) from the System Configuration (No. 3 in Figure 2). Figure 3 illustrates this step of development that is carried out with the help of software tools.

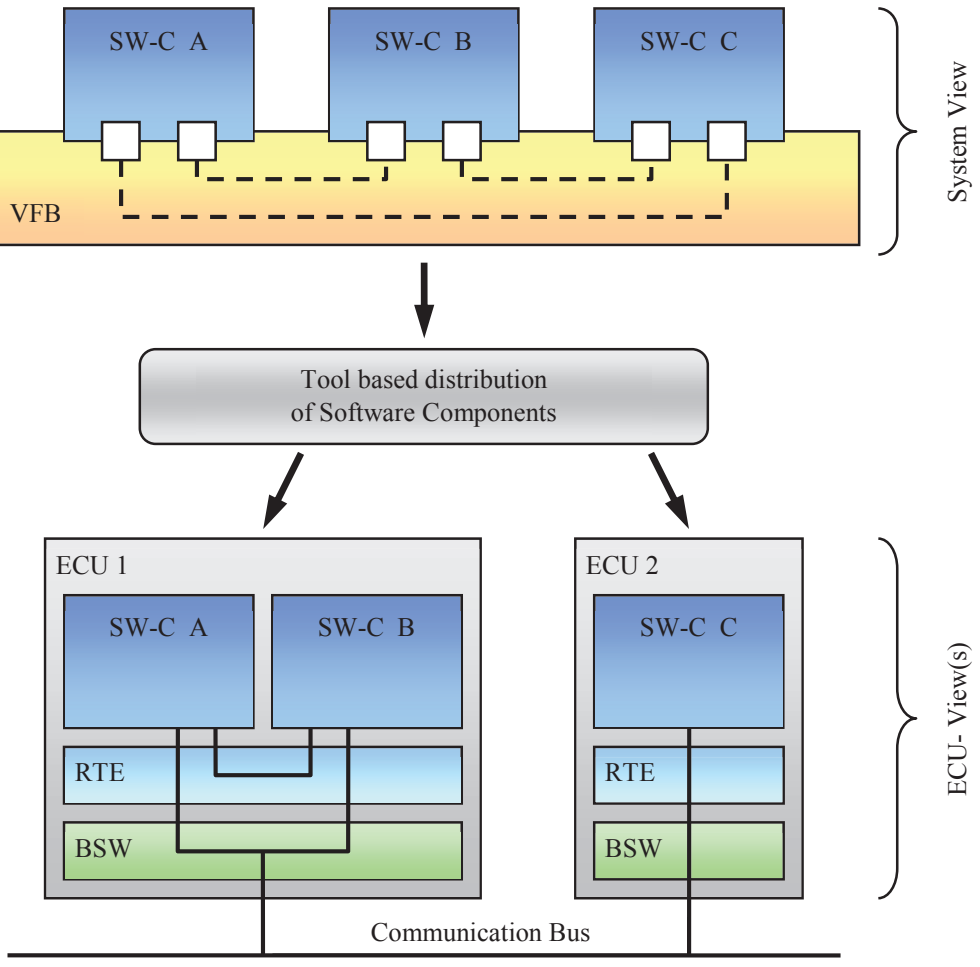

Figure 3. Tool based distribution of Software Components across ECUs (see also Figure 6-2 in Kindel & Friedrich (2009)).

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When the ECU Views are generated, the abstract communication relations between Software Components will be replaced by concrete communication connections. For this step, it does not matter if the communication takes place between two Software Components on the same ECU or if the communication has to be established across a Communication Bus. This flexibility is reached by the auto-generation of the Run-Time Environment that realises the communication connections between the Software Components.

If there are problems in one ECU regarding the computational power of the CPU, the System Configuration can be modified and the extraction of the ECU Configurations can be repeated. A prerequisite for this flexibility within the distribution of Software Components is that there are enough free communication resources on the communication bus. A constrain that two Software Components have to be assigned to the same ECU can restrict this flexibility.

The structure of the Basic Software

Within the layered architecture the Basic Software is located below the Run-Time Environment and above the ECU-Hardware. In addition to that, the Basic Software itself is subdivided into three horizontal abstraction layers and six vertical sections (Kindel & Friedrich, 2009). Figure 4 illustrates the location of the Basic Software in the layered architecture and the structure of the Basic Software itself.

The vertical subdivision of the Basic Software results in the following six sections (from left to right): System Services, Device Stack, Memory Stack, Communication Stack, I/O-Stack and Complex Device Drivers. The three horizontal Abstraction Layers are (from bottom to top): Microcontroller Abstraction Layer (MCAL), ECU Abstraction Layer and Service Layer.

The section System Services provides basic functionality as operating system-, diagnostic- and ECU State Management functions to Application Software Components and to other modules of the Basic Software. The Device Stack abstracts Microcontroller internal Hardware like the Watchdog and the Timers. The Memory Stack provides unified access to non-volatile memories as Flash-Memories and EEPROMs.

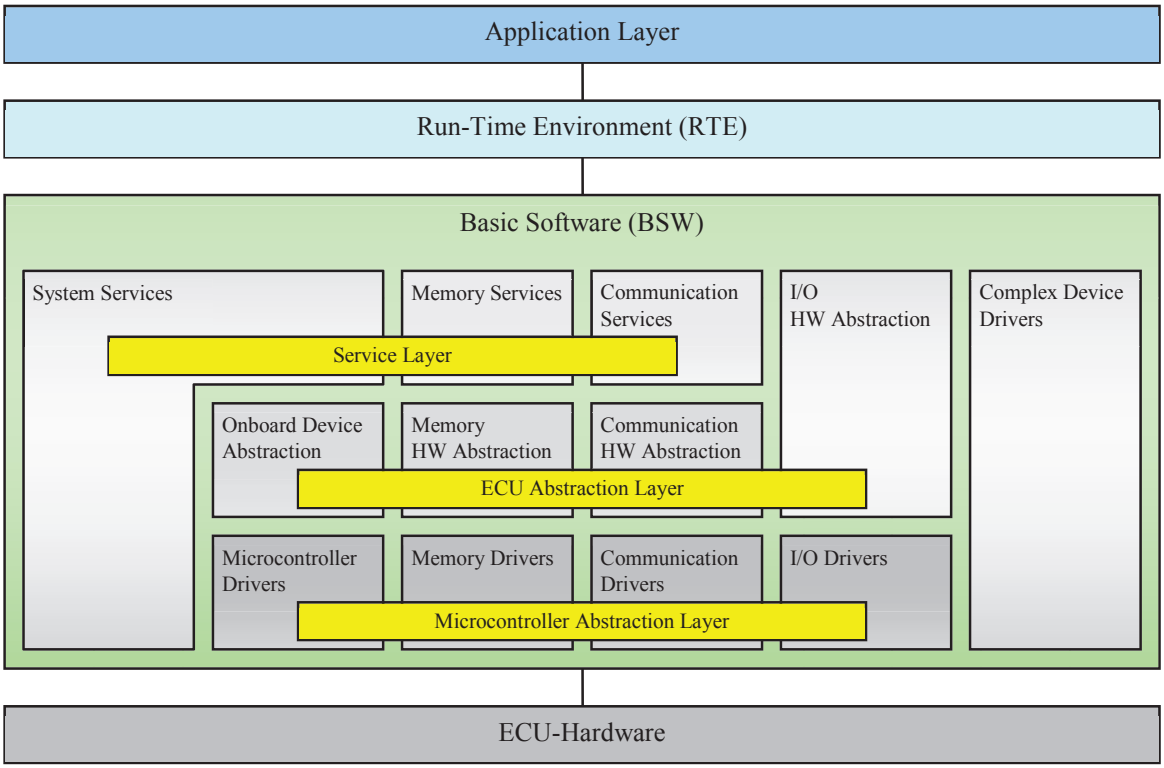

Figure 4. Structure of the layered architecture and substructure of the Basic Software (see also Figure 9-2 in Kindel & Friedrich (2009)).

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The Communication Stack provides communication services to the Application- and the Basic Software in order to exchange data with other electronic control units. The abstraction within this stack is done in a way that applications can be developed independently from the type of communication bus they use. The I/O-Stack provides access to analog-, digital- and PWM I/O-Pins of the ECU.

The section Complex Device Drivers does not belong to any layer of the Basic Software and is not specified in detail. A Complex Device Driver provides the possibility to integrate new modules into the AUTOSAR system. There can be three reasons why a Complex Device Driver is implemented: 1. A module for a special functionality is missing, 2. There are timing requirements that cannot be fulfilled with AUTOSAR and 3. Existing software shall be ported to AUTOSAR step by step.

Part II: Overview of the realised AUTOSAR 4.0 Software Project

This second part of this article will give an overview of the complete AUTOSAR 4.0 Software Project (Khound, 2017) realised by Mr. Parthib Khound, student in the master course Mechatronics at Universität Siegen. A second work of Mr. Jaysheel Mehta, also student in the master course Mechatronics, is still in progress.

Overview of the Hardware in the System

The block diagram in Figure 5 gives an overview of all hardware components that were used during the development of the AUTOSAR 4.0 Software Project. The ECU (1), for which the Software Project was developed, can be seen on the left side of the diagram. The ECU is mounted on a Breakout Box (2). The Breakout Box contains some input/output elements like switches, adjustable resistors, LEDs and connectors for several types of busses. The three LEDs numbered with 10 up to 12 and the connector for the CAN-Bus are used in this project. The Hardware Debugger (3) which is mounted on top of printed board of the ECU is used to flash the generated program code to the ECU and can of course be used to debug the developed program code. The Hardware Debugger is connected via USB link to a PC (4) that is used for software development and debugging.

The primary data source in our system is a 3D Acceleration Sensor with an additional temperature sensor (5), that sends its measured data periodically on the CAN Bus. The CAN Bus Interface (6) is used to monitor the data on the CAN Bus. The CAN Bus Interface is connected to the PC via USB link.

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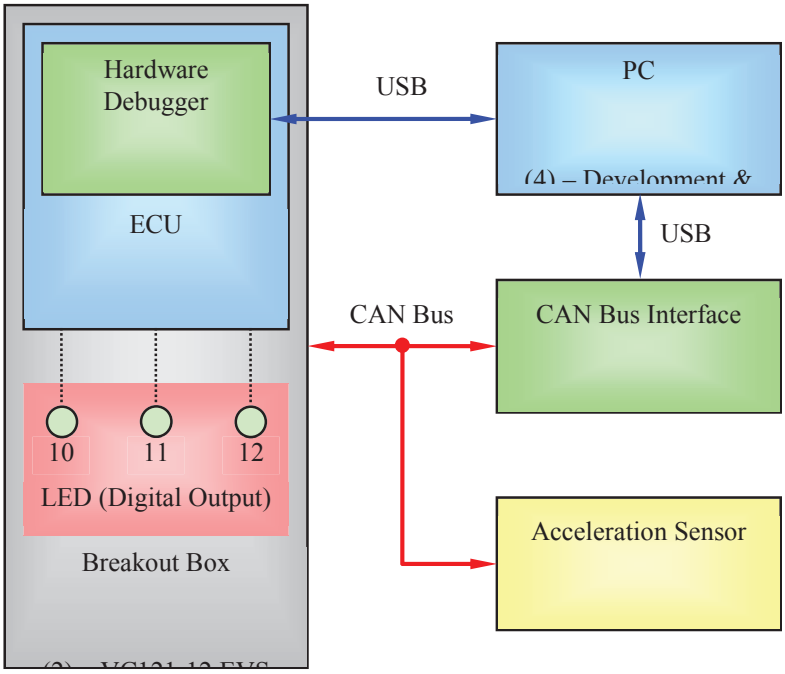

Figure 5. Block diagram of the relevant components in the overall system.

Most of the hardware such as the ECU (Type: VC 121-12), the Breakout Box (Type: VC121 12 EVS) and the CAN Bus Interface (Type: VN5610) come directly from Vector Informatik. The Hardware Debugger is a product of the company iSYSTEM AG and is sold by Vector Informatik (Type: VCA0301). The Acceleration Sensor (Type: BC–3ACC #607) was thankfully provided by 2D Debus & Diebold Meßsysteme GmbH.

Overview of the software used to develop the project

All software that was used to develop the code for the ECU is listed in Table 1. In the project described here, only one ECU is present. Therefore, the work steps within the ECU View (see Figure 2) of the AUTOSAR-Methodology were important for us. In our case, there is no System Configuration or System Configuration Description. Therefore, the configuration for the ECU could not be extracted from it. We had to create the ECU Configuration by ourselves. For configuration purposes, the DaVinci Configurator Pro (1) was used.

In order to implement the functionality described in the next chapter, the ECU needs to communicate. It receives the messages from the Acceleration Sensor and transmits messages after processing the data of the sensor. The easiest way to set up the communication is to describe the structure of the messages on the bus in a database file and add this file to the configuration. The DaVinci Configurator Pro adjusts many settings in the project according to the CAN database files. The CAN messages database files themselves can be created with CANdb++ (2).

The creation of Software Components and skeletons for Application Code has been done with DaVinci Developer (3).

CANoe (4) is a tool for monitoring and analysation of data on a bus. In order to bring the collected data to the user's eyes self-defined virtual panels can be created in CANoe. Beyond this, the software has the ability to simulate complete ECUs or complete networks of ECUs (residual bus simulation). What type of bus can be accessed by CANoe depends on the type of bus interface you have.

winIDEA (5) is the software that gives you access to the Hardware Debugger mounted on top of the board of the ECU. The developed program code can be flashed to the ECU with the help of this software and it can be of cause used for debugging.

A GNU toolchain (6) is used to compile and link the developed software for the microcontroller in the ECU.

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Table 1. List of Software used in this project.

No.	Software	Developer	Description
1	DaVinci Configurator Pro	Vector Informatik	Configuration and Generation of the Basic Software and the Run-Time Environment
2	CANdb++	Vector Informatik	Creation of CAN Bus communication database files
3	DaVinci Developer	Vector Informatik	Creation of software components and skeletons for application code
4	CANoe	Vector Informatik	Monitoring, Analysation and Simulation of communication bus signals
5	winIDEA	iSYSTEM	Software for flashing the generated program code to the ECU and for debugging of the developed software
6	GNU toolchain	Free Software Foundation, Red Hat (Software)	Compiler and Linker for the ECU-Hardware

Overview of the developed functionality

The implemented functionality of the ECU can be subdivided into two periods. The first period is the first six seconds after the ECU is started. The second period is the time after the first six seconds.

Within the first six seconds, the ECU will let the LEDs 10, 11 and 12 glow one after another. This can be regarded as a dummy replacement for a self-test function that is executed after the ECU is started.

Six seconds after the ECU has been powered, the main algorithm is started. Within the main algorithm, the ECU receives the data from the Acceleration Sensor via CAN Bus, evaluates the received data, retransmits a CAN frame and controls the LEDs 10, 11 and 12. The data of the Acceleration Sensor and the data coming from the ECU can both be evaluated and viewed in the software CANoe on the PC.

The Acceleration Sensor transmits its measured data periodically on the CAN Bus. This data includes the accelerations in x-, y- and z-direction plus the temperature of the sensor. The ECU checks all four values against threshold values and transmits a CAN message which contains information if the measured values are is below or above their corresponding threshold values. Additionally, the ECU will let the LEDs 10, 11 and 12 glow if the acceleration in x-, y- or z-direction exceeds the corresponding threshold. As already mentioned, the data of the Acceleration Sensor as well as the status values transmitted by the ECU are visualised by CANoe.

Summary

Vehicle manufacturers require that the software of new developed automotive electronic control units are developed according to the AUTOSAR standard. The standard itself introduces a Layered Software Architecture and a work product flow called AUTOSAR-Methodology that describes how software for an ECU can be developed according to the standard. The included concept of the Virtual Functional Bus provides the possibility to move software components between ECUs and increases thereby flexibility. The Basic software provides many services and functionality to the Run-Time Environment and the application software. Therefore, it can be regarded as something like an operating system. Unlike an operating system for a personal computer, the Basic software is not delivered preconfigured. This is a task the user has to perform. Since a lot of flexibility is requested, this task can be difficult. With the help of the AUTOSAR Education Environment, a first complete AUTOSAR 4.0 Software Project could be developed. The created documentation is good basis for further AUTOSAR projects.

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DEVELOPMENT OF POTENTIAL BIOACTIVE COMPOUNDS FROM BOESENBERGIA ROTUNDA

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Abstract:*Boesenbergia rotunda* is a species belonging under the family of Zingiberaceae. The local name in Indonesia is "Temu kunci", this plant is a common edible ingredient in many Asian countries. Thisstudy was conducted to identify some bioactive compounds and to testas antioxidant. The milled dried rhizome of *B. rotunda*(5 kg) was extracted exhaustively with ethanol. The ethanol extract was partitionated three timesby n-hexane, chloroform, and ethyl acetate respectively. Each fraction were fractionated by vacuum liquid chromatography (VLC) and purified by column chromatography gravitation. Identification structures of all pure compounds were elucidated based on spectroscopic methods (UV, IR, and NMR).Antioxidant was tested by 2,2-diphenyl-1-picrylhydrazyl (DPPH) method.From ethanol extract of *B. rotunda* three known compounds flavanones, namely 2',4'-dihydroxy-6-methoxychalcone (1), 5-hydroxy-7-methoxyflavanone (2), and 5,7-dihydroxyflavanone (3), were isolated.The ethanol extract of *B. rotunda* and some isolated compounds showed as antioxidant activity.

Keywords: Boesenbergia rotunda; antioxidant; bioactive compound

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DIGITAL HUMANIZATION ON QUANTUM (MULTIPLE THINKING ACTION), PROCESSABLE COLLECTIVE RAW MIND, YOUTUBER, APPLE:NETFLIX RELATED WITH SEMIOTICS

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Abstract: Beginning from 2000's the mechanism of quantum was speared out on modern human life. In other words, 'quantum" as a word began to familiar to the people. "Human thinking, as many of us know, often fails to respect the principles of classical logic. We make systematic errors when reasoning with probabilities, for example. Physicist Diederik Aerts of the Free University of Brussels, Belgium, has shown that these errors actually make sense within a wider logic based on quantum mathematics. The same logic also seems to fit naturally with how people link concepts together, often on the basis of loose associations and blurred boundaries. That means search algorithms based on quantum logic could uncover meanings in masses of text more efficiently than classical algorithms."

The purpose of this article is not to examine these mechanism of quantum. It is about multiple thinking action and its reflection on processable collective raw mind, being a youtuber, Apple(Netflix)… All of those are related with semiotics.

Keywords: Quantum Thinking, Humanization, Collective Raw Mind, Netflix, Processable.

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DOĞALGAZIN İÇTEN YANMALI BİR MOTORDA HESAPLAMALI AKIŞKANLAR DİNAMİĞİ İLE YANMA ANALİZİ

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Özet: Yapılan bu çalışmada, içten yanmalı motorlarda yakıt olarak doğalgazın kullanımı sayısal olarak incelenmiştir. Sayısal çalışmada sonlu hacimler metoduna dayalı çözümleme yapabilen ANSYS Fluent (R15.0) kodu kullanılarak dört zamanlı içten yanmalı bir motorun yanma odası modellenmiş ve analizler gerçekleştirilmiştir. Analizler 2400 d/dk sabit motor devri ve 64, 92 ve 112 mm olacak şekilde üç farklı piston strok değerleri için gerçekleştirilmiştir. Sabit motor devri için değişen piston stroklarına göre, yanma sonucunda silindir içinde oluşan doğalgaz kütle fraksiyonu, silindir iç ortamın sıcaklık ve basınç parametrelerindeki değişimler, Krank Açısı (KA) değerindeki değişime bağlı olarak incelenmiştir. Analizlerden elde edilen sonuçlara göre, artan piston stroku değerine bağlı olarak silindir içindeki doğalgazın kütle fraksiyonunda artış, ortamın sıcaklık ve basınç değerlerinde ise azalmalar meydana gelmiştir.

Keywords: Doğalgaz; hesaplamalı akışkanlar dinamiği; içten yanmalı motor.

Giriş

Enerji ihtiyacı, tüketimindeki artış ve gerekli enerjinin fosil kökenli yakıtlardan elde edilmesi çevre ve insan sağlığı açısından büyük endişe uyandırmaktadır. Taşıtlarda kullanılmakta olan yakıtlardan birim hacimde yüksek enerji üretebilmeleri, kolay tutuşması ve buharlaşması ve hava ile basit bir şekilde karışabilmesi beklenmektedir. Tüm bunlara ek olarak yine bu yakıtların kolay elde edilebilen ve hemen her yerde bulunabilen yakıtlar olması istenmektedir. Bunların neticesi olarak ulaşımda yaygın olarak kullanılan benzin ve motorin uzun bir süre alternatifsiz kalmıştır (Kahraman, 2007). İlerleyen zaman ile birlikte tükenmekte olan petrol kökenli yakıtlara olan bağımlılığın ve ekolojik dengeye verilen zararın azaltılması için mevcut enerji kaynaklarının verimli ve etkin bir şekilde kullanılması gerekmektedir (Öğüt ve Kuş, 2007). Bu durum günümüzde alternatif yakıt kullanımına yönelik araştırma ve çalışmalarda büyük artış yaşanmasına sebep olmuştur. Alternatif yakıtların geliştirilmesinde yakıt ısıl değeri, maliyeti, ekonomisi, bulunabilirliği, taşınabilirliği, depolanabilirliği ve emisyonları büyük önem taşımaktadır. Taşıtlar için kullanılmakta olan alternatif yakıtlar doğal gaz, metanol, etanol, propan, elektrikli hibrid, biyodizel ve hidrojen yakıt hücreleri olarak sıralanabilir (Çağlar vd., 2014).

Günümüzde taşıtlarda kullanılan içten yanmalı motorların (İYM) tasarım ve performansını geliştirmek deneysel olarak çok yüksek maliyetlere yol açmakta ve buna ek olarak bu deneyler için çok fazla zaman gerekmektedir. Bu nedenle İYM'lardaki ısı transferi, akış, yanma ve emisyon problemlerine çözüm üretmek amacıyla sayısal yöntemler tercih edilmektedir. Hesaplamalı akışkanlar dinamiği (HAD) metodu bu tarz problemlerin çözümü için sıklıkla kullanılmaktadır. Sonlu hacimler tekniğine dayalı yazılımların kullanılması ile birlikte ortaya çıkabilecek problemler, sebepleriyle birlikte, tasarım aşamasında tespit edilerek, bunlar için gerekli çözümler üretilirken tasarım süresi de kısalmaktadır (Açıkgöz vd, 2015). ANSYS Fluent kodu akış, ısı transferi, yanma gibi problemlerin çözümünde kullanılabilen sonlu hacimler metoduna dayalı sayısal çözümleme yapabilen bir yazılımdır. Pang, vd. ANSYS Fluent ile yaptıkları simülasyonda yanma sonuçları ve kurum üretim profillerini dizel motor üzerinde yapılan deneylerle karşılaştırmışlardır (Pang vd., 2011). Mercan, (2007) yaptığı çalışmada, dizel motorlarda yanma olayını ve optimizasyonunu incelemiş, motorun tek boyutlu matematiksel modelini hazırlayarak Basic programı yardımı ile yanma olayını etkileyen faktörlerin iş çevrimine etkilerini ortaya çıkarmıştır. Huang & Crookes, (1998) tek silindirli kıvılcım ateşlemeli bir motorda biyogaz kullanımını deneysel olarak incelemişlerdir. Biyogaz içerisindeki CO_2 varlığının NOx emisyonlarında azalmaya yol açtığını tespit etmişlerdir. Fakat silindir basıncında ise düşmeye neden olduğunu görmüşlerdir. Gerçekleşen bu basınç düşüşü neticesinde biyogazın motor gücü ve fren termal verimliliğinde azalmaya neden olduğunu ve yanmamış HC emisyon seviyesinin de yükselme gösterdiğini gözlemlemişlerdir. Çeper vd. (2009), doğalgaz - hidrojen karışımını yakıt olarak kullanan dört zamanlı kıvılcım ateşlemeli bir motorda performans ve kirlilik değerlerini farklı hava fazlalık katsayısı değerlerinde deneysel olarak incelemişlerdir. Yakıttaki hidrojen oranını sırasıyla %0, %10, %20 ve %30 olarak belirlemişlerdir. Deneylerinde 10:1 sıkıştırma oranına sahip 88 mm strok değerinde Ford'un kıvılcım ateşlemeli motorunu kullanmışlardır. Tüm deneyleri 2000 d/dk motor devrinde gerçekleştirmişlerdir. Çalışma soncuda CO, CO_2 ve HC emisyonlarını ve silindir içi basınç değerlerini ölçmüşlerdir. Hava fazlalık

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oranının artışı ile CO ve CO_2 emisyonlarında azalma olduğu sonucuna varmışlardır (Çeper vd. 2009a; Kahraman vd. 2009; Çeper vd.2009b). Bauer & Forest (2001) yaptıkları çalışmada tek silindirli bir motorda %0, %20, %40 ve %60 oranlarında hidrojen içeren metan-hidrojen karışımının yakıt olarak kullanımını test etmişlerdir. Her bir yakıt sırasıyla 700 ve 900 d/dk motor devrinde tam ve kısmi yüklemede test edilmiş ve stokiyometrik yanmadan kısmi yanma limitine kadar hava fazlalık katsayısı yine her bir yakıt için incelenmiştir. Buradan elde edilen sonuçlar çevrimin simülasyonunda kullanılmıştır.

Yapılan araştırmalar yakın tarihte ham petrol ve petrol ürünlerinin çok azalacağını ve bu ürünleri bulmanın ve üretmenin çok maliyetli olacağını göstermektedir. Fakat aynı zamanda otomobil ve İYM sayısında artışın yaşanması muhtemel olacaktır. Geçmiş yıllara nazaran motorlardaki yakıt ekonomisinin büyük gelişme göstermesine ve bu gelişmenin kuvvetle muhtemel bir şekilde gün geçtikçe artış göstermeye devam edecek olmasına rağmen, yapılan araştırmalar yakın gelecekte yakıt talebinde büyük artış yaşanacağını göstermektedir (Pulkrabek, 1997). Bu durum alternatif yakıtların araştırılması ve kullanılmasını ihtiyaç haline getirmiştir. Günümüzde yaygın olarak İYM'larda kullanılan benzin ve dizel yakıtlarına alternatif olarak doğalgaz da İYM'larda kullanılabilmektedir. Doğalgaz ilave bir rafineri işlemi gerektirmez. Dolayısıyla doğrudan motorlarda yakıt olarak kullanılabilir (Karabektaş, 2009).

Yapılan bu çalışmada, tek silindirli, dört-zamanlı, yakıt olarak doğalgaz kullanan bir İYM'un çalışma karakteristikleri ticari ANSYS Fluent (R15.0) yazılımı kullanılarak HAD analizi yardımıyla incelenmiştir. Bu incelemeler yapılırken önce uygulanacak model ve parametreler teorik olarak araştırılmıştır. İYM'un yanma odası tasarlanarak ANSYS Fluent (R15.0) yazılımı yardımıyla İYM'un sabit devir ve farklı piston strok değerlerinde analiz edilerek her bir durum için yanma sonucunda ortamdaki doğalgaz kütle fraksiyonu, sıcaklık ve basınç parametreleri yorumlanmıştır.

Materyal ve Metot

HAD programları sayesinde gerçekçi sonuçlara çok yakın veriler elde edilmekte olduğu için deney için gerekli olan tasarım parametreleri çok kısa sürede ve çok daha doğru olarak belirlenebilmektedir. Bu programların yaygın bir şekilde kullanılmasıyla beraber akış analizleri için yapılan deney sayıları azalmıştır. Böylece çok fazla tasarım işlemine gerek kalmadan temel ihtiyaçlar belirlenerek deneyler kolaylıkla gerçekleştirilebilmektedir. HAD programları sağladıkları bu avantajlarla birlikte maliyet açısından da önemli derecede tasarruflar sağlamaktadır (Demirtaş, 2012). Sonlu elemanlar metodunu kullanan ticari HAD kodları ile alakalı son dönemde çok fazla çalışma yapılıyor olmasına karşın, piyasalarda sonlu hacimler metodunu kullanan 4 kodun hakimiyeti görülmektedir. Sonlu hacimler metodunu kullanan bu kodlar PHOENICS, FLUENT, FLOW3D ve STAR-CD'dir (Demirtaş, 2012). Bu çalışmada dünyada yaygın olarak kullanılmakta olan HAD programı ANSYS Fluent (R15.0) kodu kullanılmıştır.

Yapılan çalışmada içten yanmalı 4 zamanlı bir motorda doğalgazın yanma analizleri gerçekleştirilmiştir. Bilgisayarın donanım özelliklerinin yetersiz olmasından dolayı analiz doğalgazın silindir içerisine püskürtülmesinin başladığı 720° KA'dan 20° öncesi ve 30° sonrasını ele alacak şekilde 700°-760° KA değerleri arasında gerçekleştirilmiştir. Bu işlem sabit motor devrinde (2400 d/dk) ve farklı piston strok değerleri için tekrarlanarak gerçekleştirilmiştir. Analizde kullanılan değerler Tablo 2'de gösterilmiştir.

Tablo 2. İYM için belirlenen parametre değerleri.

Parametre	Değer
Crank Shaft Speed (d/dk)	2400
Starting Crank Angle (deg)	360°
Crank Period (deg)	720°
Crank Angle Step Size (deg)	0.25
Piston Stroke (mm)	64, 92, 112
Connecting Rod Length (mm)	220
Piston Stroke Cutoff (mm)	0
Minimum Valve Lift (mm)	0
Fuel Inlet Area (mm^2)	0.497

Analizin gerçekleştirileceği İYM için yanma odasının 30°lik bir parçası SolidWorks programı yardımıyla oluşturulmuştur. Oluşturulan yanma odası Şekil 5'te gösterilmiştir. Geometrinin oluşturulması işlemi tamamlandıktan sonra ANSYS Workbench (R15.0) yardımıyla geometri için mesh yapısı oluşturulmuştur.

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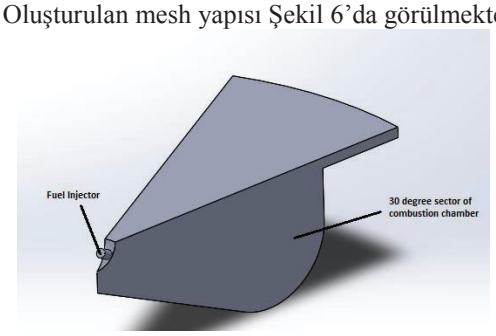
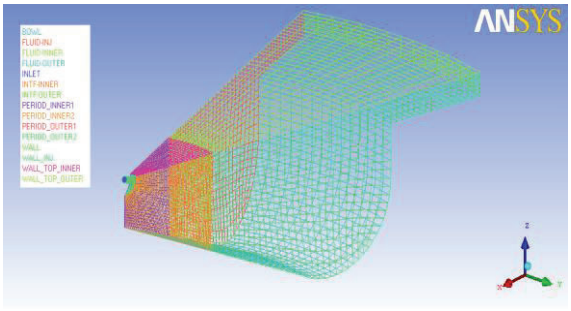
Oluşturulan mesh yapısı Şekil 6'da görülmektedir.



Şekil 5. Yanma odası geometrisi.



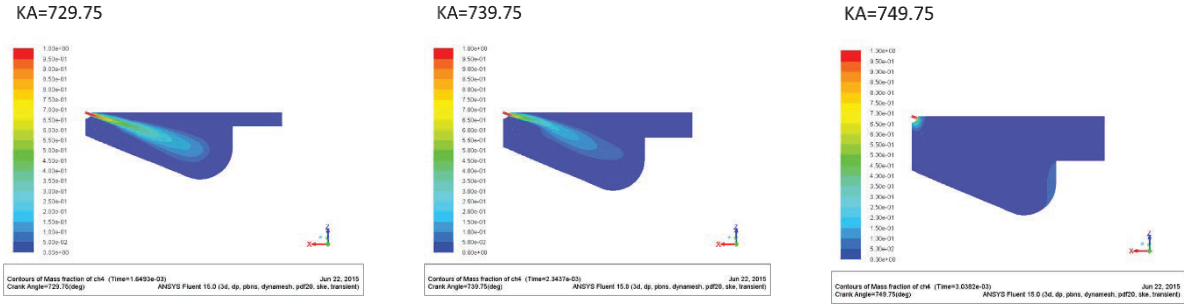
Şekil 6. Sayısal ağ yapısı.

Mesh işleminde 73051 quadrilateral ve 23066 hexahedral hücre tipi olmak üzere toplamda 96117 hücre oluşturulmuştur.

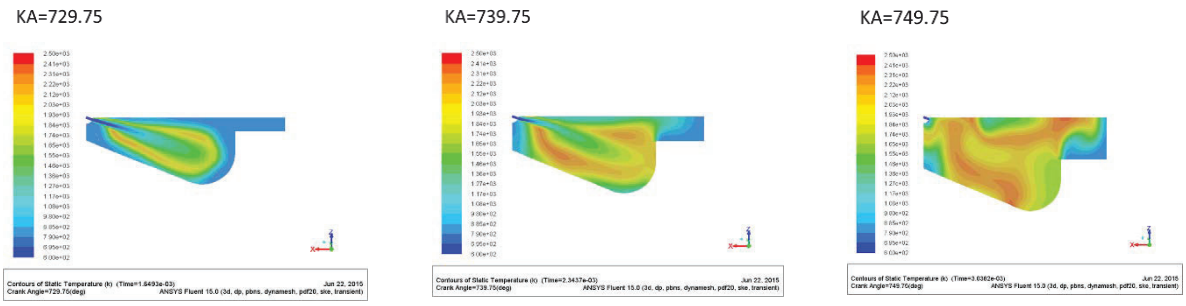
Sonuçlar ve Tartışma

Yapılan analizler piston sıkıştırma zamanında iken ve yakıt püskürtülmesi işleminden, ÜÖN ya gelmeden (720°), 20° önce başlatılmış ve pistonun ÜÖN ya ulaşmasından (720°) 40° sonra (760°) sonlandırılmıştır. 2400 motor devrinde 64, 92 ve 112 mm piston strok değerleri için analizler gerçekleştirilmiştir. Bu analizlerin sonucunda her bir 1.25°'lik KA değeri için silindir içi doğalgaz kütle fraksiyonlarının değişimi ve silindir içi sıcaklık dağılımları elde edilmiştir. Analizlerden elde edilen bulguların doğruluğundan emin olmak için programın yakınsaması önemli bir parametredir. Simülasyon gerçekleşirken piston hareketi ve yakıt püskürtülmesi esnasında her bir KA değeri için çözümler yakınsamıştır.

2400 d/dk ve 64 mm piston strok değeri için yapılan analiz sonucunda elde edilen doğalgaz kütle fraksiyonu ve silindir içi sıcaklık dağılımı farklı KA değerleri için Şekil 2 ve Şekil 3'de gösterilmiştir. Şekillerden de görüldüğü gibi silindir içi doğalgaz kütle fraksiyonunun KA ilerledikçe azaldığı görülmektedir ve bu azalmaya bağlı olarak silindir içi sıcaklığının ise ters orantılı bir şekilde artış gösterdiği gözlemlenmektedir.



Şekil.2 Silindir içi doğalgaz kütle fraksiyonunun değişimi.



Şekil.3 Silindir içi sıcaklık dağılımı.

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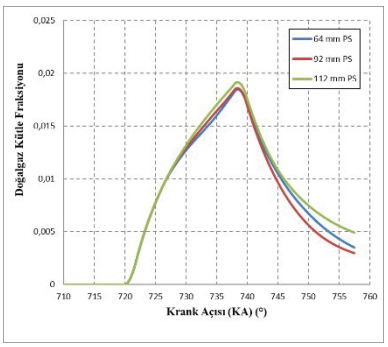
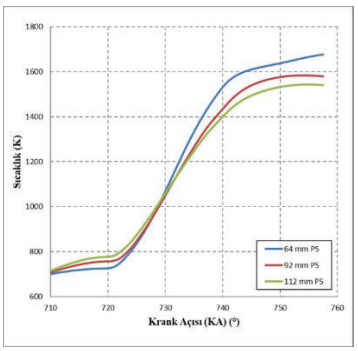
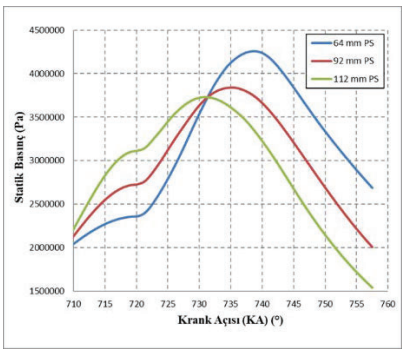
2400 d/dk sabit motor devrinde gerçekleştirilen analizler sonucunda silindir içine yakıtın püskürtülmesiyle oluşan doğalgaz kütle fraksiyonunun 64, 92 ve 112 mm'lik piston strok değerleri için KA'na bağlı olarak değişimi elde edilmiştir. Şekil 4a.'da da görüldüğü gibi doğalgazın silindir içine püskürtülmesi 720° KA ile başlamıştır. Piston strok değerinin artması ile silindir içi doğalgaz kütle fraksiyonuda küçük miktarlarda artış görülmektedir. Şekil 4b'den de görüldüğü gibi Piston strok değerinin artmasıyla silindir içinde ulaşılan maksimum sıcaklık değeri ters orantılı olarak azalmıştır.







Şekil 4a, 4b, 4c

Silindir içi basınç değerinin KA'na bağlı olarak değişimi her bir piston strok değeri için Şekil 4c'de gösterilmiştir. Piston strok değerinin artmasıyla silindir içi basınç değeri yaklaşık 730° KA değerine kadar daha büyük değerlere ulaşmıştır. Ancak 730° KA'ndan sonra durum tersine dönmüş ve piston stroku değeri ile silindir içi basınç değeri ters orantılı bir davranış sergilemiştir. Silindir içi en büyük basınç değeri 64 mm piston strok değeri için yaklaşık 740° KA değerinde görülmektedir.

Sonuç

Bu çalışmada ANSYS Fluent (R15.0) ticari yazılımı kullanılarak dört zamanlı içten yanmalı bir motorun yanma odası modellenmiş ve burada gerçekleşen yanma olayı analiz edilerek incelenmiştir. Yakıt olarak İYM'larda alternatif bir yakıt olarak tercih edilen doğalgaz kullanılmıştır. Analiz yapılırken yakıtın püskürtülmesinden, sıkıştırma zamanının sonundan, (720° KA) 20° önce simülasyon başlatılmış ve yaklaşık 760° KA değerinde sonlandırılmıştır. Yapılan hesaplamalar neticesinde kısaca aşağıdaki sonuçlar elde edilmiştir.

- Piston strok değerinin artması ile silindir içi doğalgaz kütle fraksiyonu artmıştır.
- Piston strok değeri artarken silindir içindeki sıcaklık azalmıştır.
- Silindir içi basınç değerleri piston strok değeri arttıkça 730° KA değerine kadar artış göstermiş, bu KA değerinden sonra ise ters orantılı olarak yüksek piston stroku değeri için daha küçük, düşük piston stroku değeri için daha büyük değerlerde olmuştur. Sonuç olarak, sabit devirde farklı piston strokları için elde edilen sonuçlarda, ortalama ve maksimum basınç değerleri, en düşük piston stroku değeri olan 64 mm'de gerçekleşmiştir.
- Farklı devir sayılarında analizler gerçekleştirilebilir.

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DRILL TOOL FLANK WEAR IN DRILLING OF PURE AND CARBON BLACK REINFORCED HIGH DENSITY POLYETHYLENE

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Abstract: Polymer materials are preferred in various industrial areas such as automotive, manufacturing, aeronautic etc. and their material properties are improved by reinforcing carbon black, carbon fiber, graphite, carbon nanotubes, metal oxides etc. to enhance their usage areas. Additionally, in application areas, drilling operations are required for assembly processes. Therefore, in this experimental study, drill tool flank wear was investigated in drilling of pure and carbon black reinforced HDPE (High Density Polyethylene) materials. In experiments, two cutting speeds, feeds, and drill point angles (120° and 80°-120°) were selected as drilling parameters. Depending on the results, drill tool flank wear increased with increase of cutting speed and decreased with increase of feed. The maximum tool wear values were measured in drilling with standard drill tools (120°) and the double-angled (80°-120°) drill tool design reduced the tool wear. In addition, the carbon black addition improved the material properties of HDPE and this caused an increase in drill tool flank wear during drilling process.

Keywords: Carbon Black, HDPE, Drilling, Drill Tool Wear

Introduction

Polymer materials are consumed more than steel materials and their usage continues to grow so rapidly due to their material properties such as non corrosive nature, high impact resistance, being lighter, good strength to weight ratio etc. (Alauddin et al., 1995, Gulrez et al., 2014). Among the polymer materials, polyethylene has excellent chemical resistance and mechanical properties and it is electrically insulating material. However, the electrical conductivity can be increased by using various conductive fillers to enhance their usage in other applications such as in manufacturing computer chip, fuel tankers, automotive housing etc. In general, carbon black, carbon fibers, metal fibers and carbon nanotubes are commonly preferred to improve the electrical conductivity and these fillers can enhance the modulus and strength of matrix material (Gulrez et al., 2014, Hopmann et al., 2014, Zhijun et al., 2009). Polymer materials are usually shaped using methods such as plastic injection, extrusion etc. but the demand for the machining of them increases. Drilling is one of the most important machining operations that applied on polymer and composite materials to prepare them for joining and assembly (Ahmad, 2009). During drilling of polymer and composite materials, drill tool wears and so drilled part quality is reduced. Lin and Chen (1996) studied the effects of increasing cutting speed on tool wear when drilling carbon fiber reinforced composite material with both multifacet drill and twist drill. Drill tools are worn quickly at high cutting speeds and the multifacet drill tool was not superior when compared with the twist drill. Inoue et al. (1997) carried out drilling experiments in glass fiber reinforced composite material under various feed rates and cutting speeds and the relationship between tool wear and drilled hole quality was examined. Depending on the results, a great number of holes at a constant quality were obtained at high feed rates. Khashaba et al. (2010) performed an experimental study on the effect of drill pre-wear and machining conditions in drilling glass fiber reinforced glass epoxy composites. The results showed that thrust force and surface roughness were affected by the drill pre-wear and this effect became more significant at high cutting speed and feed which increased peel-up and push-out delaminations. Uysal et al. (2012) investigated the effects of cutting parameters on tool wear in drilling of sheet molding compound composite material. Feed was found as the most effective parameter while cutting speed was the least significant parameter on drill tool wear. Wang et al. (2013) aimed to investigate the wear of uncoated, diamond coated and AlTiN (Aluminium Titanium Nitride) coated carbide drills in drilling of carbon fiber reinforced composite material. The diamond coating reduced the edge rounding wear while the AlTiN coating was not effective on reducing the wear due to its oxidation during drilling. Gaugel et al. (2016) performed drilling experiments with uncoated and diamond coated tungsten carbide hard metal twist drills in carbon fiber reinforced polymer laminates. According to the measurement results, it was figured out that there was a correlation between drill tool wear and delamination damage. Uysal and Altan (2015) investigated drill tool wears in drilling of pure and carbon black reinforced polypropylene and polyamide materials with drill tools having different drill point angles. The minimum drill tool wear was observed in drilling with drill tool having small point angle (80°) and it increased with increase of cutting speed. Additionally, drill tool wears were higher in drilling of carbon black reinforced polymer materials than that observed in drilling of pure polymer materials. In literature, the studies

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about drill tool wears have been generally performed on drilling carbon or glass fiber reinforced polymer composite materials and there are no further works on particle reinforced polymer composite materials. However, in this experimental study, drill tool flank wear was investigated in drilling pure and carbon black reinforced HDPE (High Density Polyethylene) materials. In experiments, two cutting speeds, feeds and drill point angles were selected as drilling parameters and their effects on the drill tool flank wear were examined.

Experimental Studies

In experimental studies, BPC brand pure HDPE (High Density Polyethylene) and Premix brand PRE-ELEC® PE 1296 model carbon black reinforced HDPE (CBR-HDPE) materials were the workpiece materials and their material properties were given in Table 1.

Table 1: Material properties of pure and carbon black reinforced HDPE.

Properties	Pure HDPE	CBR-HDPE
Specific gravity (gr/cm^3)	0,95	1,12
Yield strength (MPa)	23	24
Flexural modulus (MPa)	800	1100
Elongation at break (%)	>50	40
Elongation at yield (%)	9	12
Impact strength, notched Izod (4 mm thickness, 23°C) (kJ/m^2)	12	29
Deflection temperature (0,45 MPa) (°C)	60-82	80
Volume resistivity (Ωcm)	$\geq 10^{14}$	$<10^3$
Surface resistance (Ω)	$\geq 10^{14}$	$<10^5$

The polymer workpiece materials were injection molded from pure HDPE and CBR-HDPE granules in dimensions of 150x150x10 mm. Before the injection molding process, the granules were dried at 60°C for 2 hours. During the molding process, the granules were melted at 230°C, the mold temperature was 50 ºC and injection pressure was 90 MPa.

Drilling operations were performed by First MCV-300 CNC machining center with HSS (High Speed Steel) twist drill tools as seen in Figure 1. The drilling parameters were given in Table 2.



Figure 1. Drilling operation with HSS twist drill tool using CNC machining center.

Table 2: Drilling parameters.

Parameters	Value	
Cutting speed, V (m/min)	40	120
Feed, f (mm/rev)	0,1	0,2
Drill point angle, α (°)	120°	80°-120° (double-angled)

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The drill diameter was 8 mm and the drill point angles were selected as 120°, and 80°-120° (double-angled) as given in Figure 2.

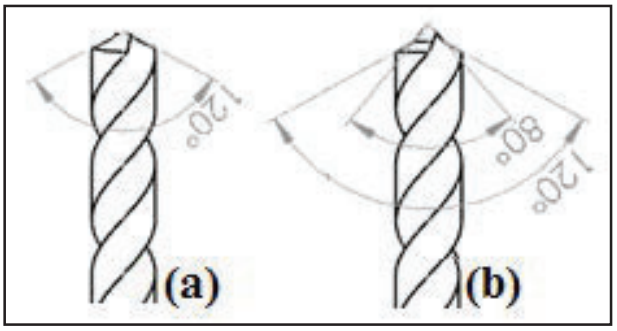

Figure 2. Point angles of selected HSS twist drill tools a) 120°, b) 80°-120° (double-angled).

Drill tool flank wears were viewed by SOIF XJP-6A model trinocular microscope and 9 MP MD90 camera as seen Figure 3. The flank wear values were measured via MShot software after drilling 50 holes and 100 holes. In addition, drill tool SEM (Scanning Electron Microscopy) images were taken by FEI Philips XL30 ESEM-FEG device.

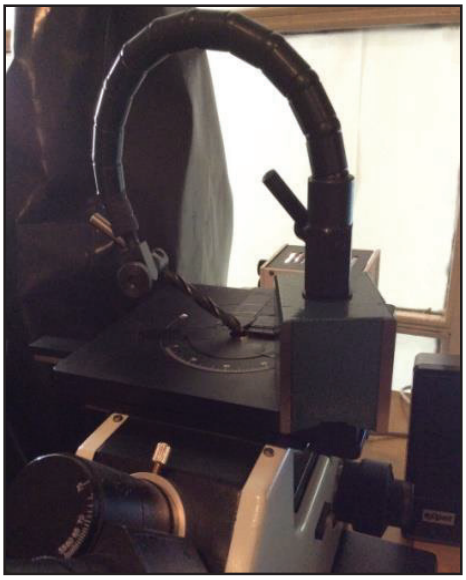

Figure 3. Viewing and measuring of drill tool flank wears by trinocular microscope.

Experimental Results and Discussion

As is known, friction between drill tool and poymer material increases at higher cutting speeds. Therefore, drill tool flank wear increased with increase of cutting speed for both pure HDPE and CBR-HDPE as seen in Figure 4.

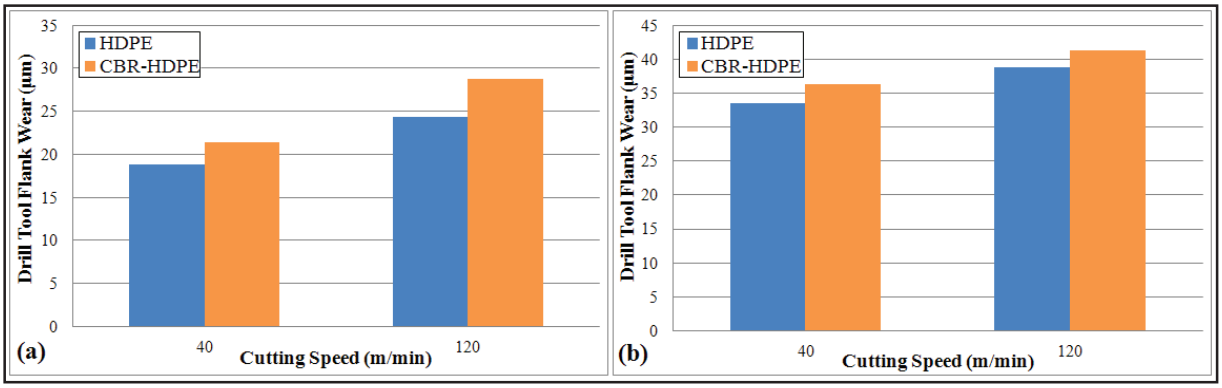

Figure 4. Drill tool flank wear according to the cutting speed (α=120°, f=0,1 mm/rev), after drilling of a) 50 holes and b) 100 holes.

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When the double-angled (80°-120°) drill tools were preferred, less drill tool wear occurred as seen in Figure 5. Polymer material can be crashed when high drill point angle (120°) is used and this increases friction and also drill tool wear while sharp pointed tip makes easier the cutting operation.

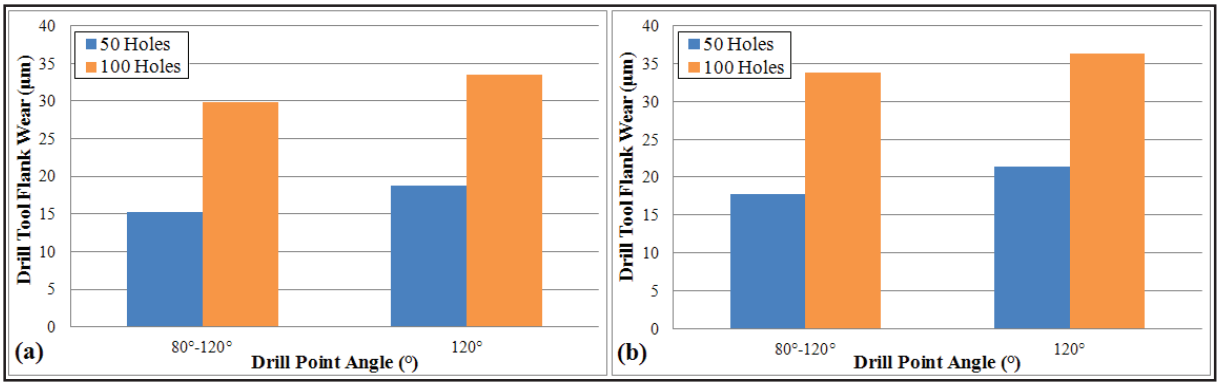

Figure 5. Drill tool flank wear according to the drill point angle (V=40 m/min, f=0,1 mm/rev), a) HDPE and b) CBR-HDPE.

The changing of drill tool flank wear with the feed was given in Figure 6. As increasing the feed, the drilling operation can be performed faster and so it is resulted that the heat based friction decreases. For this reason, less drill tool flank wear values were measured when the feed increased.

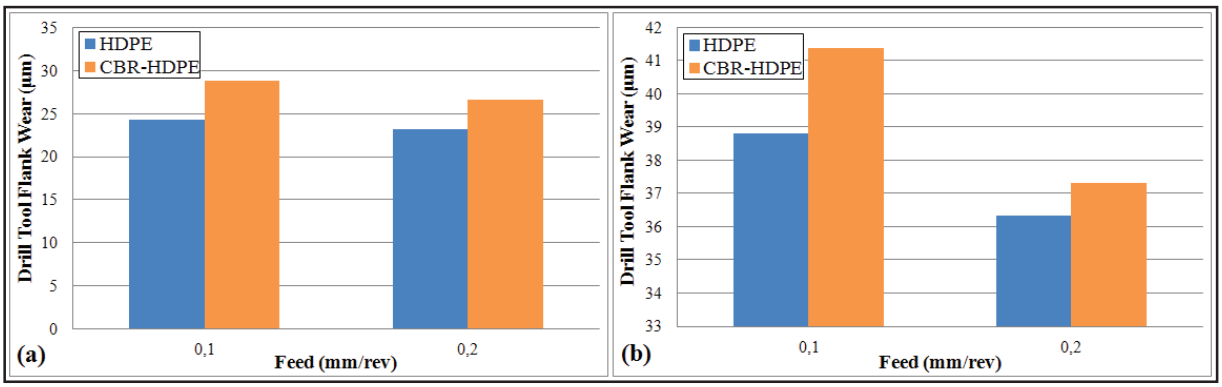

Figure 6. Drill tool flank wear according to the feed (α=120°, V=120 m/min), after drilling of a) 50 holes and b) 100 holes.

Polymer materials have low thermal conductivity and in the machining process, the generated heat is collected at the upper surface of polymer material due to not conducting. However, the carbon black reinforcement increases the thermal conductivity and also it is known that the carbon black particles improve the strength and hardness values of the polymer materials. Therefore, higher drill tool flank wears were measured in the drilling of CBR-HDPE when compared to the drilling of pure HDPE.

After drilling of 100 holes, SEM images of drill tool flank wear were given in Figure 7 and Figure 8. Drill tool were adversely worn in the drilling of CBR-HDPE at the point angle of 120°, the cutting speed of 120 m/min and the feed of 0,1 mm/rev (Figure 7). Less drill tool flank wear was occurred when drilling with the double-angled (80°-120°) drill tool at the cutting speed of 40 m/min and the feed of 0,2 mm/rev (Figure 8). Besides, it was specified that the carbon black reinforcement increased the drill tool flank wear.

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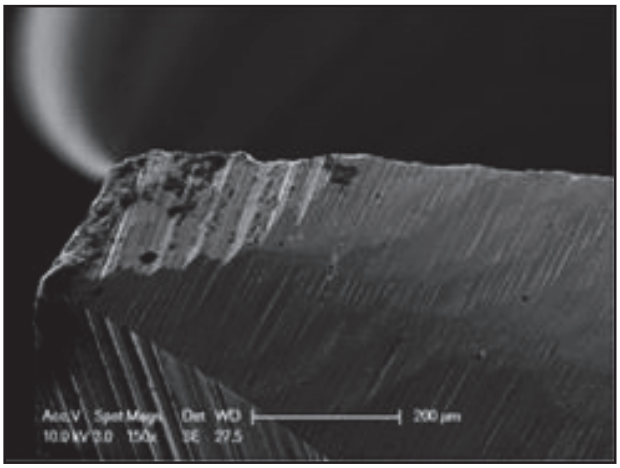

Figure 7.SEM image of drill tool flank wear after drilling of 100 holes on the CBR-HDPE (α=120°, V=120 m/min, f=0,1 mm/rev).

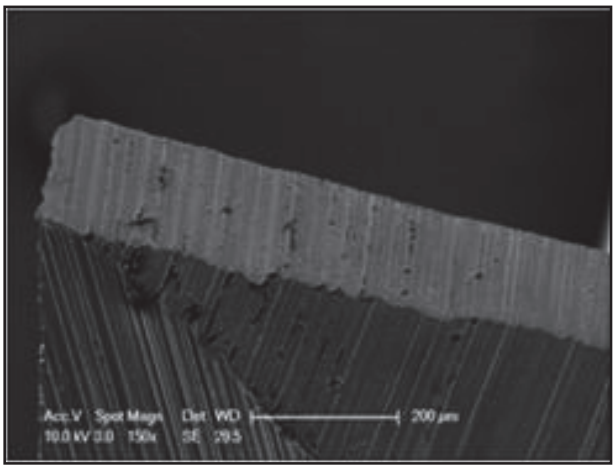

Figure 8.SEM image of drill tool flank wear after drilling of 100 holes on the pure HDPE (α=80°-120°, V=40 m/min, f=0,2 mm/rev).

Conclusion

In this study, pure and carbon black reinforced HDPE materials were drilled with drill tools having different drill point angles at two different cutting speeds and feeds and drill tool flank wear was investigated. The experimental results were given below.

- At higher drill point angles, polymer materials are subjected to plastic deformation with cutting, high drill forces occur to drill a hole and also friction and cutting temperature increase. Therefore, maximum drill tool flank wears were observed in the drilling of pure and carbon black reinforced HDPE with drill tools having drill point angle of 120°.

- The friction between drill tool and polymer material increased with increase of cutting speed and more drill tool flank wear was occurred in drilling both pure and carbon black reinforced HDPE polymer materials.

- Drill tool flank wear values decreased when increasing the feed due to the fact that drilling process was perfomed faster and less heat based on friction was occurred at high feed.

- It has been observed that the heat around the drilling zone is transmitted through the polymer material and the heat does not accumulate in a zone due to the fact that the carbon black reinforcement increases the thermal conductivity of polymer materials. In addition, less softening is observed when compared to pure polymer materials. For these reasons, drill tool flank wear values measured in the drilling of CBR-HDPE were higher than that observed in the drilling of pure HDPE.

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EFFECT OF ACID TREATMENT ON SPECTROSCOPIC AND THERMAL PROPERTIES OF CLINOPTILOLITE

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Abstract: Zeolites are hydrated aluminosilicates of alkali and alkaline earth elements with unique crystal structures consisting of three-dimensional framework of SiO4 and AlO4 tetrahedral [1]. Clinoptilolite (Si/Al > 4) belongs to the heulandite group of natural zeolites. Clinoptilolite is a monoclinic with the following unit cell parameters: a=17.62 Å, b=17.91 Å, c=7.39 Å, $\beta = 116^{o}18'$ [2]. In this study, samples obtained from Gördes region from Turkey were crushed, ground and sieved to pass through a < 63µm sieve. Clinoptilolite samples were modified by batch method using 100 ml of HCl solutions (0.1 and 1.0 M) at 90°C for 5h. The resulting acid-treated samples were named as 01H-CLI and 1H-CLI. Natural (CLI) and modified clinoptilolite samples (01-CLI and 1H-CLI) were characterized by Thermogravimetric Analysis (TG), Differential Thermal Analysis (DTA), Fourier-transform infrared spectroscopy (FT-IR) and nitrogen (N2) adsorption methods. It was found that the total % mass losses of clinoptilolite samples decreased as CLI > 01H-CLI > 1H-CLI. It was determined that the BET specific surface area (m^{2}/g) value of natural clinoptilolite sample was lower than those of acid modified samples and sequence of specific surface areas increased as CLI < 01H-CLI < 1H-CLI. The structural changes upon the acid treatment were also confirmed with the results of FT-IR.

Keywords: Adsorption; Clinoptilolite; BET, FT-IR; TG; DTA.

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EFFECT OF PRINTING LAYER THICKNESS ON TECHNOLOGICAL PROPERTIES OF 3D PRINTED SAMPLES MADE FROM WOOD FLOUR/PLA FILAMENT

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Abstract: In this study, effect printing layer thickness on technological properties of 3d printed samples made from wood flour/PLA filament having 1.75 mm was investigated. For this aim, three different printing layers, 0.1 mm, 0.2 mm, and 0.3 mm, were used in the production of the 3D-printed specimens. The water absorption of the specimens (28-days immersion in water) increased with increasing printing layer thickness while the thickness swelling decreased. The tensile strength and flexural strength of the specimens significantly improved with decreasing printing layer thickness

Keywords: Three dimensional (3D) printer, wood flour, poly(lactic acid), technological properties

Introduction

3D printing is an attractive technology that offers numerous new possibilities for the manufacturing of products. It enables users to create real objects based on a virtual computer model and thus opens up an almost unimaginable number of possibilities. Cheaper 3D printers use less expensive polymers; however, most of the materials are of synthetic origin, which means a potential for introducing harmful materials into the environment. However, with the development of new materials and lower prices for 3D technologies, 3D printing could expand into the area of manufacturing unique end-products or small batches of special products. Wood is an organic material that is widely available in the form of wood residues. Small pieces of wood, chips and particles can be milled into smaller fractions to provide a fine wood powder, which can then be used as a filler material in 3D printing with conventional plastic materials. Wood powder can also be used for printing in combination with a variety of commercial and natural adhesives. In this way the impact of 3D-printed products on the environment can be dramatically reduced. The wood flour has significant advantages as compared to the thermoplastics is considerably cheaper than thermoplastics (200 USD per ton while 1 ton of PLA is 1200 to 2000 USD), Wood is the most *abundant lignocellulosic material in the world. It is commonly used in thermoplastic composite industry due*

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to significant advantages such as high modulus, low price, good machinability, renewable, abundant, and problem-free disposal. WF is usually added to reduce the cost, meanwhile improving some mechanical and thermal properties of the PLA matrix. As the wood flour incorporated in the thermoplastics the price of material for 3D printers will decrease, which considerably increase the use of 3D printer in near future. The consumers will prefer the environmentally friendly materials for their 3D materials.

Polylactic acid (PLA) is another well-spread material among 3D printing enthusiasts. It is a biodegradable thermoplastic that is derived from renewable resources. As a result PLA materials are more environmentally friendly among others plastic materials. The other great feature of PLA is its biocompatibility with a human body. The structure of PLA is harder than the one of ABS and material melts at 180 – 220°C, that is lower than ABS (Gokhare et al., 2017). It has a lower coefficient of thermal expansion, which reduces the effects of warping. PLA also does not have the same health risks as ABS when printing in improperly ventilated spaces. The most glaring disadvantage of PLA is the lower deflection temperature under load (50 to 140°C), which will cause printed parts to deform when exposed to warm environment (Letcher and Waytashek, 2014).

3D printing is an attractive technology that offers numerous new possibilities for the manufacturing of products. It enables users to create real objects based on a virtual computer model and thus opens up an almost unimaginable number of possibilities. 3D printing is classified as an additive manufacturing (AM) process, where the material is added in layers, allowing users to create a real product directly from a 3D computer model. Such a technology is the opposite of conventional subtractive processes, such as CNC milling, where the product is the result of the removal of material; formative processes (casting or forging), where a mould is usually required; and joining processes, such as welding and bonding. There are several types of 3D printing process, but all of them are based on producing an object layer by layer. In this way, users can create complex shapes that are not otherwise possible by forming and moulding. The variety of materials (different plastics, metals and composites) offers the possibility to produce a wide range of products. However, 3D printing is best suited for the production of prototypes, small series, and unique products for the market. The development of 3D printing has seen extraordinary growth over the past few years. For example: the technology of photopolymers that consolidate with UV light has seen many improvements, 3D printing technology in several colours is now possible, and laser-sintering technologies that enable the production of finished products for toolmaking, medicine and prosthetics are well established. There are also possibilities to use 3D printing in the construction industry, with the printing of concrete forms.

Effect of printing parameters on the mechanical properties of 3D printed materials still need to be studied, particularly in regard to layer thickness. In this research work, effect of printing layer thickness on the dimensional stability and mechanical properties of the 3D printed materials was investigated.

Materials and Methods

Wood/PLA filament

The wood/PLA filaments (30 wt% and PLA (65 wt%) having a dimater of 1.75 mm and a moisture content of 1% were used in the production of 3D printed samples. The filaments were supplied from a commercial 3D-filament manufacturer (Fig. 1).

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Figure 1. The wood/PLA filament.

The 3D printed specimens were produced without supporter in the base according to the additive manufacturing (AM) process. The 3D printed samples were produced at three printing layers, which were 0.1 mm, 0.2 mm, and 0.3 mm, respectively, using Zaxe 3D printer manufactured by Zaxe 3D printer company in Istanbul, Turkey. Printing temperature and base temperature during the printing process were kept at 200 °C and 80 °C, respectively. The specimens with dimensions of 100 mm by 15 mm by 4 mm were stored at room climate (20°C and 50% relative humidity) prior to testing. The production of 3D printed specimens using 3D printer is presented in Figure 2.

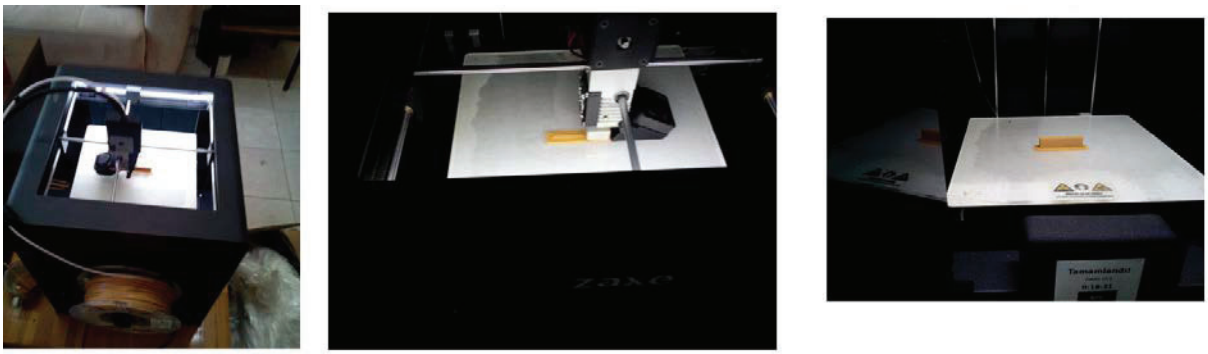

Figure 2. The production of the 3D printed samples using 3D printer.

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Determination of physical properties

The thickness swelling (TS) and water absorption (WA) tests were carried out according to ASTM D 570. Five specimens were tested for the TS and WA tests. The specimens were immersed in water having 20 °C for 28 days.

The densities of the specimens were also measured.

Determination of mechanical properties

The flexural strength (MOR) was conducted in accordance with ASTM D 790 (2010) using a Lloyd testing machine at a rate of 1.3 mm/min crosshead speed. The tensile strength was conducted according to the ASTM D 638 (2010). Tensile specimens were tested with a crosshead speed of 5 mm/min in accordance with ASTM D 638 (2010). Five specimens were tested for the tensile and flexural strength for each sample group.

Results and Discussion

Water resistance of the the 3D printed specimens

The densities of the specimens werre found to be 0.97-1.00 g/cm^3. As the printing layer thickness of the specimens was increased from 0.1 to 0.3 mm, the water absorption of the specimens significantly increased after 28 days immersion in water having normal temparature (Fig. 3). This can explained by the fact that the porosity in the specimens increased with increasing printing layer thickness, which resulted more water absorption. Apart from water absorption, as the printing layer thickness of the specimens was increased from 0.1 to 0.3 mm, the thickness swelling of the specimens significantly decreased after 28 days immersion in water having normal temparature (Fig. 4).

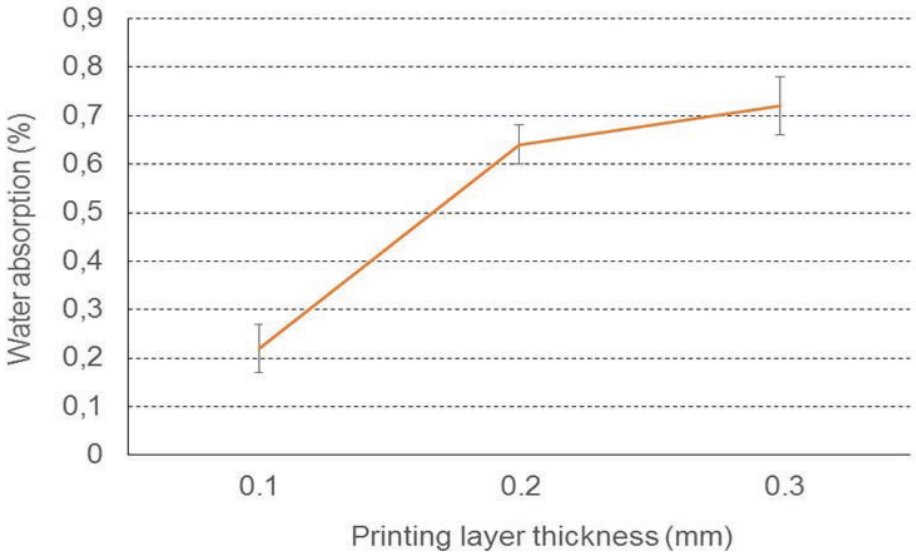

Figure 3. Effect of printing layer thickness on water absorption of 3D printed specimens.

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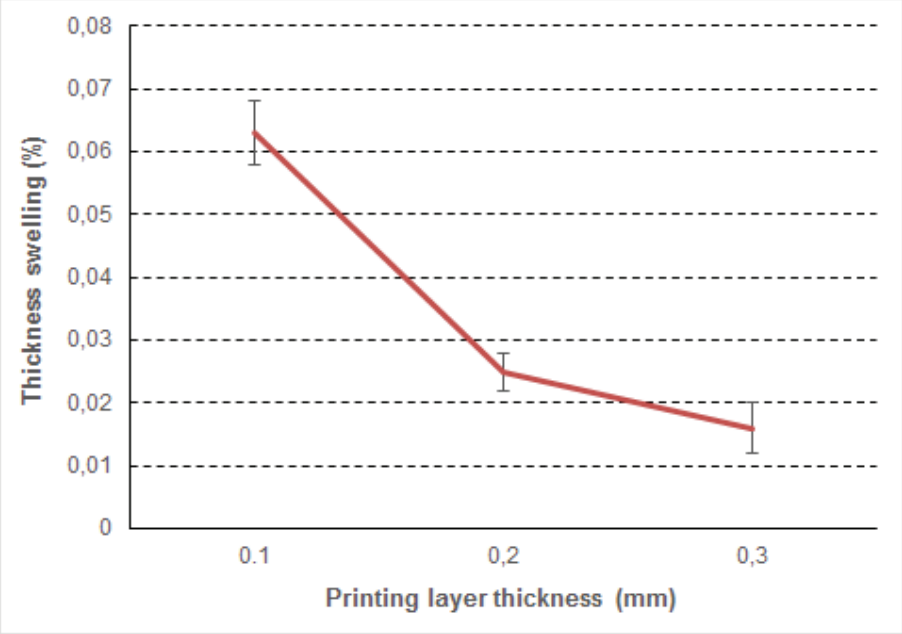

Figure 4. Effect of printing layer thickness on thickness swelling of 3D printed specimens.

Mechanical properties of the 3D printed specimens

It is evident that specimens with 0.1 mm layer thickness displayed higher values for the tensile strength than specimens with 0.2 or 0.3 mm (Fig. 5). It can be concluded from the results that higher strength for specimens with 0.1 mm layer thickness is due to smaller air-gap to material ratio. A similar result was found in previous studies (Rankouhi et al., 2016; Shubham et al., 2016). As the printing layer thickness of the specimens was increased from 0.1 to 0.3 mm, the bending strength of the specimens significantly decreased (Fig. 6). The improvement in the bending strength can be explained by the fact that the the bending stress

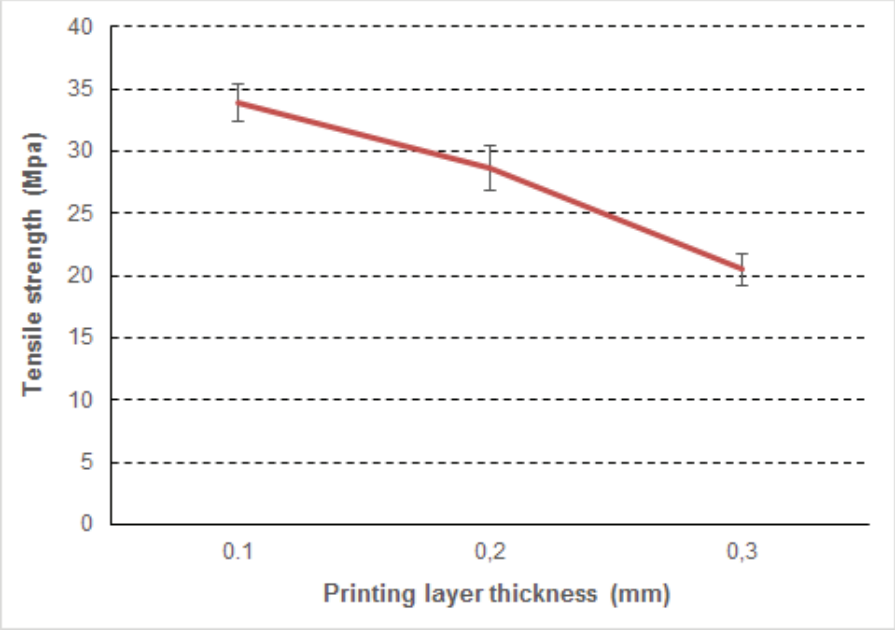

Figure 5. Effect of printing layer thickness on the tensile strength of 3D printed specimens.

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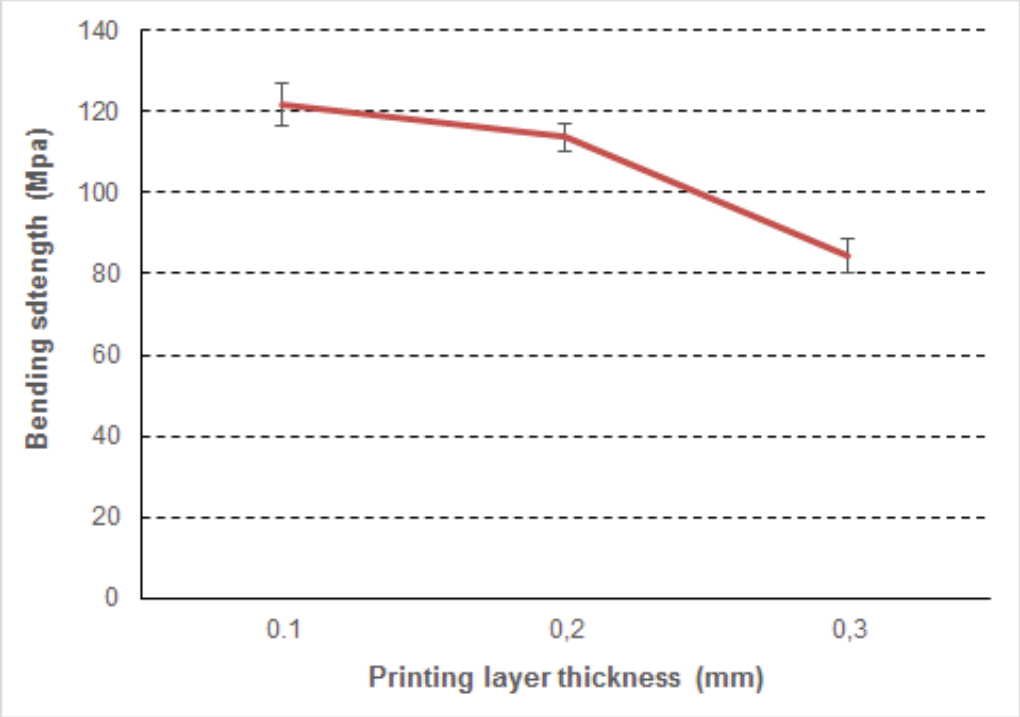

Figure 6. Effect of printing layer thickness on the bending strength of 3D printed specimens.

Conclusions

The water absorption of the 3D printed samples increased with increasing printing layer thickness from 0.1 to 0.3 mm. This can be explained by the fact that the amount of empty space in the 3D printed specimen increased with increasing layer thickness, which absorbs more water. The bending strength and tensile strength of the 3D printed specimens improved with decreasing printing layer. The results revealed that the increment in the printing layers enhanced the flexural strength and tensile strength of the specimens.

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Effect of Viscosity Parameter on the Numerical Simulation of Reinforced Concrete Deep Beam Behavior

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Abstract: In the study, a parametric nonlinear finite element (FE) study is performed in order to investigate sensitivity of viscosity parameter on numerical simulation of RC deep beam behavior. For this objective; a numerical verification of an existing experimental study of a deep beam is conducted by using ABAQUS software with varied values of viscosity parameter. Results of the experimental and numerical studies are compared in terms of load-displacement behaviors, and rate of convergence and calculation time of the numerical models. Selection of an optimum viscosity parameter and its definition to FE model improves significantly performance of convergence and reduces analysis time of numerical simulations of RC deep beams.

Key words: Viscosity parameter, concrete damage plasticity, finite element analysis, ABAQUS, reinforced concrete deep beam

Introduction

It is known that behavior of a structure relies on behavior of its members such as columns, beams etc. Therefore investigation of nonlinear behavior of reinforced concrete (RC) members under static and dynamic loads is very crucial to design safe structures (Caglar et al., 2015a, 2015b)

Deep beams are defined in ACI 318-14 (2014) code as RC members that are loaded on one face and supported on the opposite face. Moreover they have a clear span not exceeding four times the overall member depth.

There are several studies demonstrating that finite element (FE) analysis including an accurate numerical modeling technique and appropriate constitutive material models is also a quite reliable and robust tool to simulate and investigate nonlinear behavior of RC members (Demir et al., 2016a). Because of this reason, FE analysis is widely preferred tool by researchers for their scientific researches (Edip et al., 2013).

Two different constitutive material models are offered in ABAQUS/Standard, which is an implicit analysis program, for the analysis of concrete at low confining pressures: the smeared crack concrete model and the concrete damaged plasticity (CDP) model. Moreover, the CDP model is based on the assumption of isotropic damage and considers the degradation of the elastic stiffness induced by plastic straining both in compression and tension. For the CDP material model it can be defined flow potential, yield surface, and viscosity parameters ("ABAQUS online documentation server").

In implicit analysis programs, constitutive models lead to severe convergence difficulties due to softening behavior and stiffness degradation of materials. The use of a viscoplastic regularization of the constitutive equations is one of common technique to overcome some of these convergence difficulties ("ABAQUS online documentation server"). For the CDP material model in ABAQUS software, viscoplastic regularization can be taken into account by defining a viscosity parameter in material definitions.

Ren et al. (2015) conducted a finite element study of PPC bridge deck panels based on validation of an

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experimental test using concrete damage plasticity model. In a part of the numerical study they made a parametric analysis with varied values of viscosity parameter. Numerical results demonstrated that lower values of viscosity parameter increased calculation accuracy and increased the calculation time.

Moreover, Ma et al. (2012) studied the numerical simulation of an existing experimental study on the energy absorption columns. ABAQUS software was used to perform numerical research. The concrete damage plasticity model was adopted for the calculation of constitutive concrete material used in the columns and the viscosity coefficient was discussed. It was specified that until finding a reasonable value for viscosity parameter, a parametric study should be conducted in order to improve convergence of numerical simulation.

No default value for viscosity parameter is proposed in ABAQUS manuals and literature in which it is however highly recommended to be defined to FE models to overcome convergence difficulties in numerical simulations. Because of that reasons, the motivation of the study is to investigate sensitivity of viscosity parameter on nonlinear numerical simulation of RC deep beams. For this purpose numerical verification of an existing experimental study of a deep beam is performed by employing a commercial finite element software ABAQUS. Results of the experimental and numerical studies are compared in terms of load-displacement behaviors, and rate of convergence and time of numerical models.

Viscosity parameter (μ)

The CDP model can be regularized in ABAQUS/Standard using viscoplasticity by permitting stresses to be outside of the yield surface. Viscoplastic regularization of the constitutive equations causes the consistent tangent stiffness of the softening material to become positive for sufficiently small time increments. Generalization of the Duvaut-Lions regularization is used according to which the viscoplastic strain rate tensor, $\dot{\varepsilon}_v^{pl}$, is defined as (Eq. 1);

$$\dot{\varepsilon}_v^{pl} = \frac{1}{\mu}\left(\varepsilon^{pl} - \varepsilon_v^{pl}\right) \quad (1)$$

Where μ the viscosity parameter representing the relaxation time of the viscoplastic system, and ε^{pl} is the plastic strain evaluated in the inviscid backbone model.

Additionally, for the viscoplastic system, a viscous stiffness degradation variable, d_v, is defined as

$$\dot{d}_v = \frac{1}{\mu}(d - d_v) \quad (2)$$

Here d is the degradation variable evaluated in the inviscid backbone model. The stress-strain relation of the viscoplastic model is defined as follows;

$$\sigma = \frac{(1-d_v)D_0^{el}}{\varepsilon - \varepsilon_v^{pl}} \quad (3)$$

Taking a small value for the viscosity parameter, small adequate compared to the characteristic time increment, usually contributes to improve the rate of convergence of the model in the softening regime, without compromising numerical results. While $t/\mu \to \infty$, the solution of the viscoplastic system relaxes to that of the inviscid case, where t is time.

Value of the viscosity parameter can be defined as part of the concrete damaged plasticity material behavior definition. The default value of μ is zero in ABAQUS/Standard that corresponds to omission of viscoplastic regularization. If μ differs from zero, output results of the stiffness degradation and plastic strain refer to the viscoplastic values, d_v and ε_v^{pl} respectively ("ABAQUS online documentation server").

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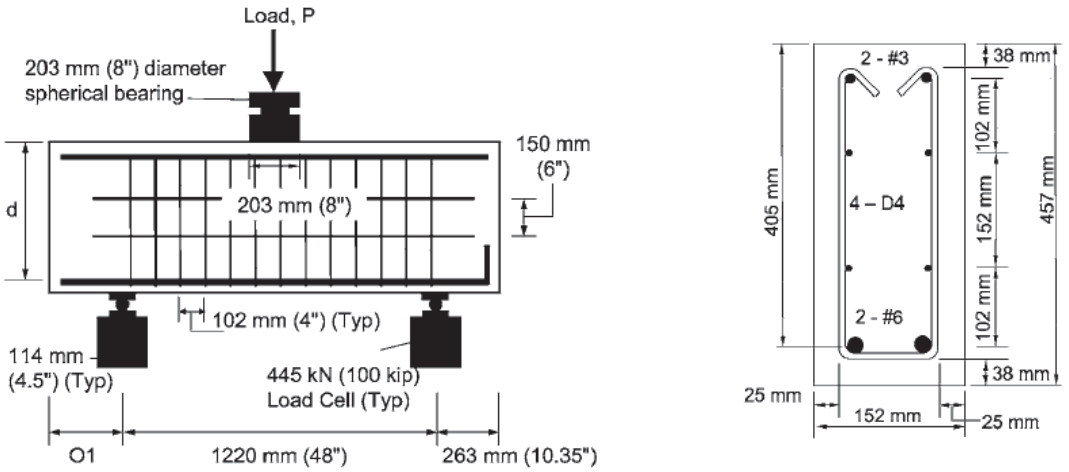
Experimental study

An experimental study conducted by Roy and Brena (2008) are selected as a reference study in order to create a numerical model of an RC deep beam. One of the specimens named as "DB1.0-0.75L" in the reference study is chosen as a reference verification specimen. The ratio of shear zone to effective depth of the section (a/d) is given as 1.0.

The details of specimen geometry, reinforcement, and experimental test setup are displayed in Fig. 1. Additional details about test setup, loading procedure and material properties can be found in the relevant study.



a) Side view b) Cross Section

Figure 1. Specimen geometry, reinforcement, and test setup (Roy & Breña, 2008)

Load-displacement result of the test is presented in Fig. 2. Since no tabular data for load-deflection graph were given in the reference study, loads and corresponding displacement values are determined manually (Demir et al., 2016b).

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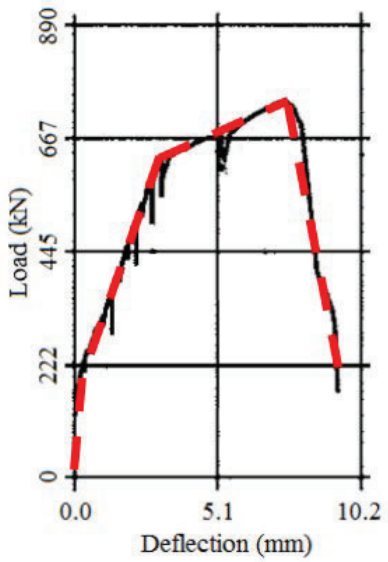

Figure 2. Load-deflection result of the test (Demir et al., 2016b)

Numerical modeling

In the study, the FE-code ABAQUS/Standard (ABAQUS/CAE 6.13-2 SE) is used to create numerical simulation. Inelastic behavior of concrete is defined to FE model by using Concrete Damaged Plasticity (CDP) model. Similar numerical FE model of a deep beam proposed in the study of Demir et al. (2016b) is used to conduct the present numerical parametric study on the viscosity parameter. Because of that reason, FE modeling procures to create current numerical simulation are not explained here and whole details can be found in the related study. Moreover FE model and verification result with test result are demonstrated in Fig. 3.

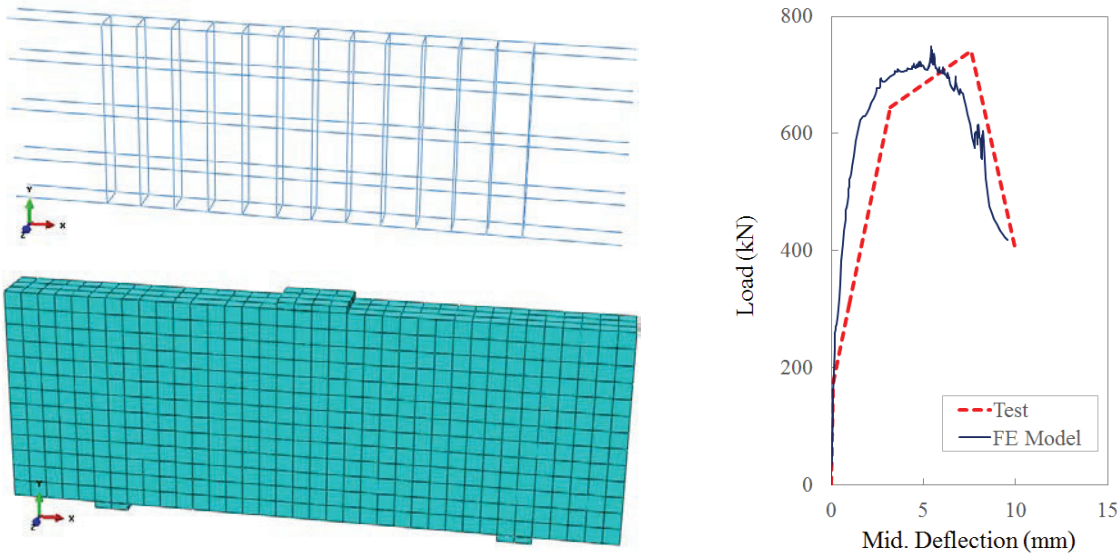

Figure 3. Meshed FE model and and verification result (Demir et al., 2016b)

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Parametric study

In order to investigate effect of viscosity parameter on numerical behavior of RC deep beam, a parametric study is performed. For that objective 8 different numerical models are created with different viscosity parameter, tabulated in Table 1. Results of the experimental and numerical studies are compared in terms of load-displacement behaviors and ultimate load levels. Additionally, total number of iterations to finish the numerical analysis, percentage of convergence according to step time (taken as 1 second in the FE model), and comparison of error of numerical results with the test result in terms of ultimate load levels are tabulated.

Results and discussion

The test and numerical study results are tabulated in Table 1 and plotted in Fig. 4. Results of the total number of iterations to finish the FE analysis and percentage of convergence according to step time are specified. Moreover, ultimate load (f_u) values of the test and numerical models are given, and error of numerical results in f_u are compared with the test result in the table.

It can be clearly seen from Fig. 4 that viscosity parameter plays very important role on numerical results in a way that it changes significantly the numerical load-displacement behavior of deep beams. However load-displacement graphs could not be obtained for models DB-1 and DB-2 because the FE models did not converged. The FE model (DB-1) aborted with very small percentage of convergence (6 %) under value of viscosity parameter, zero which is a default value of ABAQUS software. Moreover with the definition of a very small viscosity parameter to the FE model, DB-2, the simulation similarly did not converged but the percentage of convergence has slightly increased (14 %). Due to nonconvergent results, duration of analysis (total number of iteration) could not be measured for that FE models.

Table 1. Results of the experimental and numerical study

#	Name of Model	μ	Total no. of iteration	Convergence %	f_u (kN)	Error % in f_u
1	DB-Test	-	-	-	740	-
2	DB-1	0	n/a	6	n/a	n/a
3	DB-2	0.00001	n/a	14	n/a	n/a
4	DB-3	0.00005	605	100	692	-6.5
5	DB-4	0.00010	508	100	697	-5.8
6	DB-5	0.00050	444	100	738	-0.3
7	DB-6	0.00100	341	100	786	6.3
8	DB-7	0.00500	305	100	929	25.5
9	DB-8	0.01000	278	100	1109	49.9

Along with the increase in value of μ, numerical models have started to converge. For the models, DB-3 and DB-4, the numerical results are very similar to the test results in terms of load-displacement behavior of the tested deep beam. Percentage of error in ultimate load level stayed under 10 % as well. Total number of iterations for DB-3 and DB-4 are 605 and 508 respectively.

With increase in value of viscosity parameter (above 0.0005), numerical load-displacement behaviors of the models of DB-5 through DB-8 have started to lose their fitness in terms of ultimate load levels. Especially when the value of μ is above 0.005, the models of DB-7 and DB-8 performed very poor behavior and the results substantially deviated from test results. However total number of iterations decreased significantly.

Conclusions

In the present study, a parametric FE study was performed in order to investigate sensitivity of viscosity parameter on numerical simulation of RC deep beam behavior. For this objective; a numerical verification of an existing experimental study of a deep beam is performed by using ABAQUS software with varied value of viscosity parameter assigned to the FE models. Results

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of the experimental and numerical studies are compared in terms of load-displacement behaviors, and rate of convergence and time of numerical models.

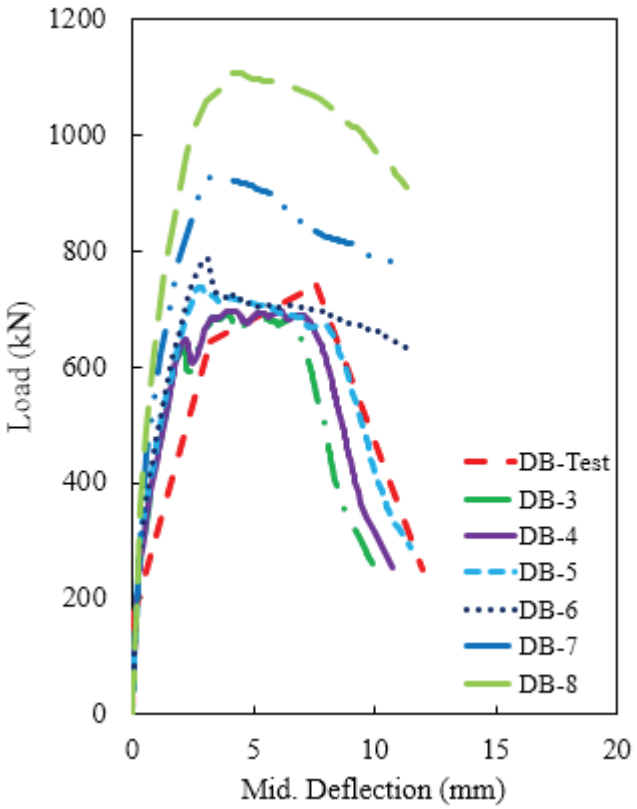

Figure 4. Load-displacement results

The numerical results are deduced that omission of viscoplastic regularization by taking the default value of μ as zero in ABAQUS generally causes nonconvergent results in FE simulations. Viscosity parameter however plays very important role on numerical simulation of RC deep beams. Along with definition of a viscosity parameter to the simulation, not only increase in convergence performance of FE model but also a significant reduce in duration of an analysis can be obtained.

For numerical simulation of RC deep beams, an optimum value for viscosity parameter in terms of numerical convergence and analysis time should be selected and assigned to the FE model. The optimum value of the parameter can be taken as 0.0005 giving very accurate numerical result in terms of load-displacement behavior. Above that value, numerical results become distant from the test results. Nevertheless, it should be noted that until finding a reasonable viscosity parameter, a parametric numerical sensitivity study should be conducted with varied values of the parameter in order to improve calculation accuracy of numerical simulation of RC deep beams.

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EFFECT OF WELDING TIME ON WELD PROPERTIES OF 30% COLD ROLLED TWIP STEEL RESISTANCE SPOT WELDS

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Abstract: In recent years, automotive manufacturers have been focused to reduce vehicle weight for lower CO_2 emission and to improve passenger safety standards. Twinning induced plasticity (TWIP) steels have highly desirable properties for automotive industry exhibiting good combination between high tensile properties and high ductility. These steels are considered to be a typical representative of the 2nd generation advanced high strength steels. The use of TWIP steels for car body manufacturing inevitably involves welding, particularly after the cold forming. As known, Resistance Spot Welding (RSW) is the most widely used joining process for steel sheets. In this study, the effect of welding time on the mechanical properties of 30% cold rolled TWIP steel joints welded by RSW was investigated. The influence of five different welding times was studied in this work. Microstructural characterization and tensile shear tests of the joints were conducted. The fracture surfaces of the selected tensile test specimens were also observed with a scanning electron microscope. In general, the higher welding time lead to the larger nugget size, coarser grain structure in the heat affected zone (HAZ), larger HAZ width and deeper indentation. Up to 150 ms, the weld strength significantly increased with increasing welding time, and then it slightly decreased with increasing welding time.

Keywords: TWIP Steel, Cold Rolling, Resistance Spot Welding, Welding Time, Microstructure, Mechanical Properties

Introduction

The body design with light weight and enhanced safety is a key issue in the car industry (Kwon et al. 2010). So, throughout the world there is increasing interest in the development of new Advanced High Strength Steels (AHSS) with enhanced combinations of strength and ductility to provide sheet materials for demanding applications in future vehicles (Matlock et al. 2012). Global steel manufacturers are still carried out to develop more advanced automotive steels. In recent years, high manganese TWinning-Induced Plasticity (TWIP) steels exhibiting outstanding mechanical properties of high tensile strength (1000 MPa) and large ductility (65%) due to high strain hardening rate have received very high interest in applications for structural components in the automotive industry (Saha et al. 2012; Jin and Lee 2009). Saha et. al. (Saha et al. 2012) also stated that high impact resistivity is another important property which made high-Mn steel excellent candidates for automotive crash-worthy components.

Resistance Spot Welding (RSW), which is a cost effective way and a common and large-scale joining method in the automotive industry, is used for the fabrication of sheet metal assemblies in automotive body construction. This welding process is usually carried out after cold forming operation. However, because of the thermal cycle during the RSW process, the microstructure of sheet steels is destroyed. These microstructural deteriorations in the weld zone are highly dependent on the initial microstructure of the base metal and the welding parameters (Aydin et al. 2016). Several studies have been conducted to investigate the weld properties of RS welded TWIP steel sheets (Holovenko et al. 2013; Saha et al. 2013; Razmpoosh et al. 2015; Spena et al. 2015; Yu et al. 2014; Chandra et al. 2014). In addition to these studies, it may be important to study the welding behavior of the resistance spot-welded joints of cold formed TWIP sheet steels. Therefore, the present study aims to examine the effect of welding time on the microstructure and the mechanical properties of the resistance spot-welded joints of commercial TWIP sheet steels after cold forming. The mechanical properties of the spot welds were evaluated through tensile shear tests.

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Materials and Methods

The steel used for this study was 1.3 mm thick a commercial available TWIP steel sheet with the chemical composition of 0.28% C, 15.6% Mn, 1.06% Si, 1.89% Al, 0.564% Cr, and 0.1% Ti with the remaining being Fe. This steel sheet was cold rolled at room temperature using a laboratory rolling mill with a total reduction with 30%, leading to the final thickness of roughly 0.9 mm. The mechanical properties of as-received and 30% cold rolled TWIP steel sheets were given in Table 1. The increase in Ultimate Tensile Strength (UTS) and hardness of 30% cold rolled specimen is around 50% and 62%, respectively, whereas the decrease in total elongation of 30% cold rolled specimen is around 85%.

Table 1: The mechanical properties of the as-received and 30% cold rolled specimens. (Mean values).

Specimen	UTS [MPa]	Total Elongation (%)	Hardness [$HV_{0.2}$]
As-recieved	982	46	260
30% cold rolled	1478	7	420

Spot welding specimens (50mm×20mm×0.9 mm) were cut from the 30% cold rolled sheet and installed as the lapping joint, as shown in Fig. 1. The spot welding test was carried out by a MFDC resistance spot welding machine connected to ABB robot arm. Copper alloy electrodes with a tip diameter of 6 mm were used in the welding processes. The welding current, welding time and electrode force were 8.5 kA, 50-250 ms and 1.5 kN, respectively. After welding, the spot welded joints were sectioned through the nugget center normal to the plane of the specimens using an electrical-discharge cutting machine and then ground, polished and etched with both Nital (3%) and $Na_2S_2O_5$ solution (10 g $Na_2S_2O_5$ in 100 ml H_2O), respectively, for metallographic examination. The microstructure of spot welded joints was examined using an optical Nikon DIC microscope under polarized light with a Clemex image analysis system. Joint tensile shear test was carried out using a fully computerized UTEST-7014 material tensile testing machine in laboratory conditions using a constant crosshead speed of 5 mm/min. The fracture surfaces of the selected tensile test specimens were also observed with a scanning electron microscope (SEM). The nugget size (NS) measurement was made from the fractured specimens using a digital caliper.

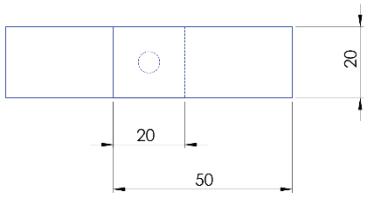

Figure 1. Size of the welded specimens.

Results and Discussion

Optical macrographs of the spot welded joints are shown in Fig. 2. The joint with 50 ms of welding time has vertical shrinkage flaws, whereas horizontal shrinkage flaw was observed in the joint with 250 ms of welding time. The NS is related to the welding time and a higher welding time produces a relatively larger NS. The weld cross-sections of the joints consist mainly of three main distinct microstructural zones, including base metal (BM), weld nugget and heat affected zone (HAZ) encircling the nugget, as shown in Fig. 3. Higher welding time also leads to coarser grain structure in the HAZ and larger HAZ width (Fig.3).

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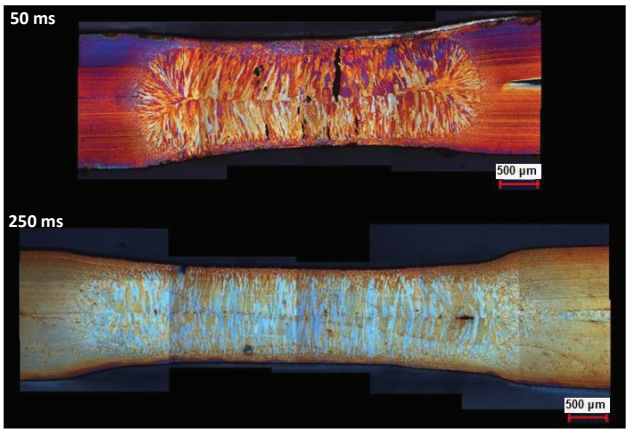

Figure 2. Optical macrographs of the spot welded joints.

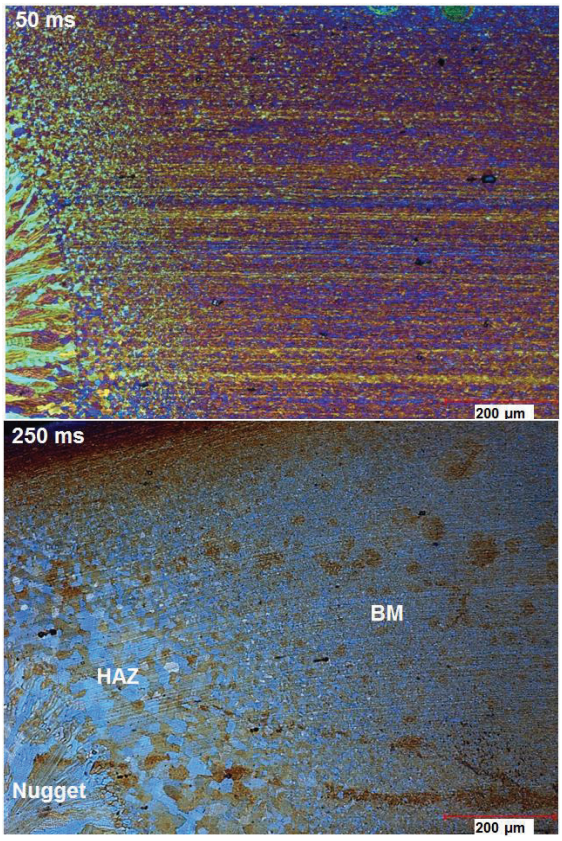

Figure 3. Effect of welding time on the heat affected zone. (BM: Base metal; HAZ: Heat affected zone)

Up to 150 ms of welding time, the NS of the spot welded joints increases with increasing welding time owing to the increased heat input (Fig. 4). The maximum NS is roughly 6 mm at 150 ms of welding time. With an increasing of welding time from 50 ms to 150 ms, the increase in NS at 150 ms of welding time is about 18.7%. However, afterwards, the NS decreases with increasing welding time. This decrease in NS is about 4.4%. Also, the relationship between the welding time and the indentation depth of the joints is given in Fig. 5. The indentation depth of the spot welded joints increases gradually with increasing welding time. With an increasing of welding time from 50 ms to 250 ms, the increase in indentation depth is roughly 26%.

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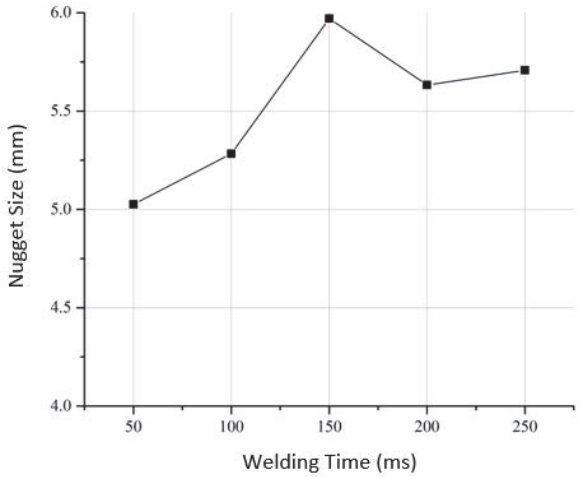

Figure 4. Effect of welding time on the nugget size.

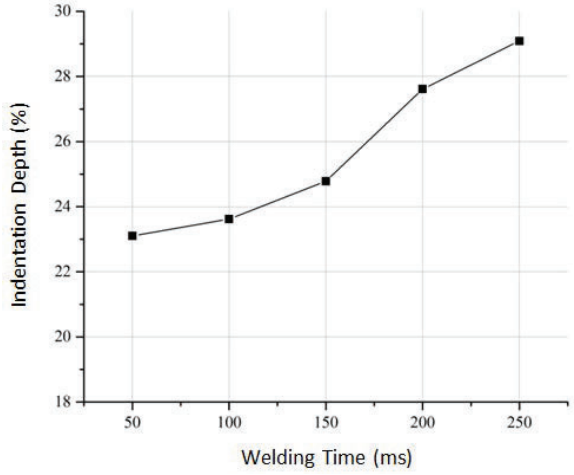

Figure 5. Effect of welding time on the indentation depth.

The results obtained from the tensile shear tests of the spot welded joints are given in Table 2. The failure mode of the joint with the lowest welding time (50 ms) is interfacial and so, this spot welded joint had the lowest tensile shear load. The other spot welded joints exhibited button pull-out failure mode, corresponding the higher weld strength. The effect of welding time on the tensile shear load of the joints is also shown in Fig. 6. Up to 150 ms of welding time, the tensile shear load of the spot welded joints significantly increases with increasing welding time. The maximum failure load is 10.83 kN at 150 ms. With an increasing of welding time from 50 ms to 150 ms, the increase in failure load is about 27%. However, afterwards, the tensile shear load slightly decreases with increasing welding time. This limited decline is only around 1.7%. The tensile shear loads obtained in the different welding times are agreement with the NS values in the different welding times: The coefficient of determination (R^2) for the correlation between the NS and the tensile shear load is almost 79% by fitting a linear model using regression analysis to the obtained results, as shown in Fig. 7.

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Table 2: The tensile shear test results of the spot welded joints (mean values). (SD: Standard Deviation)

Welding Time [ms]	Tensile Shear Load [kN]	SD	Failure Mode
50	8.52	0.19	Interfacial
100	10.13	0.28	Button Pull-out
150	10.83	0.40	Button Pull-out
200	10.75	0.63	Button Pull-out
250	10.65	0.51	Button Pull-out

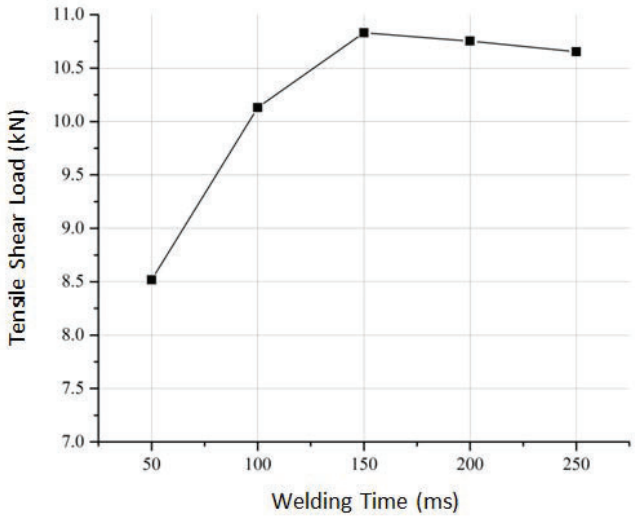

Figure 6. Effect of welding time on the tensile shear load of the spot welded joints.

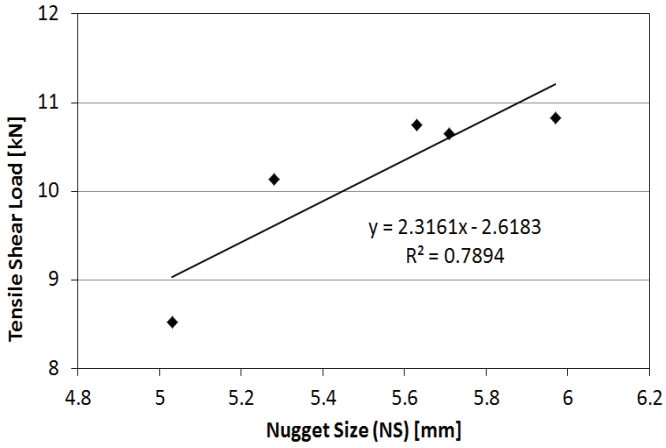

Figure 7. The relationship between the nugget size versus the tensile shear load.

The welding time has also an effect on the fracture appearance of the spot welded joint. At the lowest welding time (50 ms), nugget failed across the interface for tensile shear specimens (interfacial failure mode), having lowest weld strength (Fig. 8). At the higher welding times (over 50 ms), nuggets failed by forming a full button pull-out failure mode referring to higher deformation energy, in which fracture occurs in the HAZ at the around of the spot weld (Fig. 8). The joint with 50 ms of welding time exhibited relatively flat fracture surface with rather shallower

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dimples, predominantly indicating the typical brittle fracture mode with some areas of rather limited ductility. On the other hand, at 150 ms of welding time, some plastic deformation with relatively deeper void and dimple features were observed. Based on above results, it is favorable to select relatively high welding time for improving mechanical properties of the spot welded 30% cold rolled TWIP steel joint.

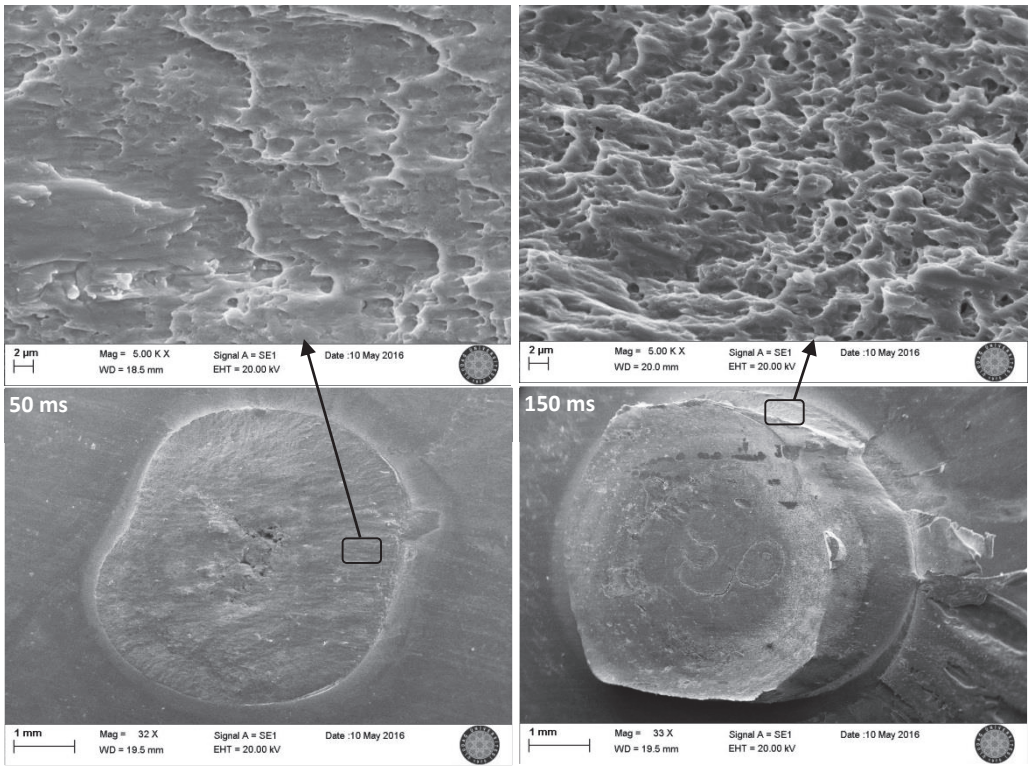

Figure 8. Fracture surface morphology of the spot welded joints.

Conclusion

The present study was focused to examine the effect of welding time on the mechanical properties of the resistance spot welded 30% cold rolled TWIP steel sheet joints. The conclusions derived from this study can be given as follows:

- In general, the higher welding time leads to the larger nugget size: Up to 150 ms, the nugget size increases with increasing welding time, then the nugget size slightly decreases with increasing welding time. The maximum NS is roughly 6 mm at 150 ms.
- The higher welding time reveals coarser grain structure in the HAZ and larger HAZ width.
- The indentation depth increases with increasing welding time. The maximum indentation depth is about 29% at 250 ms.
- Up to 150 ms, the weld strength significantly increases with increasing welding time. The maximum tensile shear load is 10.83 kN at 150 ms. Then, the weld strength rather slightly decreases with increasing welding time.
- The weld strength increases almost linearly with increasing nugget size (the linear correlation coefficient of determination, R^2= 79%)

Acknowledgements

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for providing facilities for the resistance spot-welding processes.

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EFFECTS OF HIGH-ENERGY BALL MILLING PARAMETERS ON STRUCTURE AND THERMAL BEHAVIOR OF TINCAL

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Abstract: Tincal is widely used mineral in ceramic and metallurgy industries and raw material of borax production. It contains clay minerals and crystal water in the structure. Tincal, named as sodium tetraborate decahydrate, that has same formulation with borax, as known as borax decahydrate is the member of sodium borates and its formulation is expressed as $Na_2B_4O_7.10H_2O$ or $Na_2(B_4O_5(OH)_4).8H_2O$. Extra weight of water in raw boron minerals may become problem in point of transportation, storage, energy cost for producing anhydrous borates and by-product. In this study, with the aim of removing structural water and creating structural alterations for the forward mineral processing with less cost. High-energy ball milling, as known as mechanical activation process, was applied by planetary mono mill with variable parameters such as revolution per minute-speed of main disc (100, 200, 300, 400, 500 and 600 rpm for 30 min at ball-to-mass ratio 20), ball-to-mass ratio (10, 20, 30 and 40 for 30 min at 600 rpm) and mechanical activation time (15, 30, 60, 90 and 120 min). Investigations of effects of activations parameters were done by using X-ray diffraction analysis, Fourier transform infrared spectroscopy and thermal analysis. It was concluded that structure of tincal was changed and loss of crystalline water was occurred during high-energy ball milling.

Keywords: Tincal, Amorphization, Stress energy, Mechanical activation

Introduction

Boron compounds are used in many sectors such as glass, glass fibre, ceramic, hygienic and cleaning products, flame retarder, metallurgy-materials area, health, cosmetic and energy. Among all chemical elements, boron has the highest volumetric heat of combustion (140 kJ/cm^3) and the third highest gravimetric heat of combustion (59 kJ/cm^3) after H_2 and Be (Liu et al., 2014).

Boron minerals can be grouped as sodium borates, calcium borates, calcium borosilicate, magnesium borates and sodium-calcium borates. West Turkey possesses the largest boron deposits with a worldwide share of 72% (851 Mtons) in terms of B_2O_3 content, and controlled by the national mining enterprise Eti Mine (Kavas et al., 2011). Eti Mine has four production facility position. Kırka boron plant mainly works on borax and tincal. Colemanite and boric acid are products of Emet. Colemanite ($2CaO.3B_2O_3.5H_2O$) and ulexite ($Na_2O.2CaO.5B_2O_3.16H_2O$) are obtained via open pit mining at Bigadiç. Bandırma boron plant has a wide variety of boron products.

Tincal that has clay minerals in the structure is raw material of borax production. Borax from tincal is produced via batch process. Tincal is fed to a stirred reactor containing water heated to 95-100°C. Colloidal clay in the water is coagulate with an anionic coagulant. After coagulating and precipitating of clay, clear solution is passed to filter-pressing and is then fed to a crystallizer (Boncukoğlu et al., 1999).

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Tincal that has same formulation with borax as known as borax decahydrate is the member of sodium borates. Its formulation is expressed as $Na_2B_4O_7.10H_2O$ or $Na_2(B_4O_5(OH)_4).8H_2O$. In this structure two molecules of water are structurally incorporated in the borate ion ($B_4O_5(OH)_4^{2-}$) as hydroxyl groups whereas remaining water molecules are present at outside of the ionic structure (Koçakuşak et al., 1995). Same situation is expressed for borax pentahydrate ($Na_2B_4O_7.5H_2O$) and stated that 3 mol of water of crystallization could be eliminated easily by thermal treatment but remaining 2 mol of water are strongly attached to the structure and can be removed by molecular decomposition (Sahin and Bulutcu, 2002). In many point, water in the structure may become problem such as transportation, storage and by-product.

Mechanical activation process or high energy milling has been using in the powder preparation area with the aim of synthesis of amorphous alloy powders or synthesis of alloy powders with other meta stable phases, synthesis of nanocrystalline powders, nanopowders, metal-ceramic composites and nanocomposite powders (Zhang, 2004). The fundamental principle of size reduction is supplied energy from grinding media to the powder. Trapping powder between two colliding balls compressed into small pieces (Alves et al., 2013).

In this study, with the aim of removing structural water and creating structural alterations for the forward mineral processing with less cost. High-energy ball milling, as known as mechanical activation process, was applied by planetary mono mill with variable parameters.

Materials and Methods

Tincal was obtained from Eti Mine, Bandırma/Turkey. Because of the decomposition of tincal occurs above 50°C, obtained material was dried at room temperature for one day to eliminate the dehydration of the structure. After drying, ore was milled and sieved under 75 µm for standardization to mechanical activation process.

The ore was mechanically activated in Planetary Mono Mill, Fritsch Pulverisette 6. Milling process was carried out under dry condition in tungsten carbide bowl that has 250 ml capacity with same material ball with 8.15 g in weight and 10 mm in diameter. Initially revolution per minute was tried at 100, 200, 300, 400, 500 and 600 rpm for 30 min at ball-to-mass ratio 20. After determining the efficiency of revolution, ball-to mass ratio studies were carried out at 10, 20, 30 and 40 for 30 min at 600rpm. After confirmation of revolution and ball-to mass ratio, mechanical activation durations were tried for 15, 30, 60, 90 and 120 min.

Mechanically activated samples were analysed by X-ray diffractometer to observe the structural alterations and amorphization degrees (A) were calculated by using Equation 1 (Baláž, 2008),

$$A = \left(1 - \frac{I_X . B_0}{I_0 . B_X}\right) . 100 \quad (1)$$

where I_0 is the integral intensity of the diffraction peak for the non-activated tincal, B_0 is the background of the diffraction peak for the non-activated tincal, and I_x and B_x are the equivalent values for the activated tincal (Baláž, 2008).

Also stress energy that is generated by mechanical activation process on the powder samples was calculated according to Equation 2 (Erdemoğlu et al., 2009).

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$$SE\ (J/kg) = \frac{m_B}{m_S}.a.n.t_m.D \quad (2)$$

where m_B, m_S, a, n, t_M and D refer to mass of grinding media (kg), mass of material charge (kg), theoretical acceleration in the centre of the bowl in the planetary mill (m/s^2), speed of revolution (1/s), grinding time (s) and mill diameter (m), respectively. Theoretical acceleration for this planetary ball mill is 26.41 m/s^2, as stated by the supplier.

Fourier transform infrared spectroscopy to understand which changes in progress for bonds and thermal analysis to determine the decomposition temperature changes in the activated tincal were carried out. X-ray diffraction analysis was performed using a Rigaku Ultima X-ray diffractometer and Cu Kα radiation. FT-IR was done by Shimadzu between 4000 cm^{-1}-500 cm^{-1}. DTA was performed using TA Instruments SDTQ 600 at heating rate of 5°C.min^{-1} under atmospheric conditions.

Result and Discussion

XRD analysis of the sample was given in Figure 1. Borax (JPDS card no 01-075-1078), dolomite (JPDS card no 01-075-1656) and borax pentahydrate known as tincalconite (JPDS card no 01-071-1536) phases were detected. Peak overlapping phenomenon observed mainly between borax and tincalconite.

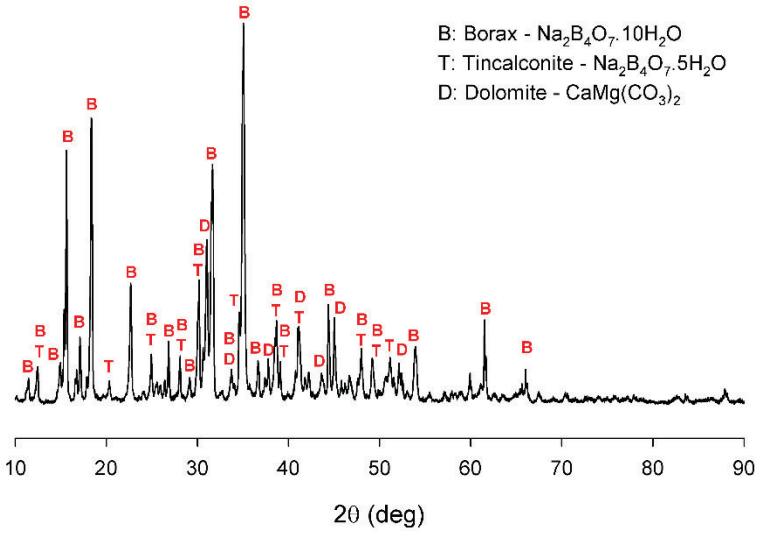

Figure 2. XRD analysis of the sample

Speed of main disc -revolution per minute- studies were carried out for 30 min and ball-to-mass ratio at 20. For observing changes at patterns, XRD was given at Figure 2 which was given between 10° - 40° to include most intensive peaks of the phases. At Figure 3, stress energy-I/I_0 (peak rate) and stress energy-amorphization degree (A%) dependence was given according to speed of main disc. As seen from the Figure 2, until 300 rpm no significant changes were obtained in terms of borax and dolomite. After 300 rpm, appearance of tincalconite was detected to accompaniment of intensity decrement of borax. By taking into consideration of crystallite size effect occurred as stretch and/or decrease in intensity of peak, peak rate (I/I_0) for borax presents at ~35° was considered where I_0 is the intensity of the non-activated sample and I is the intensity of activated one. As seen from the Figure 3, with increasing speed of main disc, stress energy increased. Peak rate decreased parallelly to amorphization

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degree increment. But these changes occurred drastically after 200 rpm in furtherance to XRD analysis. At higher speeds, due to temperature increase originated from ball-mass-bowl friction, borax phase underwent decomposition and in situ phase transformation to tincalconite occurred. When amorphization percentages were considered, speed of main disc was fixed at 600 rpm that borax patterns lost substantially.

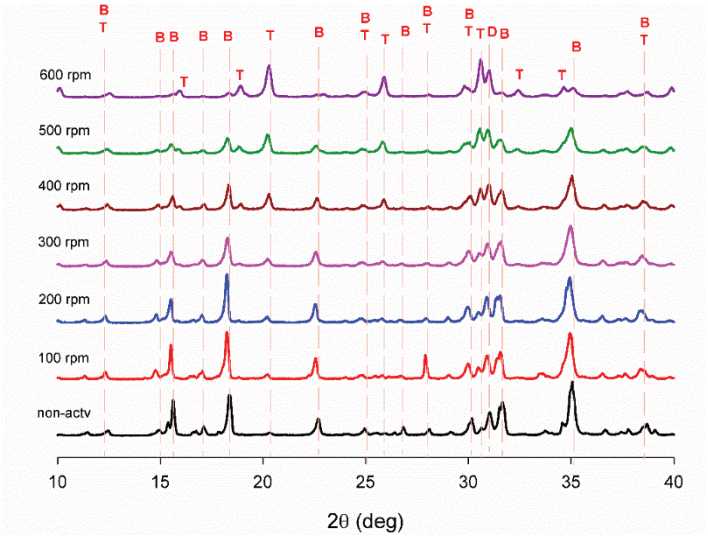

Figure 3. X-ray diffraction analysis of mechanically activated tincal sample at various speed

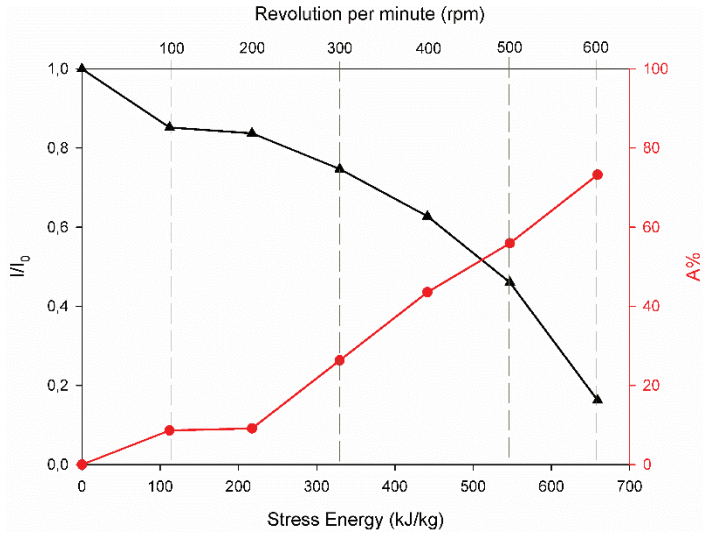

Figure 4. Stress Energy-I/I_0 and Stress Energy-%A dependance according to rpm

Effect of ball-to-mass ratio was given in Figure 4. Determination of ball-to-mass ratio was conducted at 600 rpm for 30 min. Tincalconite formation was observed for all parameter. At Figure 5, increased ball-to-mass ratio caused increment in stress energy and amorphization degree. Additionally, peak rate decrement occurred.

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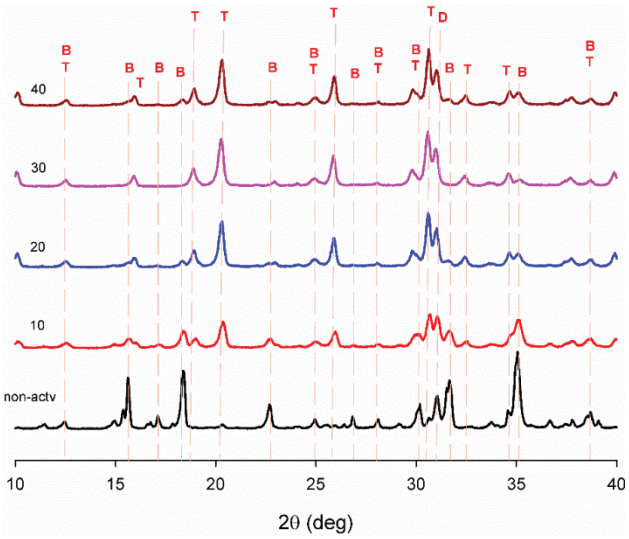

Figure 5. X-ray diffraction analysis of mechanically activated tincal at different ball-to-mass ratios.

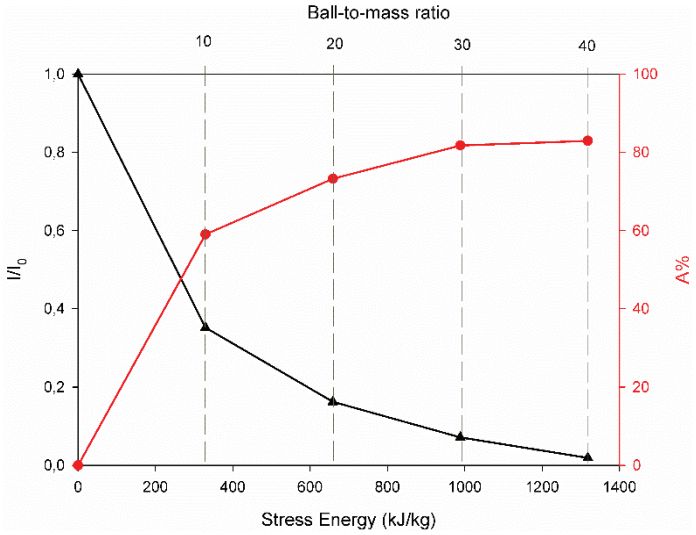

Figure 6. Stress Energy-I/I_0 and Stress Energy-%A dependance according to ball-to-mass ratio

When sample mass and amorphization degree considered together with regards to industrial application, higher ball-to-mass ratio like 30 and 40 not be logical for small variance in amorphization degree as shown in Figure 5 due to the less feed. Taking into consideration of this situation, ball-to-mass ratio was fixed at 20 for mechanical activation duration studies.

Role of mechanical activation duration was given in Figure 6. After 15 min, borax patterns lost substantially and tincalconite formation occurred. Prolonged mechanical activation time caused shifting and/or broadening of the peaks caused from mechanism of mechanical activation that base on motion of milling equipment and taken place impact on the particulate system. One of the effects of mechanical activation is released heat from the friction of the ball-sample-bowl at 600 rpm could be caused partial decomposition of tincalconite. It is stated that for a planetary mill, typical temperature is over 200°C and during milling two kinds of temperature are considered: local temperature pulses due to ball collisions and overall temperature in the vial (Baláž et al., 2013).

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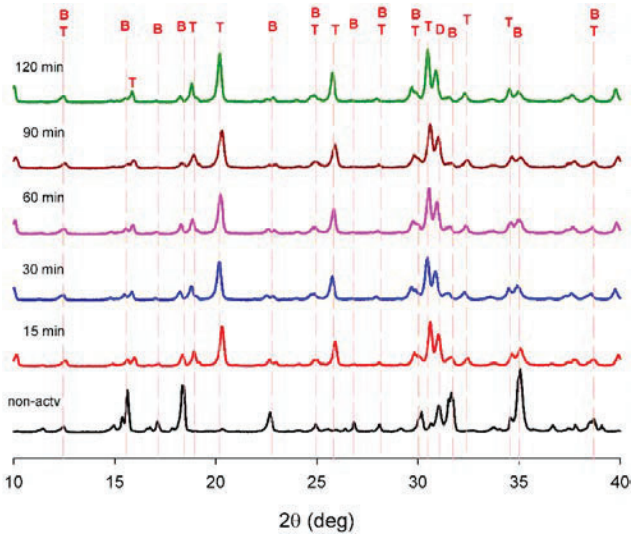

Figure 7. X-ray diffraction analysis of mechanically activated tincal for different durations.

Tromans and Meech (2001) stated that line broadening and disappearance of diffraction peaks that taken place on X-ray patterns after extended milling is a result of formation of meta-stable -amorphous phase- related with alteration of long-range lattice periodicity because of large number of dislocations and their related strain fields.

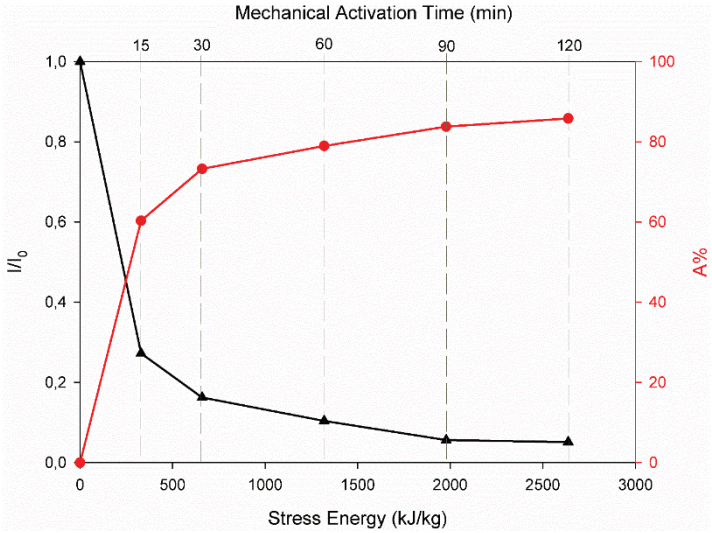

Figure 8. Stress Energy-I/I0 and Stress Energy-%A dependence according to ball-to-mass ratio

When Figure 7 was examined, it was understood that after 15 min mechanical activation duration, peak rate was drastically decreased with increased stress energy. More stress energy than provided stress energy about 360 kJ/kg by 15 min mechanical activation, formed little change in the intensity of the diffraction pattern and amorphization degree. This phenomenon means that both crystal structure and crystal size didn't affect from increased mechanical activation time anymore after 15 min.

FT-IR analysis of non-activated and activated for 15 and 60 min samples are given in Figure 8. The region of 2700-3700 cm^{-1} is attributed as hydroxyl stretching region (Ruan et al., 2002). 3344 cm^{-1}, 3498 cm^{-1} and 3576 cm^{-1} band centres were determined in this region. But for mechanical activated samples band centres were determined at 3008 cm^{-1}, 3348 cm^{-1} and 3502 cm^{-1}. 3576 cm^{-1} was absent for these samples.

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A shift of band centre to higher position means that strength of bonds is decreased. If the band shifts to a lower position it will result in tighter bonding. This region that indicates O-H stretching vibration is sensitive to dehydroxylation temperature. It was used for dehydroxylation of goethite by Ruan et al., (2002).

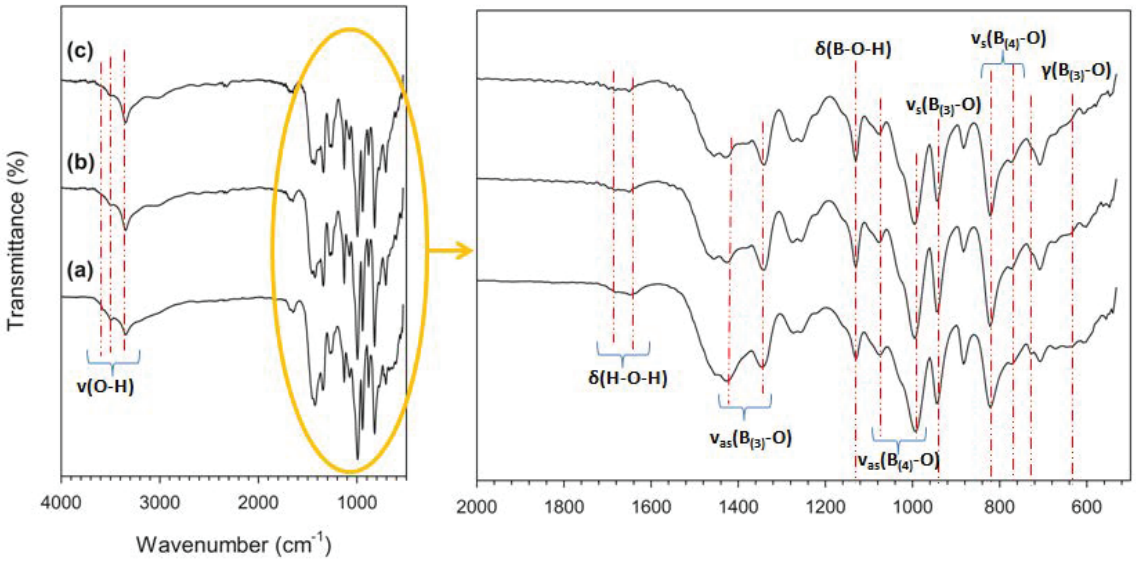

Figure 9. FT-IR analysis of a) non-activated and activated for b) 15 min and c) 60 min samples.

From these results, it can be said that with mechanical activation dehydroxylation was partially started but not completed because of existence of the characteristic band that differ in transmittance and broadness than the non-activated. The FT-IR analysis of ulexite that used for sodium borohydride production by Piskin (2009) had a band that found at 1625.84 cm^{-1} clarified as a free H_2O band. Yan et al. (2001) stated that sample at 70°C, the H-O-H bending mode exist at 1636 cm^{-1} and 1691 cm^{-1}. Like these studies, H-O-H bending mode was varied between 1578 cm^{-1} and 1691 cm^{-1} for different studies (Yan et al., 2001; Zhihong et al., 2003; Liu et al., 2006; Figen et al., 2010; Wang et al., 2010; Goel et al., 2013). Figen et al. (2010) and Wang et al. (2010) also stated that the H-O-H bending modes for their studies that found 1691-1649 cm^{-1} and 1662 cm^{-1} respectively, showed that the sample contains crystal water molecules. For tincal sample, this band was determined at 1647 cm^{-1} and 1681 cm^{-1}, and for activated sample they positioned at 1651 cm^{-1} and 1681 cm^{-1} that means mechanically activated samples still contain crystal water but not same strength of initial bond. In our FT-IR analysis wavenumber of the peaks are matching with data of Jun et al. (1995) for FT-IR of tetraborates. 730 cm^{-1} is clarified as in plane bending mode of CO_3 (Ji et al., 2009). As stated in the XRD results, tincal samples contain dolomite and this band confirms the presence of dolomite. But in mechanically activated samples this band couldn't determine.

DTA-TG analysis of the samples is given in Figure 9 and Figure 10 respectively. Tincal is an ore that starts losing its water at approximately 330K (Ekmekyapar et al., 1997). Non- activated and activated samples were compared in terms of physical water loss, peak temperatures of 70°C and 40°C were determined for non-activated and activated for 15 min samples. No related reaction at this temperature interval was determined for 60 min activated sample. Second and third endothermic reaction peak temperatures were determined at 115°C and 135°C for non-activated sample. This gradual decomposition trend turned into one step for 15 min mechanically activated sample at 140°C. 125°C and 135°C peak temperatures were determined for 60 min sample.

From the DTA analysis it was understood that for non-activated, activated for 15 and 60 min samples, tincalconite formation finished at 135°C. But the advantage of mechanical activation was confirmed as endothermic peaks area that is a describer of energy requirement of a reaction (Tunç et al., 2014).

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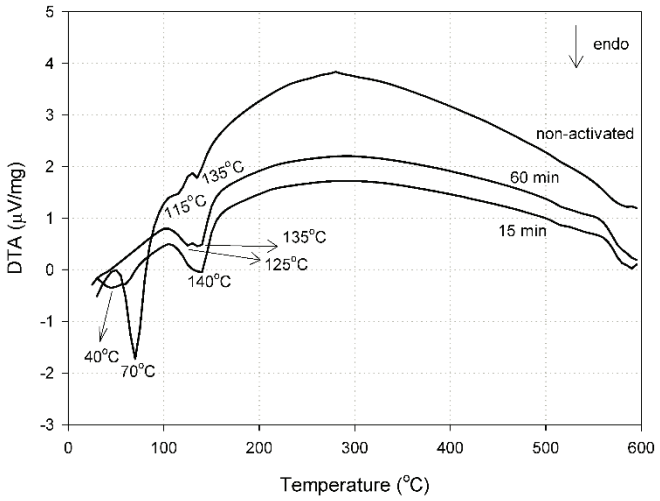

Figure 10. DTA analysis of non-activated and activated for 15 min and 60 min tincal.

When Figure 10 was examined it was understood that for non-activated sample, mass loss started as heating but for activated one, because of the physical water loss occurred during milling, decomposition started when reached at a certain temperature. When mass loss was investigated, this occurrent supported the heat occurrence during milling that cause elimination of water from the structure. Mass losses were calculated as 43%, %33 and %32 for non-activated, activated for 15 and 60 min activated samples. Form the XRD and DTA results it was understood that, decomposition of sample started in the milling process and TG results supported this phenomenon. Mass losses of the activated samples were less than the original one.

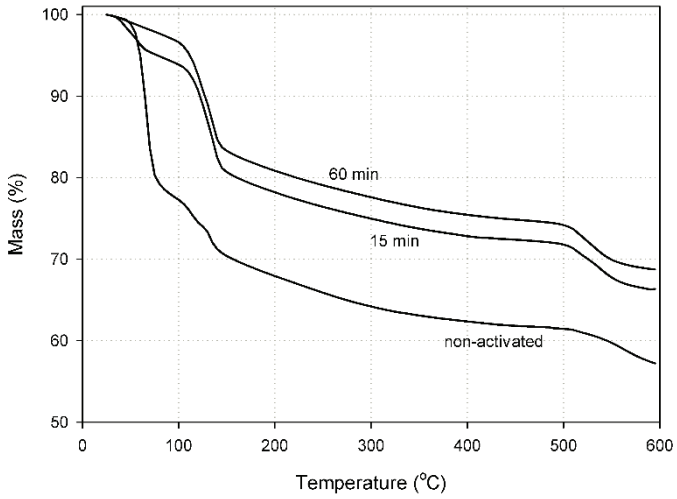

Figure 11. TG analysis of non-activated and activated for 15 min and 60 min tincal.

As determined from the XRD results, after 15 min mechanical activation, most of the diffraction peaks correspond to tincalconite and stress energy-I/I_0 graph showed that there was no need to excess energy input after 15 min to effect borax structure.

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Conclusion

Tincal that is the raw material of the borax production was mechanically activated for observing structural alterations and structural water behaviour. Speed of main disc, ball-to-mass ratio and duration were chosen as parameters for mechanical activation process. In hydrated minerals, excess water molecules may be a problem during storage, transportation and production of other related boron products in the meaning of energy consumption.

XRD results shows that original tincal sample consist of borax and dolomite crystals.

By increasing the speed of main disc because of the friction thereby occurred heat energy, borax was decomposed and tincalconite formation occurred.

For industrial application, higher ball-to-mass ratio like 30 and 40 not be logical for little variance in amorphization degree due to the less feed. Taking into consideration of this situation, ball-to-mass ratio was fixed at 20 for mechanical activation duration studies.

Mechanical activation duration studies showed that after 15 min mechanical activation procedure, crystal structure changes about 75% by means of amorphization. Provided heat during mechanical activation via milling media motion, impact and friction cause in situ phase transformation of borax decahydrate to borax pentahydrate (tincalconite). More stress energy than provided stress energy about 360 kJ/kg by 15 min mechanical activation formed little change in the intensity of the diffraction pattern. This phenomenon means that both crystal structure and crystal size didn't affect from increased mechanical activation time anymore after 15 min and DTA-TG results supported this finding.

Borax decahydrate to borax pentahydrate (tincalconite) transformation was supported by FT-IR analysis. Because of the two molecules of water as hydroxyl unit in the borate ion, hydroxyl stretching vibrations were still present but not positioned at the same wavenumber that means amorphization by mechanical activation in force about alteration of the structure via changing the bond strength.

So, it can be said that, by mechanical activation tincal structure was changed and water lost was achieved without having to heat treatment.

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EFFECTS OF MACROECONOMIC INDICATOR FLUCTUATIONS ON TURKISH SECTORS BEFORE AND AFTER THE FAILED COUP ATTEMPT

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Abstract: Like all financial markets, market sentiment towards Turkey is a significant aspect to individual investor's decisions. Understanding each industry's relation with macroeconomic indicators that is available publically plays crucial role in the market. Additionally, failed coup attempt is expected to have influence over such macroeconomic indicators in Turkey. The purpose of this study is to understand the effects of the macroeconomic indicators for distinctive sectors of Turkey and failed coup attempt's relation to these sectors. By finding which macroeconomic variables affects Turkish industries can help firms to utilize their resources accordingly. Also understanding what has changed after the failed coup attempt can help this utilization according to today's conditions.

This study pursued to find and compare the predictive macroeconomic variables of five different sectors in Turkey, as well as the before and after affects of the coup attempt to these sectors. Results indicate that country specific variable of market index has some affects over sectors. While, non-country specific variables have less or no predictive role over the sectors, this should be as a result of the limitation of the time period taken. Furthermore, failed coup attempt only revealed distinctive changes for airline sector. Hence, while there was no affect found to be result of the coup attempt to the sectors, ARIMA models revealed no distinctive differences between the sectors.

Keywords: Market Sentiment, Macroeconomic Indicators, Time Series Models

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ELEKTRİK MOTORLARINDA DALGACIK DÖNÜŞÜMÜ VE BULANIK MANTIK KULLANARAK ARIZA ANALİZİ YAPILMASI

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Abstract: Elektrik motorları, elektrik enerjisini hareket enerjisine dönüştüren makinelerdir. Temel olarak döner alanı oluşturan ve sabit duran bu stator ile bu döner alanı takip ederek moment üreten hareketli kısım rotordan meydana gelmektedir. Dönme esnasında bu hareketin düzgün olması ve sürtünmenin azaltılması için rulman ve yatak gibi ekipmanlar kullanılmaktadır. 1500 ile 3000 rpm arasında dönen bu aksamlar mekanik ömürleri sebebi ile beklenmedik zamanlarda arıza vermekte ve yapılmakta olan işlemin durmasına ve bu sebeple ciddi kayıplara yol açmaktadır. Arızanın oluşmaya başladığı andaki tespitin , elektrik motorunu çalıştırdığı sistemin devamlılığını sağlamak için oldukça önemlidir. Elektrik motoruna ek bir ekipman (örn. Sensör) bağlamadan sadece akım bilgisinde saklanan frekans spektrumlarına bakarak arızayı tespit etmek mümkün olabilir. Frekans analizinde kullanılan Foruier dönüşümünün sadece frekans bilgisini vermesi zaman hakkında herhangi bir bilgi vermemesi sinyal işlemede hızlı Foruier dönüşüm gibi farklı teknikleri geliştirme yolunu açmıştır. Durağan olmayan sinyallerin analizinde işaretin frekans ve zaman bilgilerini aynı anda elde etmek için dalgacık dönüşümü tekniği geliştirilmiştir.

Bu çalışmada; Elektrik motorlarında dalgacık dönüşümü ve bulanık mantık kullanılarak arıza analizinin tespiti yapılıp değerlendirilmiştir. Çalışma sonucunda Dalgacık dönüşümü ile elde edilen zamana bağlı frekans bilgileri bulanık mantık denetleyicisi ile daha önceden frekans bilgileri ile oluşturulmuş kural tablolarında değerlendirilmiştir. Bu sayede sistemde arıza olma ihtimali önceden tespit edilmiştir.

Keywords: Elektrik Motorları, Dalgacık Dönüşüm, Bulanık Mantık

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ENDÜSTRİ 4.0 VE TÜKETİM OLGUSU BAĞLAMINDA YENİ MEKÂN ANLAYIŞLARI

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Abstract: Toplumsal yaşamın gerekliliği sonucu insanoğlu, tarih boyunca bilgi ve deneyimlerini aktarmak, üretim ve ürün değiş tokuşu yapabilmek, gelenek ve göreneklerini sürdürebilmek, sanatsal ve kültürel faaliyetlerini gerçekleştirebilmek gibi eylemleri yerine getirebilmek için belirli mekânlarda toplanmayı temel bir gereksinim olarak görmüştür.

Söz konusu temel gereksinimin ana öznesi olan "mekân" ortaya çıkan kavramlar ve ihtiyaçlar doğrultusunda sürekli bir değişim ve dönüşüm içerisindedir. Bu kavramlar ve ihtiyaçlar arasında mekânı en çok etkileyen unsur kuşkusuz sanayi ve teknoloji alanlarında yaşanan gelişme ve ilerlemelerdir.

İnsanlık tarihi bugüne dek üç sanayi devrimi geçirmiştir. Konunun uzmanları günümüz için Endüstri 4.0 adıyla dördüncü sanayi devriminden söz etmektedir. Geçtiğimiz yüzyıllarda yaşanan sanayi devrimlerinin kent, mekân ve tasarım üzerine çeşitli etkileri olmuştur. Endüstri 4.0'ın tüketim olgusunu "mekansızlaşma" ve "insansızlaşma" kavramları çerçevesinde evrileceği beklenmektedir. Endüstri 4.0. diğer sanayi devrimlerinden farklı olarak siber fiziksel sistemlere dayalı üretimin devreye girdiği sistemler ile insansız ve internete bağlı robotlar aracılığıyla işleyen seri üretim bantlarının kurulmasını hedeflemektedir. Endüstri 4.0'ın bu hedefinin pek çok mekanın yok olmasına neden olacağı ön görülmektedir.

Bu çalışmanın amacı mekansızlaşma kavramının nasıl ortadan kaldırılabileceğine ilişkin önermeler sunmaktır. Bu kapsamda öncelikle ilk üç sanayi devrimi, özellikleri, pozitif ve negatif yönleri ile ele alınarak kent, mekân ve tasarım üzerindeki etkilerine değinilecektir. Ardından Endüstri 4.0, özellikleri, pozitif ve negatif yönleri ile ele alınarak mekan kavramının sürdürülebilirliği için önermelerde bulunulacak, yeni mekan anlayışları üzerinde durulacaktır.

Keywords: Endüstri 4.0, Sanayi Devrimi, Tüketim Olgusu, Mekan, Tasarım

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ENDÜSTRİYEL TESİSLERDE KULLANILAN YAPI MALZEMELERİNİN YANGIN DAYANIMLARININ YARATTIĞI SORUNLAR

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Yangın, geri dönüşümü olmayan hasarlar yaratan bir kimyasal olaydır. Yangında açığa çıka yüksek ısı ve yanıcı maddenin yapısına bağlı olarak oluşan yanma ürünü gazlar binalarda yapı malzemelerini fiziksel ve kimyasal olarak etkiler. Bu nedenle tüm yapı malzemeleri dayanımlarını kaybeder.

Binalar inşaa edilirken malzeme seçiminde yapılan hatalar, ilerde olası yangın olaylarında maddi ve manevi kayıpların artmasına neden olmaktadır. Ülkemizde yaşanmış ve bizzat tarafımdan incelenmiş binalarının yangın sonrası durumları bu çalışmada yer almaktadır. Verilen örneklerde hatalar irdelenmiştir.

Bina projeleri hazırlanırken yangın risk analizlerinin de yapılması gereklidir. Oysa gözardı edilen bu husus, yangın sonrası tüm binanın kullanılmaz hale gelmesini sağlamaktadır. Bu nedenle bina güvenliği için etkili yapı malzemeleri önerileri örneklerle belirtilmiştir.

Keywords: Yangın

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EPIDEMIOLOGY OF BRUCELLOSIS IN SHEEP AND GOATS IN THE IRAQI KURDISTAN REGION.

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Abstract: Brucellosis is an infectious zoonotic bacterial disease of worldwide importance. A cross-sectional serological study was undertaken in the Kurdistan Region to better understand the epidemiology of brucellosis in this region. A total of 694 sheep and 356 goats were sampled and tested with the Rose Bengal test. The seroprevalence in sheep (7.4%; 95% CI 5.5 - 9.6%) (OR 1.94; 95% CI 1.1 – 3.6) was significantly higher than that in goats (3.9%; 95% CI 2.2 - 6.5%). The highest seroprevalence among sheep (8.1%) was in Erbil province and the lowest in Dohuk province (4.9%). Among goats the highest seroprevalence (7.1%) was in Sulaymani province, and no seropositive goats were detected in Kirkuk and Dohuk provinces. The RBT seroprevalence in female sheep (6.5%; 95% CI 4.4 – 9.1%) was similar to that of males (9.3%; 95% CI 5.8 - 14.0%) (OR 0.67; 95% CI 0.38 – 1.21). The seroprevalence in female goats (4.7%; 95% CI 2.5 – 7.9%) was also similar to that of male goats (1.3%; 95% CI 0.0 – 6.9%) (OR 3.78; 95% CI 0.49 – 29.33).

Keywords: Epidemiology of Brucellosis, Sheep and Goats, Iraqi Kurdistan Region.

Introduction.

Brucellosis is a zoonotic disease of livestock which is endemic in many countries of the world (Stites *et al*., 1987). The disease is caused by infection with bacteria belonging to the genus *Brucella* and has been recognized as a zoonotic disease since the discovery of *Brucella melitensis* in 1887 (Kaye and Petersdorf 1987). Transmission of *Brucella* occurs by contact with infected animals or their materials and disease in humans is always linked to disease in animals, predominantly livestock (Nicoletti, 1989). Brucellosis in animals results in significant economic losses because of abortions, reduced milk production, decreased reproduction rate and premature births (Pappas *et al*., 2006).

Although brucellosis has a worldwide geographical distribution, it particularly remains an important public health problem in the Mediterranean Region, North and East Africa, the Middle East, Southern and Central Asia, India, Central and South America (Faye *et al*., 2005). Infection of sheep with *B. melitensis* is endemic in the Mediterranean region, particularly along the eastern and northern shores. It is found through Central Asia, south to the Arabian Peninsula and as far as Mongolia and in India and Africa (European Commission, 2001). Although the main sources of infection are sheep, goats and their products, *B. melitensis* has emerged as an important problem in cattle in Saudi Arabia, Kuwait, some Southern European countries and Israel (First International Conferences on Emerging Zoonoses, 1997).

Materials and Methods

The Kurdistan Region is located in the north of Iraq and there are approximately 2.6 million sheep and 1.2 million goats in the Region (KRG, 2012), and these are mainly located in the villages, sub-districts and districts of the region. Field sampling was carried out from March 2015 to May 2015 throughout the Iraqi Kurdistan Region, and a two sampling plan was adopted. The first sampling plan was adopted in Sulaymani and Dohuk Provinces using a multi-stage sampling protocol. Six districts were randomly selected from Sulaymani Province and two from Dohuk Province for sampling. Within each selected district one sub-district was randomly selected. Two villages

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were then randomly selected from each selected sub-district and within each village five farmers were randomly selected from those available. Finally five animals (sheep and/or goats) were randomly selected from the selected farmers. Therefore in total 300 blood samples (216 sheep and 84 goats) were randomly collected (6 districts × 1 sub-district × 2 villages × 5 farmers × 5 animals = 300 samples) from Sulaymani Province and 100 blood samples (82 sheep and 18 goats) were randomly collected from Dohuk Province (2 districts × 1 sub-district × 2 villages × 5 farmers × 5 animals = 100 samples). The number of sheep and goats sampled in the provinces was in proportion to the number of animals in that province. In Erbil and Kirkuk Provinces, blood samples were collected from sheep and goats by cooperating with the Veterinary Medical Centers (VMC) in these provinces. In Erbil Province there are 27 VMC, and 18 of these randomly collected 25 blood samples (sheep and goats) from each VMC (total 450 blood samples - 236 sheep and 214 goats). In Kirkuk Province 8 VMC collected 25 samples each for a total of 200 blood samples (160 sheep and 40 goats).

Overall a total of 694 blood samples were collected from sheep and 356 samples from goats in the four sampled provinces (Erbil, Sulaymani, Kirkuk and Dohuk). Five ml of blood was collected from the jugular vein directly into vacutainer tubes from each of the selected animals. Samples were then transported to the laboratories in the four provinces (Erbil, Sulaymani, Kirkuk and Dohuk) where they were centrifuged at 4000 rpm for 5 minutes and the sera separated and stored in Eppendorf Tubes prior to testing. All samples were tested within 24 hours of collection with the Rose Bengal Test (RBT) at room temperature as per the manufacturer's recommendations.

Using average values from the research of Blasco *et al*. (1994), EFSA-Q, (2006) and Rahman *et al*., (2013) the sensitivity and specificity of the RBT was estimated at 87.9 and 99.8%, respectively. These values were used to work out the real prevalence from the test prevalence.

Results

Of the 1050 animals sampled the overall seroprevalence was 6.2% (95% CI 4.8% - 7.8%). The seroprevalence in sheep based on the RBT (7.4%; 95% CI 5.5 - 9.6%) was significantly higher than that in goats (3.9%; 95% CI 2.2 - 6.5%) (OR 1.94; 95% CI 1.1 – 3.6). The overall real prevalence was estimated at (6.8%; 95% CI 4.8 – 7.8%) (Table 1).

Table 1: Seroprevalence to brucellosis based on the Rose Bengal Test in sheep and goats.

Species	**Total number tested**	**Number positive on RBT**	**Seroprevalence (95% CI)**	**Real Prevalence (95% CI)**	**Odds ratio (95% CI)**
Sheep	694	51	7.4% (5.5 - 9.6)	8.2% (6.3 – 10.5)	1.94 (1.1 – 3.6)
Goats	356	14	3.9% (2.2 - 6.5)	4.2% (2.4 – 6.8)	1.0
Total	1050	65	6.2% (4.8 - 7.8)	6.8% (4.8 – 7.8)	-

There was no significant difference in the seroprevalence in sheep between provinces based on the RBT. Similar observations were found for goats (Table 2). The seroprevalence was highest in sheep from Erbil (8.1%) and lowest in Dohuk (4.9%). In contrast for goats the seroprevalence was highest in Sulaymani (7.1%), and no seropositive goats were detected in both Kirkuk and Dohuk.

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Table 2: Seroprevalence of brucellosis in sheep and goats originating from different provinces sampled in Kurdistan based on the RBT.

Species	Province	Total number of samples	Number RBT +ve	Prevalence (95% CI)	Odds ratio (95% CI)
Sheep	Sulaymani	216	17	7.9% (4.7 - 12.3)	0.98 (0.49 – 1.93)
	Kirkuk	160	11	6.9% (3.5 - 12.0)	0.84 (0.39 – 1.82)
	Dohuk	82	4	4.9% (1.4 - 12.1)	0.59 (0.19 – 1.78)
	Erbil	236	19	8.1% (5.0 - 12.3)	1.00
Goats	Sulaymani	84	6	7.1% (2.7 - 14.9)	1.98 (0.67 – 5.89)
	Kirkuk	40	0	0.00% (0.0 - 8.8)	-
	Dohuk	18	0	0.00% (0.0 - 18.5)	-
	Erbil	214	8	3.7% (1.6 - 7.2)	1.00

Table 3: Seroprevalence of brucellosis based on the RBT in male and female in sheep and goats.

Species	Sex	Total	RBT +ve	Serorevalence (95% CI)	Odds ratio (95% CI)
Sheep	Female	479	31	6.5% (4.4 – 9.1)	0.67 (0.38 – 1.21)
	Male	215	20	9.3% (5.8 – 14.0)	1.0
Goats	Female	278	13	4.7% (2.5 - 7.9)	3.78 (0.49 – 29.33)
	Male	78	1	1.3% (0.0 - 6.9)	1.0
Total	Female	757	44	5.8% (4.2 - 7.7)	0.8 (0.47 – 1.37)
	Male	293	21	7.2% (4.5 - 10.8)	1.0

The seroprevalence in female sheep (6.5%; 95% CI 4.4 – 9.1) was similar to that of males (9.3%; 95% CI 5.8 - 14.0%) (OR 0.67; 95% CI 0.38 – 1.21), also the seroprevalence in female goats (4.7%; 95% CI 2.5 – 7.9) was similar to that of male goats (1.3%; 95% CI 0.0 – 6.9) (OR 3.78; 95% CI 0.49 – 29.33) (Table 3).

Discussion

In this study overall 6.2% of animals were classified as seropositive. This was lower than that previously reported (14.5%) in Sulaymani (Jabary and Al-Samarraee, 2015) in unvaccinated herds and that reported by Al-Naqshabendy *et al.,* (2014) (39.1%) in non-vaccinated ewes in Dohuk. The differences in these two surveys may be the result of ongoing control programs through mass vaccination in the surveyed regions (Ministry of Agriculture and Water Resources, 2017). In the current study the seroprevalence in sheep (7.4%) was significantly higher than that in goats (3.9%). This difference is unexpected given the similar traditional husbandry practices of

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handling both species. Others have reported a higher seroprevalence in sheep than goats (Arslan *et al.,* 2011, Shareef, 2006) (23.6 and 10.6%, respectively).

Although recently other studies have been conducted on brucellosis in the same area as the current study, those studies included only a few districts and, similar to the current study, did report a significant difference in the seroprevalence between sheep and goats (Jabary and Al-Samarraee, 2015). In this study there was no significant difference in the animal-level seroprevalence between provinces. This was not surprising as the management and husbandry systems adopted are similar between provinces. Surprisingly no seropositive goats were found in Kirkuk and Dohuk Provinces. This could be due to the sample size, as the number of sheep and goats sampled in Erbil and Sulaymani provinces was larger than that for Kirkuk and Dohuk (overall the probability of detecting at least one seropositive goat was one positive to 25 goats sampled).

The seroprevalence in males and females (for both sheep and goats) was also similar in the current study. This finding was also expected because of the similar management practices males and females are subjected to. These findings concur with those previously obtained by Jabary and Al-Samarraee, (2015) who reported a prevalence of 14.3 and 15.1% in females and males, respectively and the study of Al-Hankawe and Rhaymah (2012) who reported a prevalence of 16.1 and 15.2% in females and males, respectively. Differences in seroprevalences between studies can arise from: the sample size; the tests used and the method of interpreting seropositivity ie in series or in parallel; the study location and the associated management and husbandry practices adopted within these locations; and the control methods, such as biosecurity measures and vaccination, adopted.

There are numerous reasons why brucellosis remains endemic in Iraq and Kurdistan Region. These include the uncontrolled movements of livestock flocks and herds particularly given the endemic status of brucellosis in surrounding countries, limited veterinary support services, the geopolitical situation, political instability, and husbandry practices which favor the spread of infection.

An efficient surveillance system is key to any successful control program, and should include regional and national surveillance, vaccination to increase the proportion of protective population, and strong collaboration between the veterinary and public health sectors. Critical to disease control is good management and husbandry practices, particularly associated with the introduction of animals, isolation/quarantine of animals which abort and the presence of wildlife which can act as reservoirs for the disease. Control or elimination of these factors will reduce the potential for disease transmission in an area. It is recommended that a vaccination program against brucellosis be implemented in Kurdistan and educational activities be implemented to improve awareness of the disease by livestock owners in the region.

Conclusions

Although brucellosis is close to being or has been eradicated from a number of developed countries, it continues to be a major animal and public health problem in many regions and countries of the world. From the results of this study it can be concluded that brucellosis is endemic in Iraqi Kurdistan Region and poses an important zoonotic risk to the human community.

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EVALUATING USER SATISFACTION IN STUDENT APARTMENTS BASED ON COMFORT CONDITIONS: BURSA / GORUKLE EXAMPLE

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Abstract: Without doubt one of the most important problems for students that start their university education in a city different than the city of their families is "residence". Many students that enroll in universities in Turkey prefer to live in state dormitories, private dormitories or student apartments. Apartments are places that continuously provide residences to students. The goal of this study is to determine the important apartment criteria for students and to provide suggestions that may provide solutions to ensure that these types of buildings provide the necessary performance conditions. It is also aimed to determine dissatisfaction based on user views and based on these views to create design criteria for buildings to be constructed. A hypothesis, which states that increasing structural comfort conditions in apartments will increase the productivity of students, is also put forward. In the scope of this study a survey was made in four student apartments located in the Gorukle District, which is near the exit of the Uludag University Gorukle Campus in Bursa, the 4th largest city in Turkey. The stages of this study are literature research on the subject of this analysis, evaluation of information on indoor comfort conditions, determining comfort conditions and preparing a survey to receive feedback on the experience of users in the designed environment, and evaluating the survey results to understand users' current satisfaction levels and comfort needs. Based on these data, transportation and security, ergonomics, thermal comfort, audial comfort, natural and artificial lighting, indoor air quality were used as evaluation criteria as a means to ensure optimum comfort conditions are met in buildings.

Keywords: Comfort conditions, student apartments, thermal comfort, audial comfort

INTRODUCTION

Quality of life is considered as a person's view towards his/her own life, and is used synonymously with terms such as satisfaction from life, well-being, living conditions, and happiness (Cella, 1996). According to World Health Organization, physical functions of people, their psychological status, social relations in and outside the families, their interaction with the environment and their beliefs are also in the scope of the quality of life. Satisfaction from life is an indicator of general well-being and quality of life and includes the decision of a person regarding his/her quality of life and well-being based on the qualities that person has selected (Sahin, 1997). Satisfaction from life in general involves the whole life and various dimensions of life of a person and is influenced from many factors such as age, gender, health, professional life, economic status, educational level, religion, marriage, social support and environmental conditions (Matheny & Curlette & Aysan, & Harrington, 2002).Satisfaction from life is important for university students similar to all age groups. In Turkey most of the students enroll to a university in a city different than the city they used to live with their families. In general, the first and one of the most important problems in university life experienced by students is related to accommodation (Ersoy & Arpacı 2003).

Accommodation is one of the most important necessities for providing and sustaining the feeling of security. In Turkey accommodation, in addition to student dormitories within universities or private dormitories, is provided via student apartments that are close to campuses. When the needs and arrangements of these buildings are considered it can be seen that privacy conditions should be considered with a higher priority. When these buildings fail to adequately provide the needs of students, student apartment turn to become places where students only go for sleeping. The inability to fully satisfy the individual and social needs of students reduces students' satisfaction levels and reduces their quality of life. This also reduces students' motivation for success. Institutions of higher education are places where knowledge is generated and shared. The ability to carry out high quality research and

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provision of a comprehensive education does not only rely on the academic environment but also the environment created by the physical and social surroundings. When it is evaluated from such a viewpoint, the environment of the accommodation facilities for higher education students that enable necessary climatic, acoustic and visual comfort conditions for studying and that provide the infrastructure for social interaction will support the creation of a higher quality education environment.

In this regard, student apartments inside the Gorukle district of the city of Bursa (Turkey), which is where Bursa Uludag University Gorukle Campus is located, were selected as the study field. The research method is composed of the following stages:

- Carrying out research on literature related to the subject area to be analyzed and review of relevant information and knowledge related to indoor comfort requirements,
- Determining comfort conditions and preparing a survey to receive feedback from user experience in the designed environment,
- Evaluation of the survey results to understand comfort needs and the current level of satisfaction of users.

The evaluation criteria were examined under the following headings to ensure that the buildings met the optimum comfort conditions: ● Transportation and safety ● Ergonomics ● Thermal comfort ● Auditory comfort ● Natural and artificial lighting ● Indoor air quality

Determining the level of actual user satisfaction is a widely used method to increase the efficiency of current building and to provide directions for future building designs. Accordingly, the reference "Post-Occupancy Indoor Environmental Quality Evaluation of Student Housing Facilities" states the benefits of Post Occupancy Evaluation (POE) as follows;

- To rapidly understand problems and solutions in buildings,
- To increase feedback related to building performance and space usage,
- Creating important cost savings during construction and building lifecycle
- Creating long term improvements in building performance
- Creating a knowledge resource for improving databases, standards and criteria (Hassanain, M. A. 2007).

In order to evaluate the experiences of users related to their living space usage, a "user satisfaction survey" was prepared and the results were analyzed.

FIELD STUDY

The area selected for the field study is Gorukle district, which is 18 kilometers from Bursa city center, the 4th largest city in Turkey, and near the Uludag University Gorukle Campus (Image 1). Students in the campus can reach this district on foot and they are also able to use private cars, public and private busses. Student apartments in average have rooms that can accommodate 1, 2, 3, and 4 persons, are usually furnished and have kitchen and bathrooms. There are also apartments that have services such as laundry, private security, breakfast, dinner, social areas, cafés etc. Apartments are usually close to the university campus.

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Image 1. Uludag University Campus and Gorukle (Google Earth, 2017)

The apartments selected for this study are defined below.

APARTMENT A: This apartment was completed and has a total of 62 beds. The building is 1 block and has a ground floor and 4 storeys. There are 3 apartments in the ground floor and 8 apartments each in upper floors, which makes a total of 35 apartments. All the apartments have one living room and one bedroom. A section of the ground floor is allocated to commercial units, kitchen for personnel and a pressing room (Image 2).



Image 2. *Apartment A, view from inside and outside*

APARTMENT B: This 1 block building was constructed in 2006 and has a ground floor and 3 storeys. There are a total of 30 apartments in the building. 12 of those apartments face the front façade, 12 face the rear façade and 6 face the side façade. All the apartments have one living room and one bedroom and the total bed count is 50. There is a kitchen for personnel and a pressing room (Image 3).

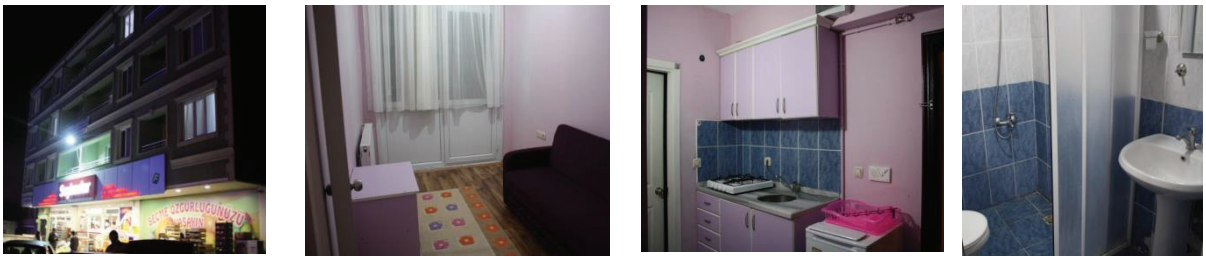

Image 3. *Apartment B, view from inside and outside*

APARTMENT C: This 3 block building was constructed in 2007 and has a ground floor and 4 storeys. The apartments are situated around a corridor which is illuminated with an atrium. The building blocks have a total of 149 apartments. 103 of those apartments have one living room and a bedroom and 46 of them have two living rooms and a bedroom (Image 4).

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Image 4. *Apartment C, view from inside and outside*

APARTMENT D: These buildings were constructed in 1998. There are four blocks, two for females and two for males. All blocks have a ground floor and 4 storeys. There are a total of 108 apartments. 21 of them have a bedroom and two rooms and 87 of them have one bedroom and one room. There are a total of 129 beds in these apartments (Image 5).



Image 5. *Apartment D, view from inside and outside*

The survey was conducted in October 2016 in daytime between 12.00 and 16.00. Within the literature analysis first key concepts to measure physical environment quality were defined and then 17 questions were asked to the building inhabitants. The closed ended questions were evaluated with a three point Likert Scale. The survey was carried out with a total of 120 students (30 students in each building) and were presented proportionally (%) to ensure they could be understood and evaluated easily.

RESEARCH FINDINGS

Table 1 shows the demographics of inhabitants of each building that participated to the survey. The demographic findings based on the survey shows that 66% of the participating students were female and 34% of the participants were male. It was seen that %55 of the participants of the survey were aged 21-25, 24% were 18-20, 21% were 25 and over. 88% of the participants of the survey were students and 12% were employees.

Table 1. *Demographics*

Demographics (%)		Apartment A	Apartment B	Apartment C	Apartment D
Gender	Female	100	67	42	53
	Male	0	33	58	47
Age	18-20	5	33	24	35
	21-25	57	40	62	61
	25 and over	38	27	14	4
Status	Student	100	71	82	100
	Employee	0	29	18	0

67% of the apartments are 1+1, 31% are 2+1 and 2% are 3+1. 51% of the inhabitants live alone in the apartments, whereas 34% have 2, 11% have 3 and 4% have 4 inhabitants. Specifications of the apartments where the survey was conducted are given in Table 2.

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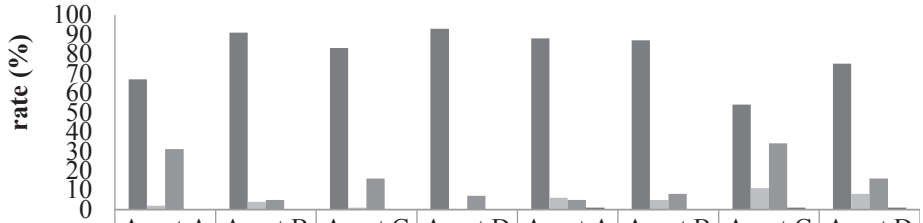
Table 2. *Specifications of apartment where surveys were conducted*

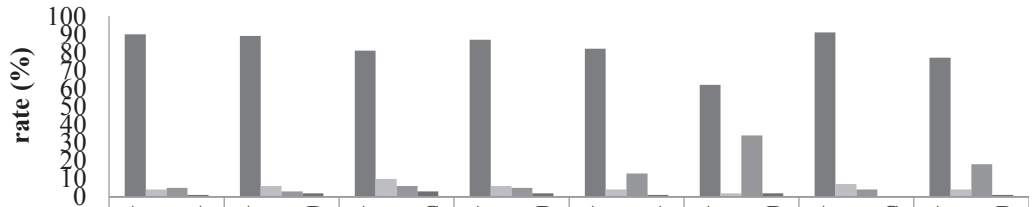
Features of the Apartment (%)		Apartment A	Apartment B	Apartment C	Apartment D
Apartment type	1+1	100	79	26	62
	2+1	0	21	74	28
	3+1	0	0	0	10
Number of inhabitants in the apartment	1 person	100	41	39	24
	2 people	0	45	53	39
	3 people	0	14	8	23
	4 people	0	0	0	14

In the survey, access to the building and safety concepts were taken into consideration as "Accessibility" criteria (Figure 1). Storey height inside the apartments and the size of windows are considered as “Ergonomics" criteria (Figure 2).



	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	transportation				safety			
satisfied	67	91	83	93	88	87	54	75
neither satisfied nor dissatisfied	2	4	1	0	6	5	11	8
dissatisfied	31	5	16	7	5	8	34	16
can't choose	0	0	0	0	1	0	1	1

Figure 1. *User opinions related to accessibility*



	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	indoor storey height				window size			
memnun	90	89	81	87	82	62	91	77
ne memnun ne değil	4	6	10	6	4	2	7	4
memnun değil	5	3	6	5	13	34	4	18
fikri yok	1	2	3	2	1	2	0	1

Figure 2. *User opinions related to size*

For the physical environmental control and "Thermal Comfort" aspects, opinions were gathered related to indoor temperature both in winter and summer (Figure 3). Thermal comfort is defined by The American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Standard 55 as satisfaction from the thermal conditions. Optimum thermal environments are defined as environments in which 80% or more of their users agree that the environment is acceptable.

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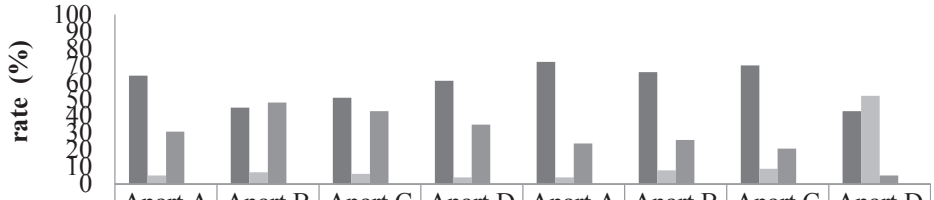
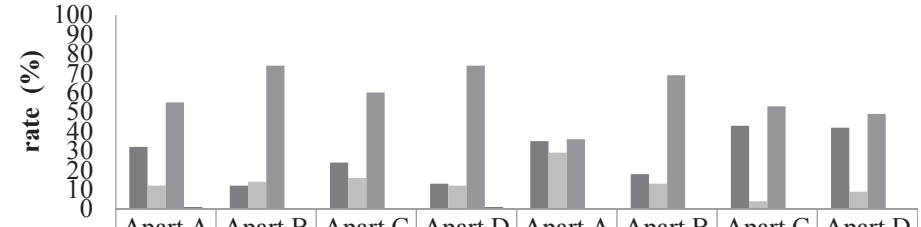


	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	summer-indoor temperature				winter-indoor temperture			
satisfied	64	45	51	61	72	66	70	43
neither satisfied nor dissatisfied	5	7	6	4	4	8	9	52
dissatisfied	31	48	43	35	24	26	21	5
can't choose	0	0	0	0	0	0	0	0

Figure 3. *User opinions related to thermal comfort*

In the study sound transfer between rooms and storeys and noise coming from outside were taken into consideration as "Acoustic Comfort" (Figure 4). Navai and Veitch define acoustic comfort as «a state of contentment with acoustic conditions». Acoustic comfort does not only involve "creating a good acoustic environment" but also defining all factors that "prevent acoustic comfort".



	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	sound transfer between living spaces				noise from outside			
satisfied	32	12	24	13	35	18	43	42
neither satisfied nor dissatisfied	12	14	16	12	29	13	4	9
dissatisfied	55	74	60	74	36	69	53	49
can't choose	1	0	0	1	0	0	0	0

Figure 4. *User opinions related to acoustic comfort*

As the criteria for "Visual Comfort" the adequacy of natural light and the condition of artificial lighting were examined (Figure 5). Visual comfort is defined as a "subjective condition stimulated by the visual surroundings". This definition takes into consideration the psychologic dimension of comfort and includes physical features that effect visual comfort. Visual comfort parameters are amount of natural light, distribution of brightness, amount of glare, color of light, amount of flickering light and the level of luminousness. Visual comfort quality is defined as the quality and quantity of the light source and how it brightens its close surroundings.

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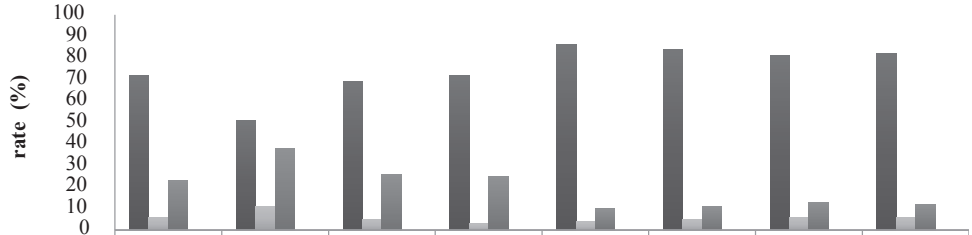
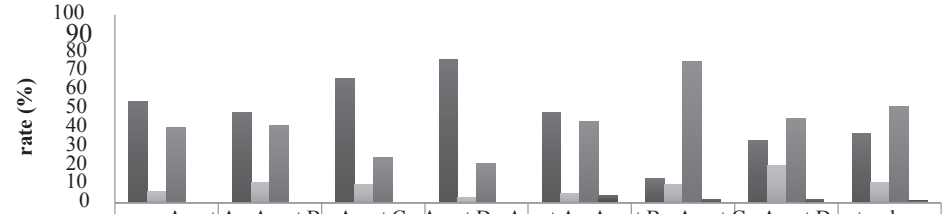


satisfied	72	51	69	72	86	84	81	82
neither satisfied nor dissatisfied	6	11	5	3	4	5	6	6
dissatisfied								
can't choose	23	38	26	25	10	11	13	12
	0	0	0	0	0	0	0	0

Figure 5. *User opinions related to visual comfort*

Related to "Indoor Air Quality", the conditions of natural ventilation, satisfaction from indoor air quality were taken into consideration (Figure 6). Indoor air quality is defined based on the dissatisfaction (odor, sensual discomfort) of inhabitants. According to ASHRAE Standard 1999-62 indoor air quality is achieved when there are no harmful air pollutant concentrations and most of the users (80%) feel satisfied from an environment.



satisfied	54	48	66	76	48	13	33	37
neither satisfied nor dissatisfied	6	11	10	3	5	10	20	11
dissatisfied								
can't choose	40	41	24	21	43	75	45	51
	0	0	0	0	4	2	2	1

Figure 6. *User opinions related to indoor air quality*

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RESULT

In the scope of the study, it is very important to define the issues that users are dissatisfied to establish design criteria for future buildings and to establish main goals for future designs. In this regard, the results of the study are summarized in the table below (Table 3).

Table 3. *Comparative satisfaction levels of users*

Satisfaction Criteria		Apartment A		Apartment B		Apartment C		Apartment D	
		Satisfied	Not Satisfied	Satisfied	Not Satisfied	Satisfied	Not Satisfied	Satisfied	Not Satisfied
Accessibility	Transportation	36		86		67		86	
	Safety	83		79		20		59	
Ergonomics	Indoor storey height	85		86		75		82	
	Windows size	69		28		87		59	
Thermal comfort	Summer-indoor temperature	33			**-3**	8		26	
	Winter-indoor temperature	48		40		49		38	
Acoustic comfort	Sound transfer between living spaces		**-23**		**-62**		**-36**		**-61**
	Noise from outside		**-1**		**-51**		**-10**		**-7**
Visual comfort	Natural lighting	49		13		43		47	
	Artificial lighting	76		73		68		70	
Indoor air quality	Natural ventilation	14		7		42		55	
	Indoor air quality	5			**-62**		**-12**		**-14**

● **Accessibility:** In the accessibility indicator related to the apartment that the users inhabited only 15% and 16% have indicated dissatisfaction with transportation and safety respectively. In general, it has been understood that inhabitants were very content with transportation and safety.

● **Ergonomics:** the performance criterion in this category was whether stores height and window size were sufficient. 5% of the users expressed discontent with inadequate storey height and 17% of the users expressed that they did not believe window sizes were ergonomic. In general, the satisfaction levels of this category were very high.

● **Thermal comfort:** Users participated in the survey expresses discontent with the indoor air temperature during summers (39%) and during winters (19%). In general users were satisfied with thermal conditions.

● **Acoustic comfort:** 66% of the users indicated dissatisfaction because of the high level of sound transfer between living spaces and 52% of the users indicated that they felt discontent because of outside noise reaching inside. These views indicate that users were dissatisfied from the acoustic comfort aspect.

● **Visual comfort:** In the survey, which has taken adequacy of daylight and comfortable usage of artificial lighting inside the apartments as a performance criterion, only 28% of the users indicated that they found natural lighting insufficient and 12% of the users indicated that they found artificial lighting insufficient. In general users were satisfied with visual comfort conditions.

● **Indoor air quality:** the performance criterion under this category was related to the conditions of natural ventilation and indoor air quality. Only 32% of the users indicated that natural ventilation was inadequate; the dissatisfaction from indoor air quality was 54%. Even though there wasn't dissatisfaction with natural ventilation, the users were dissatisfied with the indoor air quality.

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When the students were asked to present general positive features of the apartment, they answered with "a good design example", "meets climatic, visual and acoustic comfort conditions". "I like its location in the city", and "transportation is easy". When negative aspects were asked, the participants provided the following answers "I believe the structural quality is subpar", "I believe relations with neighbors are inadequate", "I believe there are many shortcomings of the architectural design", "I am dissatisfied with the noise", "I cannot heat the building enough", "I gets very hot in summers", and "I feel the living space in the apartment is inadequate".

When open ended questions on which architectural changes were needed to create optimum comfort conditions were asked the following answers were provided: heat insulation should be installed for thermal comfort; special joineries should be used in window and door frames and cases that provide sound insulation; providing high quality artificial lighting and lighting systems that do not strain eyes when students work at their desks; installing sunshades at the south façade of the building both for thermal and visual comfort; and installing air conditioning systems to provide optimum air quality.

When the students were asked to comment on the apartments from a social viewpoint they indicated that the amount of space per person in the sports hall, mess hall, guest house and social areas, and landscaping were inadequate. Also, the students were discontent with circulation areas and the lack of fire escape. However, being close to other friends was expressed as a positive aspect.

The data collected in this study will provide new dimensions to future buildings to be designed and will help those who will make architectural adjustments to current buildings.

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EXAMINING THE ACCEPTABILITY OF DESTINATION LOCAL FOOD BY DOMESTIC TOURIST VISITING NORTHERN NIGERIA

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Abstract: There are challenges faced by tourist in respect to choosing food while in tourism destination. Food is very important in the choice of holiday of tourist. Many tourists choose a destination not only because of physical attraction but they choose destination where they will not encounter challenges in respect to food. The study is aimed at examining the acceptability of northern delicacies by tourists from other parts of Nigeria. Six delicacies were produced and presented to 50 tourists who are randomly picked from the south-east, south-west, south-south and the middle belt of Nigeria. The study found out that Danwake, Masa, and Kwadon zogale were generally accepted by majority of the respondents. Although, the respondents were not comfortable with the appearance of danwake, other aspect in the checklist was accepted. Tuwon shinkafa miyan taushe was accepted in terms of appearance but rejected in terms of taste and texture. 'Yar Tsame and dindikolo were generally rejected. The study recommended that caterers, attraction owners and hoteliers in northern Nigeria should include the accepted meals in their menu so that tourist will enjoy the gastronomy of the northern part of the country.

Keywords: Food, Tourist, Nigeria

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EXPERIMENTAL INVESTIGATION OF USING ANIMAL FAT BASED BIODIESEL-DIESEL BLENDS IN A DIESEL ENGINE

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Abstract: The goal of this study is to investigate the utilization of waste animal fats as fuel in a diesel engine. Because of higher viscosity and density of waste animal fats, it is not suitable for use them purely as diesel engine fuel. For that reason, in this study fish fat biodiesel (FFB) and chicken fat biodiesel (CFB) were produced by transesterification method from waste fish fat and waste chicken fat. Then, standard diesel fuel (SDF) and two types of fuel blends called as FFB50 and CFB50 obtained by blending the FFB and CFB with the standard diesel fuel (SDF) with a ratio of 50% on volume basis. After that, SDF, FFB50, and CFB50 were used as fuel in a single-cylinder, four stroke, direct injection and air-cooled diesel engine and the effects of fuels on engine performance and exhaust emissions have been comparatively investigated with SDF. Engine tests showed that performance losses and an increase in NOx emissions were experienced with the animal fat based fuel blends operation. It is calculated that the average powers that decreased for FFB50 and CFB50 were 3.10% and 4.61% respectively. The mean torque values for FFB50 and CFB50 were 1.27% and 2.04% lower than that of SDF. Also, mean break specific fuel consumptions (BSFC) increased up to 2.06% and 4.59% for the FFB50 and CFB50 compared to SDF fuel, respectively. Furthermore, it is determined that FFB50 and CFB50 operation results in less HC and CO emissions than SDF operation.

Keywords: Engine performance, exhaust emissions, waste fish fat, waste chicken fat, biodiesel.

Introduction

The demand for energy is increasing day by day with economic developments, rapid urbanization, and population increase. In today's energy are provided by alternative energy or fossil-based sources. Because of increasingly reduction of fossil-based sources and their negative effects on the environment, the importance of biodiesel which is known as an alternative energy source for diesel engines has become more apparent. Biodiesel can be produced from edible oils and non-edible oils. The production of the biodiesel from edible oils increases the cost of biodiesel. Hence, it should be used the non-edible oils for biodiesel production. The most appropriate raw materials for biodiesel production are waste oils/fats which are harmful to the environment and human health (Alptekin and Canakci, 2011; Behçet, 2011; Behçet, 2015). In Turkey, every year millions of tons of different type waste oil are composed. On average, 375-400 thousand tons waste vegetable oil consists per year in Turkey (Istanbul Metropolitan Municipality Environmental Protection Directorate Report, 2011). On the other hand, the amount of animal fat as waste into the environment is not at the level of an underestimate. Approximately 11,000 tons fish fat occurs as a by-product at fish meal and oil factories at Black Sea region of Turkey (Behçet, 2011). In addition, as an average of the last three years, the annual amount of generated waste chicken fat is approximately 64,000 tons (Alptekin and Çanakcı, 2011). A way to reduce their harmful effects on the environment is to re-evaluate these oils/fats. To reduce the negative effects on the environment, the best method for re-evaluating the waste fats/oils is to convert to biodiesel and use as a fuel in internal combustion engines (Behçet, 2015). The usage of waste oils/fats in biodiesel production also prevents their hazardous effects on the environment and human health (Sanli et al., 2014). Moreover, biodiesel derived from waste oils/fats is an important alternative fuel for the countries depends on foreign sources such as Turkey.

In order to decrease the price of biodiesel, the non-edible oils and fats which are renewable as well as easily available can be used in biodiesel production as potential low-priced sources (Saydut et al., 2010). Therefore, producing biodiesel from different kinds of resources, such as vegetable and animal oils, and other waste oils gains importance.

In recent years, several studies about the production of biodiesel from different type waste oils and utilization as

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fuel in diesel engines of them have been performed. Tashtoush et al. (2004) investigated the interaction between temperature and time of conversion of waste animal fat into biodiesel. They determined that the most suitable reaction temperature is 50℃, and the best duration is two hours for conversion of waste animal fat into biodiesel. Encinar et al. (2011) indicated that animal fats which are characterized by high free fatty acids suitable for the production of biodiesel raw materials and they produced methyl esters from three types of animal fats according to EN14214 standards by both acidic and basic catalyst transesterification method. Marulanda et .al (2010) studied on supercritical transesterification of chicken fat in order to produce biodiesel from low-priced raw materials. Study of Hoque et al. (2011) are related to producing of methyl esters from three different kinds of waste oils by transesterification method. Ganapathy et al. (2009) studied analytically and experimentally performance of a single cylinder diesel engine fueled with biodiesel produced from inedible jatropha oil. Taymaz and Coban (2013) investigated performance and emissions testing on a single cylinder diesel engine fuelled with methyl ester from waste animal fats. They reported that because of the higher amount of oxygen of biodiesel, while thermal efficiency gets higher, HC and CO emissions in the exhaust get lower compared to diesel fuel. To assess the waste fats/oils Lin and Li (2009) produced the fish fat using mixed species of marine fish wastes (skin, tail, bones, etc.) and then the oil is converted into biodiesel by transesterification method. In addition, using the waste cooking oil as the same method biodiesel is produced and fuel properties are analyzed. To determine the emission values of fuels, produced biofuels are used as a fuel in an internal combustion engine and the effects of these fuels on exhaust emissions were investigated. In their study, the emission characteristics of waste cooking oil and marine fish biodiesel were compared with standard diesel fuel. It was found that compared with ASTM No. 2D diesel, both marine fish oil and waste cooking oil biodiesel appeared to have a lower gross heating value, cetane number, exhaust gas temperature and CO emission and a higher fuel consumption rate and oxygen content. To investigate the effects on engine performance and emissions of the degree of unsaturation of biodiesel fuels consisting of fish oil and vegetable oil-based methyl esters was performed an experimental study by Altun (2014). Experimental results showed that biodiesel fuels resulted in lower emissions of carbon monoxide, and smoke opacity, with some increase in emissions of unburned hydrocarbons. But it was also found that there was no significant effect of the degree of unsaturation on the engine performance while the effect on emissions was clear.

Although, a lot of studies were made about reutilizing waste cooking oil, studies about reutilizing waste animal fats are limited in Turkey. In this study, FFB and CFB, which are based waste animal fats, were produced from waste fish fat and waste chicken fat in order to eliminate harmful effects of waste oils on the environment by reusing them. Biodiesel from animal fats was produced using methanol, sulphuric acid and sodium hydroxide in a two stage process. Characteristics of the methyl esters and SDF such as density, flash point, cetane number and lower heating value were determined. Exhaust emissions such as carbon monoxide, hydrocarbon, and nitrogen oxide were measured during experiments by exhaust emission test device. Performance parameters such as brake power, engine torque and brake specific fuel consumption were evaluated based on the experimental data collected from the test setup during the experiments. The results obtained from the tests of animal fats biodiesel-diesel fuel blends were compared with those of petroleum base diesel fuel.

Experimental equipment and test procedure

For biodiesel production, 99.50% purity of methyl alcohol (CH_3OH) and sodium hydroxide (NaOH) as a catalyst, sulphuric acid (H_2SO_4) and as a raw material two types of fats which are waste anchovy fish fat and waste chicken fat were used. Anchovy fish fat was obtained from Sursan fish meal and oil factory and waste chicken fat used in the production of CFB was provided from Banvit poultry in Balıkesir (Bandırma) province in Turkey. Diesel fuel was purchased from a commercial supplier. Anchovy fish fat biodiesel and chicken fat biodiesel were blended by the ratio of 50% with petroleum diesel fuel on volume basis to yield biodiesel-diesel fuel blends that are FFB50 and CFB50.

Some fuel properties of FFB, CFB and SDF are given in Table 1, in which they are listed with the specifications of EN 14214. The properties of fuels used in the experiments have been determined by fuel analysis laboratory of Chemistry Department of Faculty of Arts and Sciences at Dicle University and Batman TUPRAS fuel analysis laboratory. Engine performance and emissions tests were performed in Diesel Engine Laboratory of Batman University. Schematic view of experimental test apparatus is shown in Fig. 1. Technical specifications of the test engine and exhaust gas analyzer are given in Table 2 and Table 3, respectively. Test engine was loaded with a hydraulic dynamometer. After the engine was started, the engine temperature reached the regime temperature using standard diesel fuel (STD) where the experiments were based on 1000 and 2500 rpm in the range of 500 rpm intervals at full load. Then, instead of diesel fuel, FFB50 and CFB50 were sent to the engine separately, and experiments were repeated in the same way.

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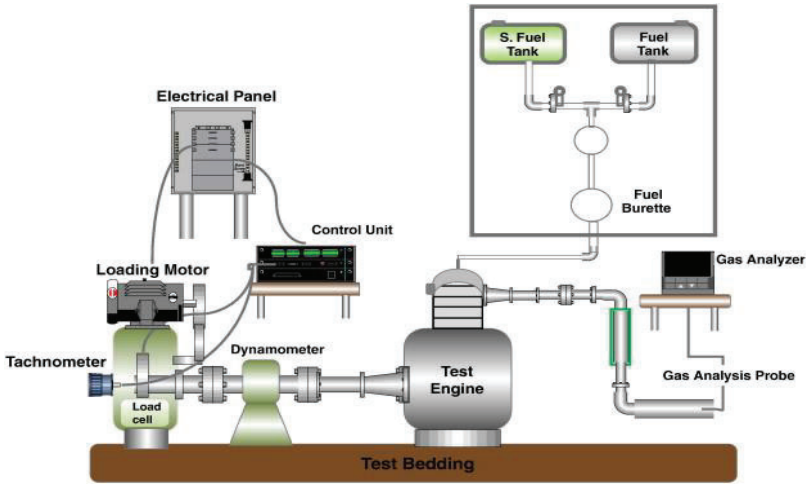

Figure 1. Schematic view of experimental apparatus

Table 1: Some Fuel Properties of the Test Fuels

Properties	EN 14214	FFB	CFB	STD
Density at 15 °C, [g/cm^3]	0.86-0.9	0.881	0.876	0.843
Kinematic viscosity at 40°C, [mm^2/s]	3.50-5.0	4.451	4.35	3.66
Flash point, [°C]	>101	155	176	60
Pour point [°C]	-	-4	3	-15
Lower heating value [kJ/kg]	-	40546	39934	43356
Cetane number	-	52.4	54.8	52

Table 2: Test Engine Specification

	Specifications
Number of cylinders	1
Cylinder diameter/ Stroke [mm]	86/70
Compression ratio	18:1
Maximum power [kW]	7.5
Injection type	Direct injection

Table 3: Specification Exhaust Gas Analyzer

Emissions	Measuring Range	Precision
CO	0-15% vol.	0.001%
CO_2	0-20% vol.	0.001%
HC	0-10000ppm	1 ppm
O_2	0-21.7%vol.	0.01%

Results and Discussion

In Figure 2 torque curves of the test engine for SDF, FFB50 and CFB50 operation are displayed. As seen in the figure that the torque curves of the engine are similar for all the test fuels. FFB50 and CFB50 result in less torque output than SDF at all engine speed because of lower energy content for biodiesel fuels. The corresponding maximum torque values for SDF, FFB and CFB are obtained as 35.73, 35.38 and 35.10 Nm, respectively at 2000 rpm. At high engine speeds, torque values for test fuels were decreased due to an increase in mechanical friction and a decrease in volumetric efficiency in nature.

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Figure 3 demonstrates that the change of engine power for test fuels. When the engine speed is increased, engine power for the test fuels also increases and maximum power is obtained at an engine speed of 2500 rpm by using SDF fuel. It can be considered that the higher heating value of the diesel fuel leads to the higher engine power output than the other test fuels. On average, the engine power values are determined as 4.99, 4.84 and 4.79 kW for diesel, FFB50 and CFB50, respectively. It was determined that engine power of FFB50 and CFB50 are 3.01% and 4.01% less than those diesel fuel, averagely. But, this decline is limited because the density of the biodiesel fuels is higher than SDF fuel. Due to using high-density fuel, more fuel attends to combustion and as a result, more engine power is supplied (Aydin and Bayindir, 2010). Also, in real driving conditions it is not easy for drivers to perceive power losses for blend fuels (Xue et al.,2011).

In Figure 4, break specific fuel consumptions (BSFC) of the test engine for SDF, FFB50 and CFB50 operation are given with respect to engine speed. When the figure was examined, brake specific fuel consumption of the engine increased with using of FFB50 and CFB50 fuels. While the lowest BSFC values have been obtained for diesel fuel, the highest BSFC values of the test engine were obtained for CFB50, at all engine speeds. Compared to SDF, the mean BSFC of the engine fuelled with FFB50 and CFB50 increased 2.06% and 4.59%, respectively. The reasons for BSFC increase with biodiesel fuels operation is considered to be the lower heating values of biodiesel. In addition, the high density and viscosity of biodiesel fuels may result in an increase in the BSFC values for blend fuels. Minimum BSFC values for SDF, FFB50 and CFB50 were determined as 310.20, 321.18 and 333.60 g/kW-h at 2000 rpm.

The exhaust gas temperature (EGT) indicates the effective use of the heat energy of fuel combustion. It was observed that the exhaust gas temperature was reasonably higher for FFB50 and CFB50 when compared to diesel fuel as depicted in Figure 5. This may be due to more fuel being burnt at higher loads to meet the power requirement and higher oxygen content of the biodiesel which sustains the combustion in the late of expansion stroke and thus may increase the exhaust gas temperature. At the same time, because of higher density and kinematic viscosity of biodiesels than petroleum diesel fuel, mixture formation in cylinder deteriorate for fuel blends operation and it may result in incomplete and prolonged combustion and results in a higher exhaust gas temperature. Mean exhaust temperature was determined as 153 ºC, 163 ºC and 169ºC for SDF, FFB50 and CFB50 operation, respectively. These EGTs are very low when compared to a diesel engine exhaust gas temperature. The reasons for low exhaust temperatures for this study depends on measuring technique for EGT. Because of the lack of equipment to measure EGT directly, in the experimental process, the exhaust gas temperatures were measured by a laser thermometer on the exhaust muffler surface.

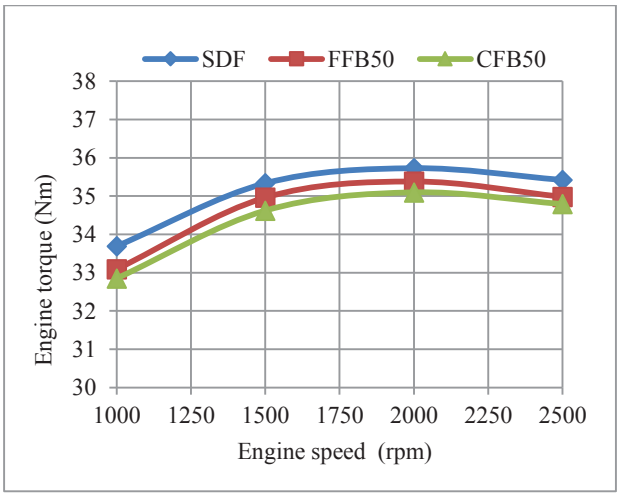

Figure 2. The engine torque as a function of engine speed for test fuels

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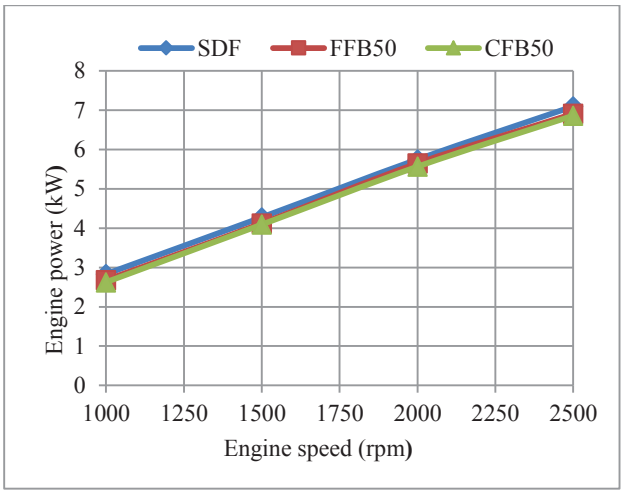

Figure 3. The engine power changes in test fuels

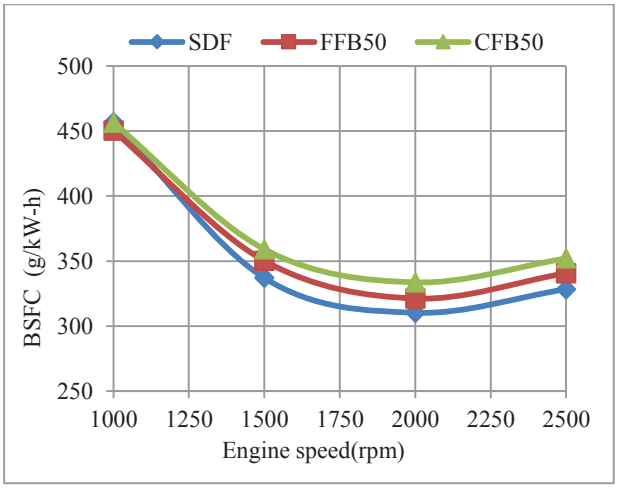

Figure 4. The BSFC as a function of engine speed for test fuels

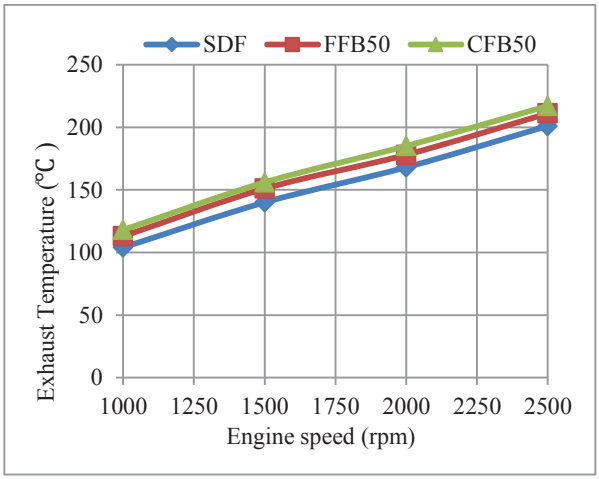

Figure 5. Exhaust gas temperature as a function of engine speed for test fuels

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CO emissions in internal combustion engines occur due to incomplete combustion. This condition is called incomplete combustion in which reasons such as low air-fuel ratio, fuel properties, bad spray characteristics, low temperature and lack of sufficient time for conversion CO_2 can cause an increase in CO emission (Behçet, 2011; Ozsezen et al., 2009). Figure 6 illustrates the variation of CO emissions of the test fuels with different engine speeds. When the FFB50 and CFB50 were used in the engine, lower CO emission was exhausted than that of the diesel fuel at all engine speeds. Although, the CO emissions for all the fuels are high at low engine speeds, the amount of CO declines sharply when the speed is over 1500 rpm. At low engine speeds, the low temperature in the cylinder may result in more CO emissions. Because biodiesel fuels have oxygen content, the combustion process becomes more complete for fuel blends. Therefore, the CO emissions decreased for FFB50 and CFB50 usage (Aydin and Bayindir, 2010). Average CO emission for standard diesel fuel, FFB50 and CFB50 were determined as 0.88, 0.82, 0.77% (in volume), respectively.

In Figure 7, HC emissions for FFB50, CFB50 and SDF fuels are shown with respect to the engine speed at full load. It is indicated in the figure that the unburned HC emissions resulting from the burning of FFB50 and CFB50 were lower than that of diesel fuel. When HC emissions of FFB50 and CFB50 were compared with SDF fuel, the amount of reduction in mean HC emissions was found to be 7.96% and 14.11%, respectively. In fact this reduction can represent the saved fuel energy, because of HC emissions are loss chemical energy (Behçet et al., 2015). The main reasons of reduction in HC emission for FFB50 and CFB50 operation can be oxygen content of biodiesel fuels result in more oxidation in the rich mixture zones. There has been a reduction in HC emission for all test fuels with increasing engine speed. As long as the speed increases, air movements, cylinder pressure, temperature increases, too (Behçet, 2015; Sanli et al., 2014). Therefore, less HC emissions are emitted from the engine at high engine speeds.

Figure 8 shows the change of NOx emissions for SDF, FFB50 and CFB50 operation. As seen in the figure maximum NOx emissions are emitted from the exhaust at 2000 rpm for all test fuel operation. It is known that formation of NOx depends on air-fuel ratio, combustion temperature and reaction time. Therefore, it can be said that high combustion temperature and oxygen concentration result in more NOx emissions at 2000 rpm. NOx emission for FFB50 and CFB50 are higher than SDF operation at all engine speed. The reasons for higher NOx emissions for FFB50 and CFB50 can be oxygen content of the biodiesel. Also, high viscosity, high density and lower compressibility of biodiesel may result in more NOx emission by advancing the start of injection timing (Canakcı and Ozsezen, 2011). As NOx emissions of FFB50 and CFB50 were compared with SDF the amount of increase in mean NOx emissions was calculated to be 23.48% and 13.72%, respectively.

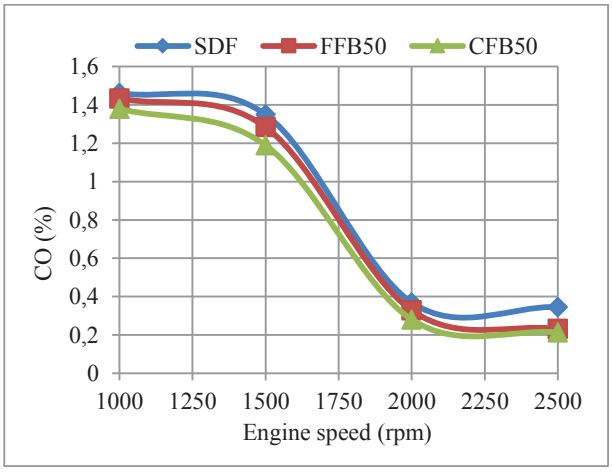

Figure 6. CO emissions as a function of engine speed for test fuels

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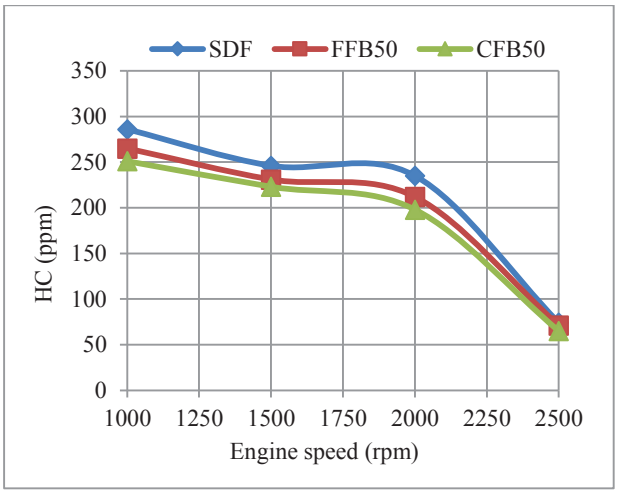

Figure 7. HC emissions as a function of engine speed for test fuels

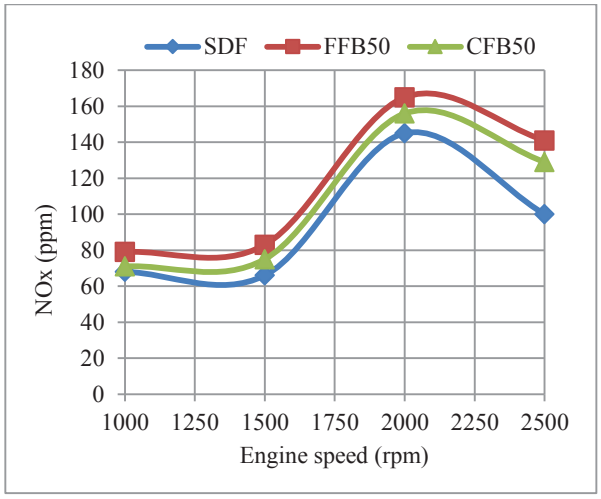

Figure 8. NOx emissions as a function of engine speed for test fuels

Conclusion

In this experimental study, the effects of FFB50 and CFB50 on engine performance and exhaust emissions at full load and four different engine speeds were investigated. The main conclusions of this study can be summarized as follows:

- Engine power and engine torque for the FFB50 and CFB50 operation was lower than that of diesel. The average powers that decreased for FFB50 and CFB50 were 3.01% and 4.01% respectively. The mean torque values for FFB50 and CFB50 are 1.27% and 2.04% lower than that of SDF. Also, mean BSFC increased up to 2.06% and 4.59% for the FFB50 and CFB50 compared to SDF fuel, respectively.
- By using the FFB50 and CFB50, it was observed that less CO and HC emissions were emitted from the exhaust but blend fuels result in higher NOx emissions than SDF fuel. The mean NOx emissions of FFB50 and CFB50 were found 23.48% and 13.72% higher than that of diesel fuel.
- Since FFB50 and CFB50 are originated (%50 on volume base) from waste animal fats, the hazardous effect of waste fats on the environment and human health can be reduced. Because of the energy recovered from the feedback of waste, the production of biodiesel from waste oils can be seen as an environmentally friendly and economically process.
- For future researches, the production process of biodiesel from waste animal fats can be optimized in order to obtain high-quality biodiesel and more experimental studies should be conducted at different loads and engine speeds which represent real operating conditions.

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Exploring the Relationship between Job Satisfaction and Turnover Intention among Employees in Hospitality Industry: The Moderating Role of Gender

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Abstract: This study explores the moderating role of gender on job satisfaction and turnover intention, focusing on employees in the hospitality industry. Job satisfaction has become one of the most widely studied topics in research, mainly because of its importance to employees' psychological condition, which in turn affects customer satisfaction and organizational effectiveness. Job related dissatisfaction can cause employee-turnover intention at the workplace. Previous research has consistently shown that job satisfaction is negatively associated with employee-turnover intention. However, little research has been conducted on the potential moderating effects of one or more socio-demographic variables on this relationship. The present study proposed to extend the findings of the previous research by exploring the moderating effect of gender on the relationship between job satisfaction and employee-turnover intention. Using individual employees in tourism and food industry as the unit of analysis, the conceptual framework can be used to analyse the moderate effect of the gender on the relationship between job satisfaction and turnover intention in the hospitality industry.

Keywords: Turnover Intention, Job Satisfaction, Gender, Hospitality Industry.

Introduction

Organizations nowadays in Turkey are facing extremely severe complex competition and uncertainty due to continuous and rapidly changing technology in the marketplace arising from globalization (Shipley, 1994; Sohi, 1996; Prager, 2003; Jones et al., 2000, 2005, 2007). In the current global competitive environment, the hospitality industry is selective as regards areas to concentrate on providing excellent service quality and making customer satisfaction. This will ensure the players in the tourism sector a steady stream of successful loyal customers which are essential for their survival and achievement. Loyal employees should make loyal customers (Reichheld, 1996). Regardless of the carrying out of management goals, frontline hotel employees are challenged with several issues related with insufficient coaching and improvement possibilities, low pay, excessive workloads, and unsocial work hours (Babin and Boles, 1998; Karatepe and Sokmen, 2006; Kim *et al.,* 2009). Based on concise reviews, this study explores the moderate role of gender, its relationship with job satisfaction, and the effect of this relationship on the turnover intention of employees in an organization.

Literature Review

Job Satisfaction and Employee's Turnover Intention

Job satisfaction has been defined as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976, p. 1300). The job satisfaction is a concept prevailed by the emotional aspect and it generally emerges according to the extent to which the job meets the expectations of the employees (Luthans, 1995). Gill (2008) stated that employees in the hospitality industry loaded with high level of trust will have higher levels of job satisfaction. Job satisfaction ultimately affects several other variables such as turnover intentions. Turnover is defined as the movement of people in and out of employment within an organization (Rahman *et al.*,

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2010). Price and Mueller (1981) stated that job satisfaction has an indirect influence on profitability via its direct control over intent to leave.

Potential Role of Gender as a Moderator Variable

Although employee turnover intention may take part by men and women, prior research demonstrates gender differences in employee-turnover intention (e.g., Lyness & Judiesch, 2001; Russ & McNeilly, 1995). Social role theory hypothesizes that men and women tend to behave differently in exhibiting turnover intention (Eagly, 1987). Consistent with this theory, research suggests that women were more likely to leave their job than their men counterparts (Johnsrud & Heck, 1994; Zhou & Volkwein, 2004). The proposed conceptual framework has shown in Figure 1depicts the relationship between job satisfaction and employee-turnover intention, as well as the potential moderating role of gender on this relationship.

Theoretical Framework

There are several social theories that our study will be based on. These theories are foundation of the researches to postulate the relationship between job satisfaction and turnover intention.

Job Satisfaction Theories

Job satisfaction as one of the most extensively concerned and researched dimension in business environment (Indermun & SaheedBayat, 2013). It is essentially a measurement of an individual emotional feeling shaped as response from a job (Weiss, 2002). Locke (1976) defined job satisfaction as a pleasurable emotional state formed by job experiences and become one of the most widely used definitions.

Two-Factor Theory (Hygiene Theory) of Job Satisfaction

Frederick Herzberg's motivation-hygiene theory, developed in 1959, which is also known as the two-factor theory or hygiene theory, depicts two different factors; namely, hygiene factors and motivator factors. These are stated as the primary causes of job dissatisfaction and job satisfaction.

Turnover Intention Theories

Turnover behaviour is a multilevel process that comprises attitudinal, decisional and behavioural dimensions. Studies (e.g. Fox & Fallon, 2003; Hom & Hulin, 1981; Mobley, 1982; Mobley, Horner & Hollingsworth, 1978; Newman, 1974; Shields & Ward, 2001; Tett & Meyer, 1993) have successfully demonstrated that behavioural turnover intentions are regularly seen with moderate to strong correlations with turnover, validating the view of Ajzen (1991).

Method

Design and Participants

The study was in the form of a questionnaire study. The sample groups were the frontline employees in tourism and food industry.

Instruments

In order to measure the job satisfaction of the participants, Agho, Price and Müller (1992) 6-item Job Satisfaction Scale (JSS) was applied. Regarding the measure of the employee-turnover intention, the Intention to Leave Scale consisting of 3 items was used based on the definition by Bluedorn (1982).

Conceptual Research Framework and Hypotheses

The objective of this study is to investigate the moderate role of the gender on the job satisfaction and turnover intention of the hospitality front line staff. Based on the variables described in previews sections and related theories and existing empirical studies (Blau, 1964; Carol & Richard, 2001; Eagly, 1987; Jiang et al., 2012;; Nadiri & Tanova, 2010; Tett & Meyer, 1993; Tschopp, Grote, & Gerber, 2014), a conceptual framework was developed in below (Figure. 1) and the related hypotheses proposed are presented.

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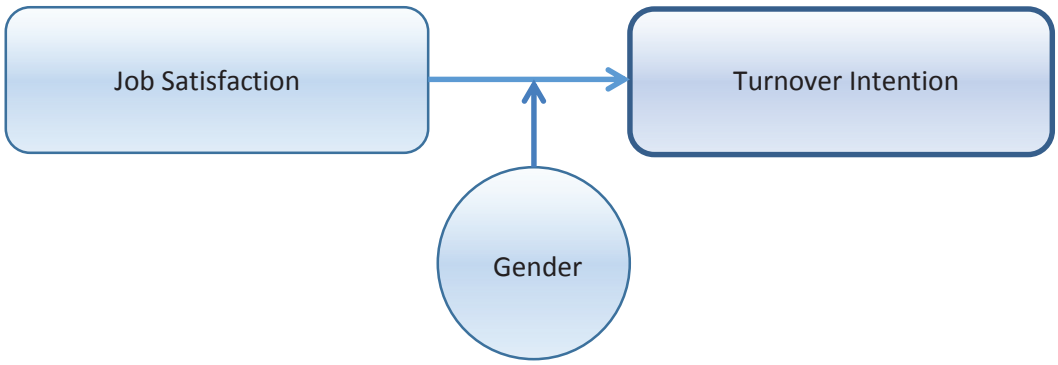

Figure 1. Conceptual Research Framework

The framework can be used to study the moderate impact of the gender on the relationship between job satisfaction construct and turnover intention on the hospitality industry. The unit of analysis for the study is the individual employees in the tourism and food industry. The hypotheses based on this goal enumerated as follows:

H_1: There is a significant relationship between job satisfaction and turnover intention of front line employees of the hospitality industry and job satisfaction relates negatively to employee-turnover.

H_2: Gender will moderate the positive relationship between job satisfaction and employee-turnover intention, such that the relationship is stronger for women than for men.

Analysis

The questionnaire form was distributed to **525** front line employees in tourism and food industry, of which 362 returned their responses. The **SPSS 21** package software was utilized and the compiled data were analyzed and interpreted in line with the determined objectives by using the descriptive statics and employing various statistical analyses (Correlation Analysis and T-Test).

Results and Discussion

368 out of 565 distributed questionnaire forms were returned by the respondents in hospitality industry. Within the scope of the study conducted, 6 of the questionnaire forms were not included in the current *analysis* due to the fact they are incomplete or incorrect. In this respect, data obtained from a total of 362 employees were analyzed. The study indicates that there is a significant and negative correlation between the job satisfaction and the turnover intention. Negative correlation between the job satisfaction and the turnover intention is consistent with the finding of Mobley et al., 1978; Price and Mueller, 1981; Shore and Martin, 1989; Aryee and Wyatt, 1991; Hellman, 1997; Chan and Morrison, 2000; Ghiselli et al., 2001; McBey and Karakowsky, 2001, Muchinsky, 1993; Sharpnack and Funsten, 1999; Wong, 1995.

Table 3. The influence of job satisfaction to turnover intention

Model		Non-Standardized Coefficient		Standardized Coefficient	t	p
		B	Standard Error	β		
1	(Fix)	5,837	0,18		32,390	0,000
	Job Satisfaction	- 0,75	0,05	-0,60	-14,357	0,000
Dependent Variable: Turnover Intention; R^2=0,36; S.E=0,79; F=206,123; p=0,001						

As shown in Table 3, the influence of the job satisfaction as an independent variable on the turnover intention is statistically significant and negative (standardize beta: -0,60; p<0,001). The job satisfaction indicates the 36 % of the variation over the turnover intention. According to the simple linear regression analysis, it has been determined that job satisfaction has negative significant influence on the turnover intention and then the Hypothesis **H_1** was supported. The results of t-test provided which was performed to examine whether gender variable has any

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significant influence on the job satisfaction as well as the turnover intention. In accordance with the results of Levene tests, it is observed that the variances in job satisfaction (p= 0,864>0, 05) and turnover intention (p= 0,744>0, 05) are equal. The results indicated that gender moderates the relationship between two constructs and then the Hypothesis **H_2** was also supported.

Conclusions

Prior research has consistently demonstrated that job satisfaction relates negatively with employee-turnover intention across different research context. The present study verifies and extends the findings of the prior research by exploring the moderating effect of gender on the relationship between job satisfaction and employee-turnover intention. It then provides an evidence base for the impact of moderating role on the relationship between job satisfaction and employee turnover intention. Implementing this framework will benefit studies conducted on hospitality industry management to review the impact of gender differences, and its moderating effect on job satisfaction and turnover intention. In light of the results described above it is important to conduct future research that examines if gender is a moderating variable of voluntary turnover and of the relationship between job satisfaction and voluntary turnover. Despite this limitation, this study had demonstrated the relationships of job satisfaction and turnover intention of hospitality industry employees in Turkey and the moderating role of gender on the relationships. The contribution of this study is that it has been able to conduct a cross cultural replication of western findings in a developing country.

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EXPLORING THE STUDENTS' PERCEPTIONS ON BUSINESS ENGLISH COURSE / GAZANFER BILGE VOCATIONAL TRAINING SCHOOL EXAMPLE

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Abstract: This research is aiming to obtain necessary information regarding the perception of the students who enrolled the course of Business English, whether it differs in terms of their gender, high school type, department, living place and having been in abroad before or no, thinking about work in abroad in the future or no, at the Kocaeli University's one of the vocational training schools, Gazanfer Bilge vocational training school in the 3 departments of, business administration, public relations and Office management. For collecting data Personal Demographic info form and 5 points likert scale, designed according to Geiger and Ogilby's (2000) have been used. Sum of 136 students have been questioned. For Statistical analyses, SPSS 16 has been used. Cronbach alpha value was 0.755 thus acceptable. Even though students find Business English course difficult, this subject is useful and will help them do well in their career .Also they are agree that, this course will help them to get acquainted and establishing communication with foreign cultures and understanding the World better. One of the 2 interesting results of research are: only 10 % of the responders have been abroad before and 58,1 % answered no to the question of if they want to work in a foreign country in the future.

Keywords: Business English course, Geiger&Ogilby perception scale, demographic differences scale.

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EXTRACTION OF CUSTOMER DEMOGRAPHIC CHARACTERISTICS IN SUPERMARKETS BASED ON IMAGE PROCESSING TECHNIQUES

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Abstract: Analysis of video data in a retail environment provides valuable information for business operators. Customer gender identification and age interval estimation are commonly used to better plan resources and marketing strategies. In this study, some demographic characteristics (gender and age interval) of hypothetical customers are extracted from video images. To extract gender information, geometric facial features are used. On the other hand, age intervals are estimated by measuring the size and proportions of the human face, and edge analysis as well. Besides, the trajectories of the customers are determined by image processing techniques. The preliminary experimental results show that promising clues are extracted to be used in the retail video analytics. In the future, we believe that these characteristics can be associated with heatmaps of customer walk-through patterns, which allows for optimal product placement and efficient floor setup.

Keywords: Retail Video Analytics, Customer Demographic Characteristics, Consumer Buying Behavior, Image Processing

Introduction

In recent years businesses are focused on satisfying the customer's needs and expectations in an efficient way than their competitors. Although the expectations of consumer markets are different from industrial markets, for both of the markets, the best way of meeting wants are based on identifying the consumers' needs and organizing the marketing activities according to them. At this point, the concept of consumer behavior becomes more important in the value creation process. Consumer behavior "is the study of the processes involved when individuals or groups select, purchase, use, or dispose of products, services, ideas, or experiences to satisfy needs and desires (Solomon, 2006: 7).''

In the literature, various studies are conducted to explore the impact of demographic factors on consumer behavior. Kumar (2014) expressed that demographic factors such as sex, age, marital status, ethnic, income, education, occupation and family size are the important factors which effect buying decisions. Hence, firms have to examine the demographic characteristics of the consumers carefully to plan their marketing activities efficiently. Therefore actually, customer demographic characteristics are important inputs for the businesses.

In the study, in order to understand the consumer behavior partly; image processing techniques are taken into consideration. By using image processing techniques, it is aimed to determine and understand the behavior of the consumers in a store. Briefly, there are two aims of the study. First one is to extract the customer demographic information in a hypothetical store, second is to determine the instore customer trajectories through image processing techniques. In this study, customer demographic characteristics are limited to gender and age. In this context, first consumer buying behavior is introduced. Next, extraction of customer demographic characteristics such as gender and age interval estimation is explained. Further, customer trajectory determination is discussed. Finally; results, discussion and conclusion are expressed.

Consumer Buying Behavior

From past to present, consumer buying behavior is the main research topic of marketers. Although many studies are focused on consumer buying behavior, still the reasons of the buying behavior of consumers cannot be

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discovered exactly. Moreover, for this reason, consumer's mind is like a black box. Hence, it is not so easy to answer the questions such as "when they buy?", "why they buy?", "what they buy?" etc. It is the truth that the success of the businesses is depending on understanding the expectations of the customers and planning all their activities according to them. Product designs, pricing the goods and services, shelf designs etc. are among these activities. Herein, considering and studying the factors that affect consumers to behave in a certain manner are important (Khaniwale, 2015: 281).

According to Kotler and Armstrong (2012: 159), major factors that affect the buying behavior of consumers are classified as:

- Cultural factors

  Culture, subculture, social class
- Social factors

  Reference groups, family, roles and status
- Personal factors

  Age, life cycle stage, occupation, economic situation, lifestyle, personality and self-concept
- Psychological factors

  Motivation, perception, learning, beliefs and attitudes

Khaniwale (2015) classified the factors which influence consumer buying behavior as external and internal. External factors consist of cultural and social factors. On the other hand, internal factors are composed of personal and psychological factors.

Extraction of Customer Demographic Characteristics

In the context of video analysis, some demographic characteristics of hypothetical customers are extracted. These characteristics are determined as gender and age in the present study. Furthermore, the instore customer trajectories are detected through image processing functions.

Gender Estimation

Gender estimation is carried out using a portrait photo taken before entering the store. As a first step, the detection of face region is performed. To do that, Matlab's vision.CascadeObjectDetector function is used (https://www.mathworks.com/help/vision/ref/vision.cascadeobjectdetector-class.html, 07.08.2017). This function uses the Viola-Jones algorithm and detects people's faces, noses, eyes, mouth, or upper body (Viola and Jones, 2001). Then, the eye, nose and lip regions are cropped from the face. A sample detected face and the corresponding regions cropped from the face are shown in Figure 1.

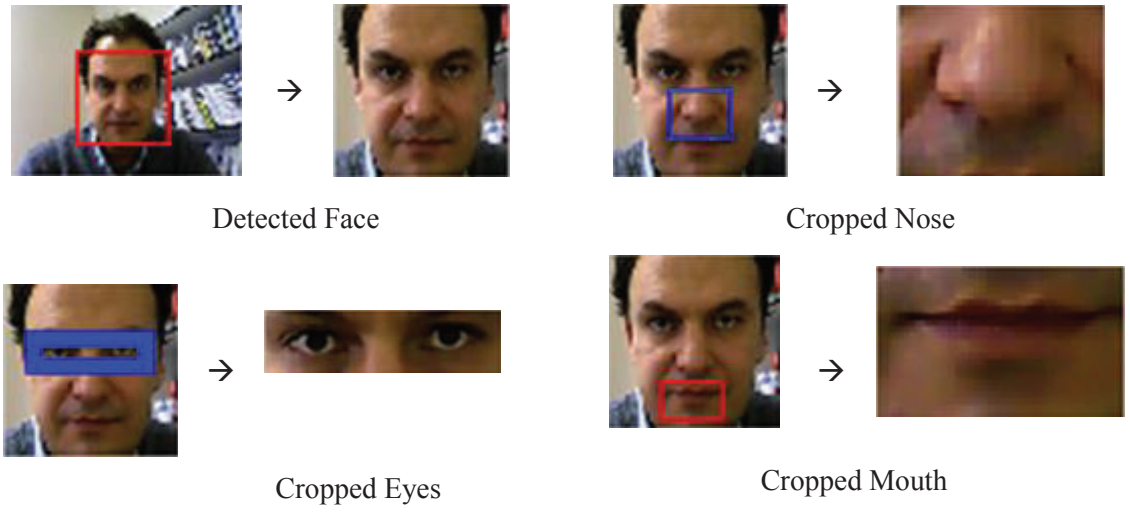

Figure 1. Results of face detection and face region cropping

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After that four different ratios are computed using the geometric facial distances (Ramesha *et al.* 2010). The distances are illustrated in Figure 2, and the ratios are given in the following equations 1 to 4.

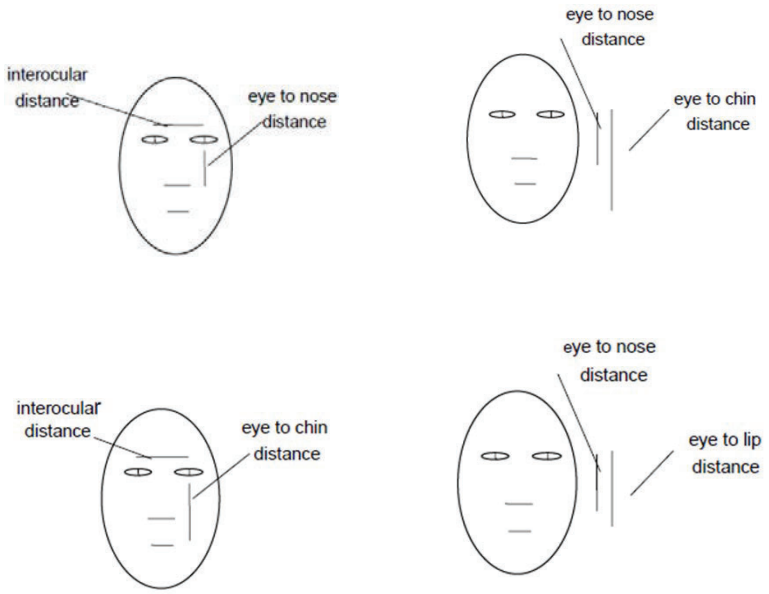

Figure 2. The distances used in gender detection (adapted from Ramesha *et al.* 2010)

$$Ratio1 = \frac{interocular\_distance}{eye\_to\_nose\_distance} \quad (1)$$

$$Ratio2 = \frac{eye\_to\_nose\_distance}{eye\_to\_chin\_distance} \quad (2)$$

$$Ratio3 = \frac{interocular\_distance}{eye\_to\_chin\_distance} \quad (3)$$

$$Ratio4 = \frac{eye\_to\_nose\_distance}{eye\_to\_lip\_distance} \quad (4)$$

The interocular distance is defined as the distance between the right and left eyes in the cropped face image. On the other hand, eye to nose, eye to chin and eye to lip distances are assumed as the distances between the line joining the eyes and nose tip (midpoint of cropped nose), lip (mid line of cropped mouth) and chin (bottom line of cropped mouth), respectively. After performing several experiments, optimum threshold values that differentiate male from female are determined for each ratio.

Age Interval Estimation

The age interval is estimated by the analysis of wrinkles. In the present study, three age intervals are considered which are (i) young, (ii) middle age and (iii) old. The regions labeled as "1" and "2" are used in the wrinkle map (Figure 3). These regions are automatically located for each face by generating buffer zones above and below the eye regions.

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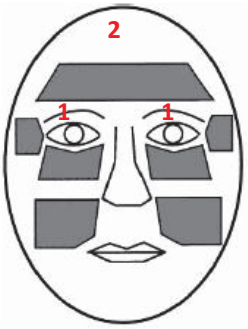

Figure 3. The regions of wrinkle map (adapted from Kwon and Lobo 1999)

To reveal the wrinkles, Canny edge detection operator is used (Canny, 1986). This operator uses a multi-stage algorithm to detect edges in images. It also provides low error rate, good localization and minimal detector response per edge. The detected wrinkles (edges) on the cropped face image are shown in Figure 4. After obtaining all wrinkles, the edges fall within the predefined regions given in Figure 3 are counted. According to the number of lines counted, the age interval is determined. After performing numerous experiments, optimum separation values that differentiate three age intervals are determined.



Figure 4. Detected wrinkles on a sample image

Customer Trajectory Determination

In the final step, the instore trajectories of customers are determined by object segmentation techniques. In a video data taken from an oblique angle, the initial (empty) image frame is accepted as the background frame. The following frames are subtracted from the initial frame to reveal the moving objects. The moving objects are considered as customers in our hypothetical scenario. Sample moving objects segmented by background subtraction technique are illustrated in Figure 5.

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Figure 5. The original image frames (left) and their segmented counterparts in binary form (right).

To determine the walking paths of the customers, segmented blobs are analyzed according to their Center of Mass (CoM) positions. To do that, for each image frame, the centroid points are computed for each isolated blob. These points found in each frame are marked on a still image cumulatively. Different colors are used for each customer to provide a better discrimination. In an example given in Figure 6, three different instore trajectories are obtained colored by yellow, green and blue.



Figure 6. Computed instore trajectories of three different customers.

Results and Discussion

The preliminary experimental results show that promising clues are extracted to be used in the retail video analytics. The tests are conducted on Chicago Face Database, which is developed at the University of Chicago (Ma *et al*., 2015). The database provides high quality, standardized face images of females and males between the ages 17-65. Of 50 female images chosen from the database, 32 were found to be correct (64% accuracy) in terms of gender and age interval. On the other hand, the accuracy of male images was computed to be 70% by predicting 35 images out of 50, correctly. The overall accuracy of the proposed approach is found to be 69%.

Although the proposed approach produces promising outcomes, some limitations are still apparent. First, instead of using real shopping videos with real customers, an indoor environment video with hypothetical customers is utilized due to difficulty in getting legal permissions. Second, the age interval is limited to three categories as young, middle age and old. More sophisticated prediction algorithms are needed to extend the age intervals.

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Conclusion

Understanding the behavior of consumers is very important in the success of the businesses. On the other hand, it is the truth that understanding each of them is not so easy. In this situation, the best way is to make collaboration with other disciplines such as computer science and informatics.

As a matter of fact, consumer's behaviors are tried to be analyzed with image processing techniques. In this study, a preliminary video data analysis is performed in a retail environment, which provides valuable information for business operators. To do that, customer gender identification and age interval estimation are carried out, which are commonly used to better plan resources and marketing strategies. Besides, the instore customer trajectories are revealed by image processing algorithms. The overall accuracy of gender identification and age interval estimation is found to be 69%. The preliminary experimental results show that promising clues are extracted to be used in the retail video analytics.

As a future work, the demographic characteristics can be associated with heat maps of customer walk-through patterns, which allows for optimal product placement and efficient floor setup.

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EXTRACTION OF THE ACOUSTIC FEATURES OF SEMI-VOWELS IN THE KURDISH LANGUAGE

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Abstract: In this study, it was aimed to extract the acoustic features of semi-vowels in the Kurdish language spoken in Turkey at the phoneme level. For this purpose, voice recordings were collected from 42 adult speakers who know how to read and write in Kurdish. The isolated voice signals of the data set generated with these recordings were obtained by Praat software. The acoustic features of the isolated semi-vowels obtained were acquired by extracting the F1, F2, F3 and F4 formant frequencies in the Matlab environment using the LPC method. Semi-vowels, the phonetic analysis of which was examined, were then addressed with vowels at the end of this study, and their similarities and differences in terms of the phonetic feature were revealed according to the examination results of the analyzed data. This is the first study in which the acoustic analysis of Kurdish semi-vowels was performed. This study will contribute to the researchers who will carry out studies on Kurdish voice processing systems in the future.

Keywords: Speech processing, Kurdish, Phonetic feature, Formant frequency analysis, Lpc, Praat.

Introduction

Kurdish is an Iranian language of the Indo-Iranian language group of the Indo-European language family in terms of the language family and is an inflected language when examined in terms of the structure. Kurdish communities speak many different dialects, including Kurmanji, Sorani, Lori, Gorani, and Zazaki, according to the regions they live in and the tribes and principalities they depend on (Ciwan., 1992). In this study, the Kurmanji dialect, the most spoken dialect of the Kurdish language, is taken as a basis. Kurdish is the most spoken language in Turkey among the living languages following the Turkish language. Therefore, in this study, the acoustic structure of the phonemes in Kurdish was examined in order to develop the voice processing applications such as speech recognition, speaker recognition, voice to text, and text to voice, in the Kurdish language using biometric data consisting of Kurdish sound signals for the determination of crimes committed in Turkey. The examinations were carried out with the sorting of the formant frequencies of the isolated semivowel phonemes in Kurdish.

Formant frequencies are the resonance frequencies of the vocal tract that are expressed as the peak amplitude in the frequency spectrum of the sound. With these frequencies, the most important acoustic properties of semivowels were obtained.

Formation Process of Semivowels and Vowels

The speech signal is produced as a result of the vibrating of airflow coming from the lungs in vocal cords and passing of the vibrations through the throat, oral cavity, and nasal cavity and forming in the tongue, teeth, jaws, palates, and lips, the articulator structures. The smallest sound units that make up a spoken language consist of vowels and consonants. Vowels are the voiced sounds produced by the oscillation as a result of the vibrating of vocal cords. Consonants are the sounds produced by the obstacles against the airflow in the vocal tract. For this reason, the vocal cord vibrations do not have any significance in the production process of consonants. However, this is not the case for the production of every consonant. Thus, vowels and some of the consonants are voiced. This is also observed in the semivowels (/w/ and /y/) of Kurdish. When the semivowels are pronounced, they have both the consonant and the voiced sound properties. When examined, while the voiced sounds exhibit a periodic structure, voiceless sounds exhibit a non-periodic structure (Artuner., 1994).

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Semivowels in Kurdish

There are two semivowels in Kurdish, being /w/ and /y/. In Kurdish, semivowels are classified into 2 main groups as labial and palatal semivowels by their phonation places as in Table 1.

Table 1: Semivowels in Kurdish.

	Labials	Prepalatals
Semivowels	/w/	/y/

When the semivowels in Kurdish are analysed phonetically, they demonstrate the following properties:

- /w/ sound is a continuous voiced sound pronounced with two lips (Ciwan., 1992, Khan., & Lescot., 1971).
- /y/ sound is a voiced sound pronounced in the prepalate (Ciwan., 1992, Khan., & Lescot., 1971).
-

Vowels in Kurdish

There are 8 vowels in Kurdish, being /a/, /e/, /ê/, /i/, /î/, /o/, /u/, and /û/. Vowels in Kurdish are classified into 3 main groups as long and short vowels by their pronunciation time when being pronounced, as prepalatal and postpalatal vowels by the motions the tongue has in the prepalate and postpalate in the oral cavity, and as high, mid, and low vowels by the proximity of the tongue to the mandible and palate as in Table 2.

Table 2: Vowels in Kurdish.

	Long Vowels			Short Vowels		
	High	Mid	Low	High	Mid	Low
Prepalate	/î/, /û/	/ê/				/e/
Postpalate			/a/, /o/	/i/, /u/		

The remaining parts of the article are arranged as follows: Materials and methods used are presented in Chapter 2, the formant frequency analysis results of the isolated semivowels are examined in Chapter 3, and a general deduction is made from the obtained results in Chapter 4.

Materials and Methods

In this study, the acoustic properties of Kurdish semivowels were sorted by the formant analysis method. The formant analysis is one of the most important methods used to determine the distinctive properties or significant frequency combinations from the speech data. They are demonstrated with F1, F2, F3, and F4. In this study, the formant analysis values were obtained in Matlab environment with the Linear Predictive Coding (LPC) method, and sound analysis process was performed with Praat software.

The Data Set Used and Its Properties

The properties of the data set formed for the acoustic analysis of Kurdish semivowels are presented in Table 3. The recordings were obtained in a silent room environment with the Easy Voice Recorder Pro voice recording program and General Mobile Discovery II + brand mobile phone.

Table 3: Properties of the database used.

Isolated semivowels	The number of male speakers	The number of female speakers	The age of male speakers	The age of female speakers
/w/	42	8	19-35	21-30
/y/	42	8	19-35	21-30

LPC Method

LPC is a technique used to characterize spectral properties from the sound signals. In this technique, the prediction of the n sample of the speech signal s(n) is expressed as the linear combination of the previous p samples. This is shown in equation 1 and the a_i values in Equation 1 refer to the LPC coefficients (Sel., 2013).

$$S(n) = -\sum_{i=1}^{p} a_i s(n-i) \qquad (1)$$

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In the LPC method, the difference between the actual signal value s(n) and the predicted signal value S(n) of the speech equals to the error signal. This is expressed in Equation 2. The LPC coefficients in this method make production to calculate the error signal to be minimum (Sel., 2013).

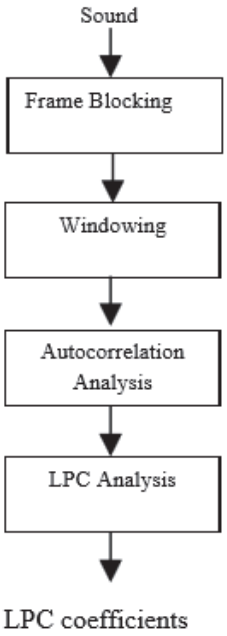
$$e(n) = s(n) - S(n) = s(n) + \sum_{i=1}^{p} a_i s(n-i) \qquad (2)$$

With the z-transfer transformation, a filter with a finite impulse response, which is based on the human vocal tract and its properties, is obtained with the A(z) LPC analysis filter in Equation 3,

$$H(z) = 1 - \sum_{i=1}^{p} a^i z^{-i} = A(z) \qquad (3)$$

Steps of the LPC method

Steps constituting the LPC method are presented in Figure 1.



Şekil 1: The block diagram of the steps constituting the LPC method.

Frame Blocking: It is the processing of the speech signal in a small period of time, especially between 20 and 30 ms, and obtaining more stable characteristics of the speech signal (Karasartova., 2011).

Windowing: It is used to block discontinuous areas at the beginning and end of each framed sound signal. The examples of windowing are Hamming, Hanning, Rectangular, Barlett, and Kaiser. The most commonly used windowing example in voice processing applications is the Hamming windowing. This windowing is expressed by Equation 4 [7]. (The symbol "N" in this equation indicates the number of samples in each frame).

$$w(n) = 0.54 - 0.46\cos\left(\frac{2n\pi}{N-1}\right) \qquad (4)$$

Autocorrelation Analysis: The autocorrelation analysis is performed to each windowed frame signal. The autocorrelation analysis equation is expressed by Equation 5. In this equation, the symbol p indicates the analysis degree that can range from 8 to 16 (Eray., 2008).

$$r_l(m) = \sum_{n=0}^{N-1-m} \hat{x}_l(n) \cdot \hat{x}_l(n+m), m = 0,1,2 \ldots\ldots p \qquad (5)$$

The LPC Analysis: In this operation, p+1 LPC coefficient values are calculated from each frame applied with the autocorrelation analysis. These calculated values are called the LPC parameters.

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Results and Discussion

The mean and standard deviation values of the frequencies F1, F2, F3 and F4 of the semivowels in the data set are presented in Table 4 for male speakers and in Table 5 for female speakers.

Table 4: The mean and standard deviation values of semivowels for males.

	Mean Formant Values			
	F1	**F2**	**F3**	**F4**
/w/	378.305	1056.323	2848.916	4124.831
/y/	299.084	2263.655	3309.581	4300.899
	Standard Deviation Formant Values			
	F1	**F2**	**F3**	**F4**
/w/	38.697	444.588	421.887	655.171
/y/	35.827	395.661	376.336	675.381

When the mean formant frequency values of the male speakers in Table 4 are examined, the format analysis of the semivowels of males is as follows:

- Since the phoneme with the highest F1 value is the /w/ sound, the /w/ phoneme is pronounced more clearly than the /y/ phoneme. In this case, the /y/ phoneme is pronounced more closed than the /w/ phoneme.
- Since the phoneme with the highest F2 value is the /y/ sound, the /y/ phoneme is pronounced more closely to the prepalate than the /w/ phoneme by the position of the tongue.

Table 5: The mean and standard deviation values of semivowels for females.

	Mean Formant Values			
	F1	**F2**	**F3**	**F4**
/w/	405.272	1069.249	3259.623	4447.568
/y/	323.411	2768.787	3835.873	4837.657
	Standard Deviation Formant Values			
	F1	**F2**	**F3**	**F4**
/w/	74.102	290.413	641.514	588.197
/y/	59.256	242.791	344.807	503.110

When the mean formant frequency values of female speakers in Table 5 are examined, it is observed that the format analysis of the semivowels of females shows the same conclusions as male speakers and the mean formant frequency values of female speakers have higher frequency values than male speakers. This is because the female vocal tract is longer than the male vocal tract.

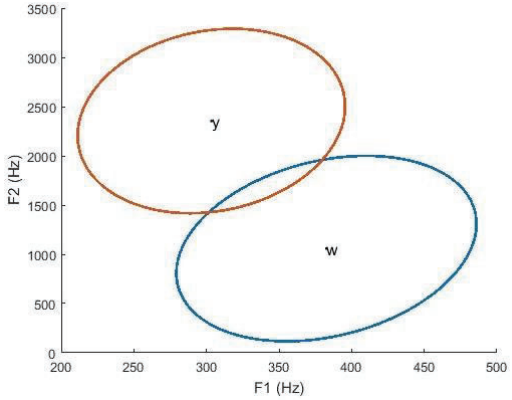

Figure 2: The scatter graph of the mean F1 and F2 frequency values of all speakers for semivowels.

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In Figure 2, which is drawn according to the mean and standard deviation results of F1 and F2 frequency values of all speakers for semivowels, it is observed that the F2 formant frequency values of the /y/ semivowel are in areas with high values and the F1 formant frequency values of the /w/ semivowel are in areas with lower values, and the F1 formant frequency values of the /y/ semivowel are in areas with low values and the F1 formant frequency values of the /w/ semivowel are in areas with higher values.

According to the classification of the vowels (Table 2), it can be said by the shape of the tongue, jaw, and lips when pronouncing semivowels [/w/, /y/] and vowels [/a/,/e/,/ê/,/i/,/î/,/o/,/u/ ,/û/] that;

- The /w/ phoneme shows similar phonetic properties with /a/, /o/, /e/, and /ê/ vowels compared to the /y/ phoneme in terms of the size of the jaw angle and it is different form /î/, /u/, /ı/, and /û/ high vowels.

- The /y/ phoneme shows similar phonetic properties with /e/, /ê/, /î/, and /û/ pre-tongue vowels compared to the /w/ phoneme and it is different form /a/, /o/, /i/, and /u/ post-tongue vowels.

Conclusion

Sorting the acoustic properties of the vowel and semivowel phonemes for the development of the speech processing applications, such as the voice to text and text to voice in Kurdish is of great importance. For this reason, in this study, the vowel and semivowel phonemes in Kurdish were examined, and their characteristic features were sorted. At the same time, the phonetic properties of the isolated semivowels and vowels in Kurdish were introduced, and their pronunciation relations were revealed.

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FACULTY DEVELOPMENT EXPERIENCE USING TECHNOLOGY TO IMPROVE TEACHING AND LEARNING IN HIGHER EDUCATION

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Abstract: This paper investigates the use of instructional technology including social media for the purpose of enhancing and improving both the act of teaching and the motivation of learning. It involves information and knowledge providers and receivers that are faculty, students, and technology trainers. It also analyzes the dynamics of teaching and learning by recognizing contemplative practices, diversity, service learning, and faculty learning services. The approach is to apply qualitative methodology of linking objectives to curriculum adapted from Diamond, R. M. (1998) and the applications in classrooms, laboratories, curricula, and instructional technology, and goals across courses.

Keywords: Education, Social media

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GELİŞMEKTE OLAN ÜLKELERDE DEMOKRASİNİN EKONOMİK BÜYÜME ÜZERİNDEKİ ETKİSİ*

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Özet: Ülkelerin kurumsal yapılarını anlamak için demokrasi en önemli göstergelerden birisidir. Son zamanlarda literatürde sürdürülebilir bir ekonomik büyüme sağlamak için ülkelerin demokrasi seviyelerini arttırmaları gerektiği tartışılmaktadır. Bu amaçla, bu çalışmada gelişmekte olan ülkelerde demokrasi ve ekonomik büyüme arasındaki ilişki incelenmektedir. Çalışmada 2000-2016 dönemi için demokrasi ve ekonomik büyüme arasındaki ilişkiyi test etmek için panel FMOLS ve panel DOLS yöntemleri kullanılmıştır. Analiz sonuçlarına göre değişkenler arasında uzun dönemli bir eşbütünleşme ilişkisi vardır ve artan demokrasinin gelişmekte olan ülkelerde ekonomik büyümeyi arttırdığı görülmüştür. Son olarak, çalışmada daha yüksek demokrasi seviyelerini yakalamak için bazı politika önermelerinde bulunulmuştur.

Anahtar Kelimeler: Demokrasi, Ekonomik Büyüme, Panel FMOLS, Panel DOLS

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EFFECT OF DEMOCRACY ON ECONOMIC GROWTH IN DEVELOPING COUNTRIES*

Abstract: Democracy is one of most important indicator to understand institutional structure of countries. Recently, in the literature, it has been discussed that to achieve sustainable growth, countries need to increase their democracy level. For this pupose, the aim of this study is to investigate the relationship between democracy and economic growth in developing countries. To this extent, relationship between democracy and economic growth is tested by panel FMOLS and DOLS analysis over the period of 2000-2016. According to the analysis findings, there is long term cointegration relationship between the variables and increasing democracy level leads to higher economic growth in developing countries. Finally, some policy recommendations are discussed in the study to achive high democracy level.

Keywords: Democracy, Economic Growth, Panel FMOLS, Panel DOLS

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GİRİŞ

Ekonomik büyüme dünya ekonomilerinin temel meseleleri arasında yer almaya devam etmektedir. Son dönemlerde ülkeler, ekonomik büyümenin asli kaynakları olarak kabul edilen doğal kaynaklar, işgücü, fiziki ve beşeri sermaye, teknoloji dışında ekonomik performansı etkileyen kurumsal yapıya odaklanmaktadır. Veblen (1919), Commons (1931), Mitchell (1949,1950), Coase (1960), Williamson (1985), Rodrik (1997), Acemoğlu vd. (2001) ve North (2002) çalışmaları kurumların ekonomik büyüme olan katkılarını inceleyen öncü çalışmalar olmuştur. Literatürde "Kurumcu İktisat" olarak ifade edilen bu yaklaşım, ekonomik büyüme sürecinde asli üretim faktörlerini önemli olduğunu savunurken, bu faktörlerin etkinliğini artıran ve çeşitli teşvik mekanizmaları ile harekete geçiren kurumlara dikkat çekmektedir. İlgili literatür incelendiğinde ekonomik özgürlükler, hukuk düzeni, güven ortamı, hükümet etkinliği, bürokratik kalite, yolsuzluklar vb. ilaveten kurumsal yapının en önemli göstergelerinden bir tanesinin demokrasi olduğu vurgulanmaktadır (Lipset, 1959; Rodrik, 1997; Acemoğlu ve Robinson, 2000). Demokrasi siyasal bir rejim olmasının yanında hukukun üstünlüğünün ön planda olduğu, bürokrasi gibi bir sorunun olmadığı, yolsuzluk düzeyinin düşük olduğu, hak ve özgürlüklerin yasalarla güvence altına alındığı, piyasa belirsizliklerin ortadan kalktığı dolayısıyla güven ortamının sağlandığı ekonomiler için kullanılan bir kavramdır.

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Literatürde demokrasinin ekonomik büyüme üzerindeki etkisinin yönü konusunda tam olarak bir uzlaşı bulunmamaktadır. Lipset (1959), demokrasinin belirli bir büyüme sürecinden sonra uygulanabileceğini ve ekonomik büyümenin demokrasinin devamının sağlanmasında pozitif bir etkisinin olduğunu öne sürmüştür. Huntington (1991), Çin ve bazı Asya ülkelerindeki yüksek büyüme rakamlarını göstererek demokrasinin büyüme için şart olmadığını vurgulamıştır. Doucouliagos ve Ulubağoğlu (2008), demokrasinin firmaları yatırıma yönlendirerek kaynakların daha verimli kullanılmasını sağladığını ve yatırımcıların arzu ettiği güven ortamının korunduğunu ifade etmiştir. Aynı şekilde Przeworski ve Limongi (1997), çalışmalarında demokrasi ile beraber ortaya çıkan güven ortamına dikkat çekmiştir. Manan (2009) ise, çalışmasında demokrasinin varlığı ekonomik özgürlüklerin gelişimine katkı sağladığını, ekonomik özgürlüklerin ise politik hak ve sivil özgürlükleri geliştirerek demokrasiyi teşvik ettiğini öne sürmektedir.

Sirowy ve lnkeles (1990), demokrasi ile büyüme arasındaki ilişkiyi açıklarken üç farklı yaklaşıma işaret etmiştir. i)Çatışma yaklaşımı, ekonomik büyümenin demokratik kurumlar tarafından engellenebileceği ihtimali üzerinde durmaktadır. Bu yaklaşımda, otoriter rejimler demokratik usul ve kurumların, politik hak ve sivil özgürlüklerin gelişimini engelleyerek ve bastırarak hızlı bir büyüme için gerekli ortamı sağlamaktadır. ii)Bağdaşma yaklaşımı, bir ülkede kanun ve düzenin sağlanmasının ancak otoritelerle mümkün olabileceğini savunmaktadır. Bu yaklaşıma göre, demokrasi, ekonomik özgürlükleri maksimize eden, özel alanı ve mülkiyet haklarını koruyan, yatırımları uyaran ve kaynakların en verimli şekilde kullanımını sağlayan etkili bir araç olarak tanımlanmaktadır. iii)Şüpheci yaklaşım, demokrasi ile ekonomik büyüme arasındaki ilişkinin varlığı konusunda kuşkulu bir tavır sergilemektedir. Demokrasi ve siyaset kurumunun ekonomik gelişmeler üzerinde etkisinin olmadığını ya da çok az bir etkisinin olduğunu savunmaktadır. Bu yaklaşımda, ülke ekonomileri için asıl önemli olan ortaya konulan ekonomi politikaları ve kurumsal düzenlemelerdir.

Kurumsal yapının belirleyicisi olarak demokrasinin dikkate alındığı bu çalışmada, demokrasi ile ekonomik büyüme arasındaki ilişki analiz edilmiştir. Bu bağlamda iki değişken arasındaki ilişki 2002-2016 dönemlerinde BRIC (Brezilya, Rusya, Hindistan, Çin) ülkeleri için incelenmiştir. Bu amaçla üç bölümden oluşan çalışmanın giriş bölümünde demokrasi ve ekonomik büyüme arasındaki teorik ilişkiye ilişkin bir kısım bilgiler verilmiştir. Birinci bölümde demokrasi ile ekonomik büyümeye arasındaki ilişkiyi inceleyen çalışmalara ve sonuçlarına yer verilmiştir. Çalışmanın üçüncü bölümünde model ve veri seti tanıtılmış, dördüncü bölümünde ise ampirik analiz bulgularına yer verilmiştir. Çalışmanın son bölümünde ise ampirik bulgular değerlendirilmiş ve bir kısım politika önermelerinde bulunulmuştur.

Ampirik Literatür

Kurumsal yapının önemli bir göstergesi olan demokrasinin ekonomik büyüme üzerindeki etkisinin ölçüldüğü çalışmaların 1990'lı yılların başından itibaren artmaya başladığı görülmektedir. Bu durum demokrasi düzeyinin ölçülmesindeki zorluklar ile açıklanmaktadır. Literatür bu açıdan incelendiğinde bazı çalışmalarda geliştirilen yöntemlerle demokrasi endeksinin oluşturulduğu, diğer grup çalışmalarda ise ülkelerdeki demokrasi düzeyi Freedom House ve Uluslararası Ülke Risk Rehberi (ICRG: International Country Risk Guide) gibi kuruluşlardan elde edilen verilerle ölçülmektedir. Bu bölümde literatürde demokrasi ve ekonomik büyüme arasındaki ilişkiyi analiz eden çalışmalar ve sonuçlarına yer verilmiştir. İlgili literatür incelendiğinde bu ilişkiyi zayıf bulan çalışmalar varken pozitif ve negatif sonuçlara da rastlanmaktadır.

Helliwell (1994), demokrasi ve ekonomik büyüme arasındaki ilişkiyi analiz ettiği çalışmasında 1960-1985 yılları arasında 125 ülke için araştırma yapmıştır. Çalışmanın bulguları büyümenin demokrasi üzerinde anlamlı bir etkisi olmadığını gösterirken, demokrasinin büyüme üzerinde olumlu bir etkisi olduğu sonucunu ortaya çıkarmıştır. Çalışmada demokrasinin büyümeyi etkileme kanalı olarak beşeri sermaye ve yatırımlar üzerinde durulmuştur. De Haan ve Siermann (1995); demokratik rejimlerin ekonomik büyüme üzerinde hem doğrudan hem de dolaylı etkilerini inceledikleri çalışmalarında iki değişken arasında güçlü bir ilişki olmadığını iddia etmişlerdir. Barro (1996), 1960-1990 dönemini baz alarak 100 ülke için yapmış olduğu çalışmada demokrasi düzeyinin düşük seviyede olduğu ülkelerde demokrasinin büyümeyi pozitif etkilediğini, demokrasi düzeyinin yüksek seviyede olduğu ülkelerde ise demokrasinin büyümeyi negatif etkilediği sonucuna ulaşmıştır. Barro (1996), iki değişken arasındaki bu durumu demokrasinin belirli bir düzeye kadar artması iktisadi büyümeyi pozitif etkilerken, yüksek demokrasi seviyelerinde bu etkinin azaldığı şeklinde açıklamaktadır. Barro'ya göre, demokratikleşme artıkça gelir dağılımındaki adaletsizlik artmaktadır. Bu yöndeki politikalar yetersiz kaldığı zaman yatırımlar ve ekonomik büyüme olumsuz etkilenmektedir. Perotti (1996), 1960-1985 dönemi için 67 ülke için gelir dağılımı, demokratik kurumlar ve ekonomik büyüme arasındaki ilişkiyi analiz etmiştir. Çalışma bulguları demokrasinin iktisadi büyüme üzerinde anlamlı bir etkisinin olmadığını göstermiştir. Leblang (1997), 1960-1989 dönemi 70 ülkede demokrasinin iktisadi büyüme üzerindeki etkisini araştırmıştır. Çalışmada demokrasinin iktisadi büyüme üzerinde pozitif bir etkiye sahip olduğu sonucuna ulaşmıştır. Minier (1998), 1965-1987 dönemi için 96 ülkede yapmış oldukları

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çalışmada, demokrasinin büyüme üzerinde doğrudan bir etkisi olduğuna işaret etmiştir. Minier (1998), bir ülkede demokratikleşme artıkça ekonomik büyümenin de artığını tersine daha az demokratik ülkelerde büyümenin düştüğünü savunmaktadır.

Rodrik (2000), 1970-1989 dönemini baz alarak 90 ülkede demokrasinin ekonomik büyüme üzerindeki etkisini analiz etmiştir. Çalışmanın bulgularına göre, demokrasilerde katılım artıkça ekonomik büyüme artmaktadır. Rodrik (2000)'e göre, katılımcı demokrasilerdeki belirsizliğin düşük seviyelerde olması, siyasi istikrar, ekonominin şoklara karşı dayanıklı olması ve gelir dağılımındaki etkin politikalar demokrasi ile ekonomik büyüme arasındaki etkileme kanallarıdır. Tavares ve Wacziarg (2001), 1970-1989 dönemleri için 65 gelişmiş ve gelişmekte olan ülkede demokrasinin ekonomik büyüme üzerindeki etkisini araştırmıştır. Çalışmada söz konusu iki değişken arasındaki en önemli etkileme kanallarının beşeri sermaye, gelir eşitsizliği, fiziki sermaye ve kamu harcamaları olduğu kabul edilmiştir. Çalışma, demokrasinin gelir eşitsizliğini azaltması ve beşeri sermaye birikimini artırmasının ekonomik büyüme üzerinde pozitif bir etki bırakacağını savunmaktadır. Öte yandan, çalışmaya göre demokrasi kamu harcamalarını artırarak ve fiziki sermaye birikimini azaltarak ekonomik büyüme üzerinde negatif bir etki bırakmaktadır. Kruzman vd. (2002), 1951-1980 dönemi 106 ülke için yapılan çalışmada demokrasinin ekonomik büyüme üzerinde doğrudan bir etkisinin olmadığı sonucuna ulaşılmıştır. Fakat demokrasinin yatırımlar ve kamu harcamalarını uyararak ekonomik büyümeyi etkilediği savunulmuştur. Çalışmaya göre, demokrasi yatırımları pozitif etkileyerek ekonomik büyümeyi artırmakta, kamu harcamalarını negatif etkileyerek iktisadi büyümeyi azaltmaktadır. Drury vd. (2006), 1982-1997 dönemini baz alarak 100'den fazla ülke için yaptıkları çalışmada yolsuzluk ve demokrasinin ekonomik büyüme üzerindeki etkisi analiz edilmiştir. Çalışma ülkeler, demokratik ülkeler ve demokratik olmayan ülkeler olmak üzere iki gruba ayrılarak yapılmıştır. Demokratik ülkelerde yolsuzluk ve demokrasinin ekonomik büyüme üzerinde anlamlı bir etkisi gözlemlenirken, demokratik olmayan ülkelerde negatif bir etkinin varlığı test edilmiştir. Ghosh ve Gregoriou (2009), 1960-1990 dönemini kapsayan 15 ülke için yapmış oldukları çalışmalarında demokrasinin ekonomik büyüme üzerinde pozitif bir etkisi olduğu sonucuna ulaşmışlardır. Beşkaya ve Manan (2009), Türkiye için yapmış oldukları çalışmada demokrasi ve ekonomik performans arasındaki ilişkiyi farklı modeller kurarak analiz etmişlerdir. Bazı modellerde iki değişken arasındaki ilişki pozitif olarak saptanırken bazı modellerde ise ilişkinin negatif olması sebebiyle net bir sonuç ortaya konulamamıştır. Jaunky (2013), 1980-2005 dönemini baz alarak 28 Sahra altı Afrika ülkesinde demokrasi ve iktisadi büyüme arasındaki ilişkiyi araştırmış ve bu ilişkinin katsayısının pozitif olduğu sonucuna ulaşılmıştır. Acemoğlu vd. (2014), 175 ülke için 1960-2010 dönemini temel alarak yaptıkları çalışmada demokrasinin ekonomik büyümeyi pozitif etkilediği sonucunu elde etmişlerdir. Ayrıca çalışmaya göre, demokrasi büyümeyi yatırımlar, okullaşma oranı, ekonomik reformlar vb. gibi kanallar aracılığıyla etkilemektedir. Hayaloğlu (2015), çalışmada 1990-2012 dönemlerinde demokrasi ve ekonomik büyüme ilişkisi MINT ülkeleri için analiz edilmiştir. Elde edilen bulgular, demokrasi ve ekonomik büyüme arasında pozitif yönlü bir ilişki olduğunu göstermektedir. Şahin (2017), çalışması 1995-2015 dönemleri arasında geçiş ekonomileri için yapılmıştır. Analiz sonuçlarına göre, demokrasi ve ekonomik büyüme arasında uzun dönemde çift yönlü nedensellik ilişki bulunmaktadır. Çalışmada, geçiş sürecindeki ülkelerde demokraside meydana gelen gelişmeler ekonomik büyümeyi artırırken, ekonomik büyümenin de demokrasi gelişimini olumlu yönde etkilediği gözlenmektedir.

Model ve Veri Seti

Demokrasi ve ekonomik büyüme arasındaki ilişkiyi araştıran bu çalışmada aşağıdaki gibi panel veri formatında bir doğrusal regresyon modeli kurulmuştur.

$$GSYH_{it} = \alpha_{0i} + \alpha_{1i}DEMO_{it} + u_{it} \qquad i=1, ..., N;\ t=1, ...T \qquad (1)$$

Denklem (1)'de GSYH ekonomik büyümeyi ve DEMO ise demokrasi endeksini temsil etmektedir. Analizde kullanılan veri seti 2002-2016 dönemi yıllık verilerinden oluşmakta olup, BRIC ülkelerini kapsamaktadır. Bu ülkeler sırasıyla Brezilya, Rusya, Hindistan ve Çin'dir. GSYH değişkenine ait veriler World Bank istatistiksel veritabanından, DEMO değişkenine ait veriler Freedom House raporlarından derlenmiştir.

Metodoloji ve Ampirik Sonuçlar

Bu çalışmada ekonomik büyüme ve demokrasi arasındaki ilişki panel eşbütünleşme analizi yöntemiyle incelenecektir. Söz konusu ilişki üç aşamada incelenecektir. Birinci aşamada değişkenlerin durağanlıkları IPS ve Maddala ve Wu (1999) panel birik kök testleri ile araştırılmıştır. İkinci aşamada Pedroni (1999) panel eşbütünleşme testi ile değişkenler arasındaki uzun dönemli ilişki test edilmektedir. Üçüncü aşamada Panel DOLS ve Panel FMOLS tahmincileri ile eşbütünleşme katsayıları tahmin edilmiştir.

Panel Birim Kök Testleri

Eşbütünleşme ilişkisinin tespitinden önce değişkenlerin durağanlığının kontrol edilmesi gerekmektedir. Eğer değişkenlere ait veriler durağan ise değişkenler arasındaki ilişkileri tespit etmek amacıyla regresyon analizi

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kullanılacak, durağan değilse sahte regresyon sorunu ortaya çıkacak, tahmin edilen regresyon sonuçları sağlıklı olmayacaktır. Değişkenlerin durağanlığının tespiti durumunda eşbütünleşme ilişkisinin varlığı test edilecektir. Bu anlamda, çalışmada Im, Pesaran ve Shin (2003, IPS) testi ve Maddala ve Wu (1999) tarafından geliştirilen Fisher-ADF testi panel birim kök sınamasında kullanılacaktır.

IPS panel birim kök testi için aşağıdaki modelin tahmin edilmesini gerektirmektedir:

$$\Delta y_{it} = \mu_i + \rho y_{it-1} + \sum_{j=1}^{m} \alpha_j \Delta y_{it-j} + \delta_{it} + \theta_t + \varepsilon_{it} \quad (2)$$

Denklem 2'de, Δ birinci fark operatörü, m gecikme uzunluğu, μi ve θt sırasıyla birime özgü sabit ve zaman etkileridir. Tüm i'ler için ρ = 0 sıfır hipotezi, tüm i'ler için ρ < 0 hipotezine karşı test edilmektedir. Sıfır hipotezinin reddedilmesi durumunda serinin durağan olduğu ortaya çıkmaktadır.

Maddala ve Wu (1999) tarafından geliştirilen Fisher-ADF testi ise, her yatay kesit i için birim kök testlerinden elde edilen ρ değerlerini birleştirmektedir. Test parametrik değildir ve 2n serbestlik derecesiyle ki-kare dağılımına sahiptir. Testte "n" göstergesi, paneldeki yatay kesit verisi sayısını vermektedir. İlgili test istatistiği Denklem 3'de gösterilmiştir.

$$\lambda = -2 \sum_{i=1}^{n} \log_e(p_i) \sim \chi 2_{2n(d.f.)} \quad (3)$$

Denklem 3'de ρi birim i için ADF birim kök testinden elde edilen p değeri görülmektedir. ADF-Fisher testi, bireysel ADF regresyonlarındaki farklı gecikme uzunluklarına bağlı olmama avantajına sahiptir (Hossain and Saeki, 2011: 322).

Panel birim kök testinden elde edilen ampirik sonuçlar Tablo 1'de gösterilmektedir. Birim kök test sonuçlarına göre değişkenlerin genel görünümü düzey değerde durağan değilken ilk farkta durağan olduğu, yani I(1) olduklarıdır. Bu durumda değişkenler arasında uzun dönemli bir eşbütünleşme ilişkinin olup olmadığı test edilebilmektedir. Eğer değişkenler arasında eşbütünleşme ilişkisi varsa bu durumda elde edilen regresyon yanıltıcı olmayacaktır.

Tablo 1 : Panel Birim Kök Test Sonuçları

Variables	**IPS Testi**		**ADF-Fisher Testi**	
	İstatistik Değeri	**Prob. Değeri**	**İstatistik Değeri**	**Prob. Değeri**
GSYH	-0.29	0.39	9.56	0.30
DEMO	-0.30	0.38	4.17	0.38
ΔGSYH	-4.12	0.00*	31.42	0.00*
ΔDEMO	-1.51	0.07***	8.76	0.04**

*, **, ***, sırasıyla %1, %5 ve %10 anlamlılık düzeylerini göstermektedir.

Panel Eşbütünleşme Testi

Literatürde durağan olmayan değişkenler arasında uzun dönem eşbütünleşme ilişkisinin olup olmadığını sınamak için kullanılan yöntemlerden biri de Pedroni (1999; 2004) tarafından geliştirilen panel eşbütünleşme testidir. Pedroni, eşbütünleşme ilişkisi yoktur şeklinde tanımlanan sıfır hipotezini sınamak için 7 farklı test istatistiği geliştirmiştir. Bu istatistikleri panel eşbütünleşme regresyonundan elde edilen artılardan elde etmektedir. Bu testlerin dört tanesi grup içi (panel-v, panel-ρ, yarı parametrik panel-t ve parametrik panel-t) istatistiklerden, diğer üç tanesi gruplar arası (grup- ρ istatistiği, yarı parametrik group-t istatistiği ve parametrik group-t) istatistiklerden oluşmaktadır.

Tablo 2, Pedroni panel eşbütünleşme test sonuçlarını göstermektedir. Sabitli model değerlendirildiğinde, yedi istatistiğin biri %10, ikisi %5 anlamlılık düzeyinde sıfır hipotezinin reddedildiğini göstermektedir. Sabitli ve trendli modelde ise, yedi istatistiğin 4'ü %1 anlamlılık düzeyinde sıfır hipotezinin reddedildiğini göstermektedir. Bu sonuçlar değişkenler arasında uzun dönemde eşbütünleşme ilişkisinin olduğu şeklinde yorumlanabilmektedir.

Tablo 2: Pedroni Panel Eşbütünleşme Test Sonuçları

Test	Sabitli	Sabitli ve Trendli
Panel v-Statistic	-0.75	-1.70
Panel rho-Statistic	-1.31***	-0.37
Panel PP-Statistic	-1.62**	-4.04*
Panel ADF-Statistic	-1.65**	-2.26*
Panel rho-Statistic	-0.37	0.01

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Group PP-Statistic	-1.13	-4.37*
Group ADF-Statistic	-1.15	-1.86*

*, %1 anlamlılık düzeyini göstermektedir.
***, %10 anlamlılık düzeyini göstermektedir.

Panel Eşbütünleşme Katsyılarının Tahmini

Uzun dönem eşbütünleşme ilişkisinin elde edilmesinin ardından sonra ikinci aşama olan uzun dönem eşbütünleşme katsayılarının tahmine geçilebilmektedir. Bu amaçla Pedroni (2000, 2001) tarafından geliştirilen panel fully modified ordinary least squares (FMOLS) and panel dynamic ordinary least squares (DOLS) yöntemleri tercih edilmiştir. FMOLS ve DOLS tahmincileri, aralarında uzun dönemli ilişki bulunan serilerin en küçük kareler yöntemiyle tahmin edilmesi durumunda sapmalı sonuçların ortaya çıkması üzerine geliştirilmiştir. FMOLS yöntemi, oto korelasyon ile içsellik problemini parametrik olmayan bir yaklaşım ile düzeltmekte iken; DOLS yönteminde ise değişkenler gecikmeli değerleri ile alınarak oto korelasyon giderilmekte ve tahmin yapılmaktadır. Tablo 3'de panel DOLS ve FMOLS analizlerinden elde edilen sonuçlar gösterilmiştir.

Tablo 3: Panel Eşbütünleşme Katsayıları (GSYH bağımlı değişken)

Değişken	Panel FMOLS	Panel DOLS
DEMO	-5.13***	-10.56*
	(0.10)	(0.05**)

*, %1, **, %5 anlamlılık düzeyini göstermektedir.
( ), değişkenlerin prob değerlerini göstermektedir.

Analizden elde edilen sonuçlar değerlendirildiğinde hem Panel FMOLS hem de Panel DOLS sonuçlarına göre uzun dönem katsayıları DEMO değişkeni için sırasıyla %10 ve %5 önem düzeyinde anlamlı ve işaretleri negatiftir. Bu bulgulara göre demokrasiyi temsil eden DEMO değişkeni ekonomik büyümeyi temsil eden GSYH değişkenini pozitif yönde etkilemektedir. Dolayısıyla demokrasi endeksinde meydana gelen azalma (demokrasinin arttığı anlamına geldiği için) söz konusu ülkelerde ekonomik büyümeyi pozitif yönde etkilemektedir. Dikkat edilmesi gereken bir başka husus demokrasi endeksi üzerinedir. Buna göre demokrasi endeksinin metodolojisine bakıldığında endeksin yükselmesi, demokrasi düzeyinin azalması, endeksin azalması ise demokrasi düzeyinin arttığı anlamına gelmektedir. Dolayısıyla hem FMOLS hem de DOLS analizlerinden elde edilen bulgular neticesinde demokrasi endeksinin katsayısının negatif ve anlamlı çıkması; demokrasi endeksinde meydana gelen azalmanın ekonomik büyümeyi arttırdığı anlamına gelmektedir. Ayrıca her analizden de elde edilen sonuçların aynı olması modelin tutarlılığı konusunda önem arz etmektedir.

Sonuç

Ekonomi literatüründe yükselen piyasalar olarak ifade edilen BRIC ülkelerinde, son dönemlerde artan ekonomik performanslarının yanı sıra yüksek büyüme rakamları dikkat çekmektedir. Hal böyle olunca bu ülkelerde ekonomik büyümenin belirleyicileri tartışılmaktadır. Kurumcu iktisat yaklaşımı, ekonomik büyüme sürecinde asli üretim faktörlerinin yanı sıra, bu faktörlerin etkinliğini artıran ve çeşitli teşvik mekanizmaları ile bu faktörleri harekete geçiren kurumlara dikkat çekmektedir. Kurumları temsil eden en önemli göstergelerden bir tanesi ise demokrasidir. Bu amaçla çalışmada BRIC ülkelerinde (Brezilya, Rusya, Hindistan, Çin) 2000-2016 dönemi için demokrasi ve ekonomik büyüme arasındaki ilişki test edilmiştir. Analiz yöntemi olarak, panel FMOLS ve panel DOLS yöntemleri kullanılmıştır. Elde edilen analiz sonuçlarına göre, değişkenler arasında uzun dönemli bir eşbütünleşme ilişkisi vardır ve artan demokrasinin gelişmekte olan ülkelerde ekonomik büyümeyi arttırdığı görülmüştür. Başka bir ifadeyle, çalışmada elde edilen bulgulara göre söz konusu ülkelerde belirtilen dönemlerde demokrasi ekonomik büyümeyi pozitif etkilemektedir.

Çalışmada elde edilen bulgulardan hareketle, söz konusu ülkelerde ekonomik büyüme sürecinde bazı faktörlerin harekete geçirilmesinde demokrasinin önemli olduğu görülmektedir. Bir ülkedeki kurumsal niteliğin önemli bir göstergesi olan demokrasi düzeyinin artırılması istikrarlı bir ekonominin oluşturulmasına katkı sağlamaktadır. Demokrasi bireysel hak ve özgürlükleri güvence altına alarak ekonomideki kaynakların daha verimli kullanılmasını sağlamakta ve ekonomik büyümeyi teşvik etmektedir. Bir ülke ekonomisinde sürdürülebilir büyümenin sağlanabilmesinin en önemli şartlarından bir tanesi demokratik ortamı oluşturacak reformların hayata geçirilmesidir.

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GENOME-WIDE DETERMINATION OF HSP60 GENES IN WATERMELON (CITRULLUS LANATUS)

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Abstract: Watermelon is a member of Cucurbitaceae family which is a model system for vascular biology studies. Heat shock proteins (Hsp) are ubiquitous proteins that are synthesized extensively in all organisms. Hsp60 family (chaperonins) of heat shock proteins is key components of cellular chaperone machinery. In this study, identification and characterization of Hsp60 family members in watermelon genome were aimed. A total of 27 *ClaHsp60* genes were identified. The lengths of ClaHsp60 proteins were between 91 and 1792 amino acids and their molecular weights varied between 9.6 and 200.08 kDa. *ClaHsp60* genes were mapped on 11 chromosomes of watermelon. ClaHsp60 proteins can be classified into 3 groups based on phylogenetic tree. Predominantly, 3 motif patterns were observed for ClaHsp60 proteins. As a result of the exon-intron analysis, all *ClaHsp60* genes had introns except of *ClaHsp60-09* and *ClaHsp60-16*. Predicted biological role of ClaHsp60 proteins were in cellular processes. They were located especially in cell, cell part or organelle. Based on 3D protein structure prediction analysis, α-helix structure was mainly observed in all ClaHsp60 proteins. These genome-wide studies enable to reveal characterization of protein families in organisms.

Keywords: Watermelon, Hsp60, Chaperonins, Genome-wide identification

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GÖÇLERIN ŞEHRIN DILSEL GÖRÜNÜMÜNE YAPTIĞI ETKİYE BIR ÖRNEK: ŞANLIURFA'DAKI ARAPÇA LEVHA VE TABELALAR8

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ÖZET

Özet: Uluslararası göçler; gerçekleşme zamanı, yoğunluk derecesi (miktar), devamlılık, ani ve hızlı olma durumuna bağlı olarak, göçün yöneldiği alanlarda önemli ekonomik ve sosyal etkiler yapmaktadır. Öyle ki, göçlerin kontrolsüz bir durumda gerçekleşmesi halinde, ortaya çıkan bu etkiler daha çabuk görülebilmekte, aynı zamanda daha büyük ve kalıcı olabilmektedir. Şanlıurfa şehri de, bu tarzda gerçekleşen zorunlu ve ani Suriye kaynaklı göçler nedeniyle sosyo-ekonomik ve kültürel etkilere maruz kalmıştır. Nitekim Şanlıurfa Valiliği İl Göç İdaresi Müdürlüğünün 2016 yılı verilerine göre, Türkiye'de bulunan toplam (kamp ve kamp dışı) 2.753.696 sığınmacının 395.823'ü (kayıtlı olanlar) Şanlıurfa ilinde bulunmaktadır. Bununla birlikte bunun 110.058'i kamplarda kalmakta, geriye kalanlar ise ilin farklı şehirlerinde ikamet etmektedir. Şanlıurfa şehrinde ikamet eden Suriyeli sayısı da 113.568'tir.

Yukarıda ifade edilen miktara göre (395.823), Şanlıurfa ili, İstanbul'dan sonra (408.161) en fazla göçmen/sığınmacı barındıran ikinci il olmuştur. Ayrıca bu rakamlara göre Türkiye'deki Suriyelilerin (2.753.696) yaklaşık %14.4'ü Şanlıurfa ilinde yaşamaktadır. Bununla birlikte ilde bulunan kayıtlı Suriyeli sığınmacıların (395.823) 2015 yılı Şanlıurfa il nüfusuna (1.892.320) oranı %20.9'e ulaşmıştır. Başvuru aşamasında ve değerlendirilmeyi bekleyen Suriyelilerin sayısı da (toplam 49.671 kişi) bu miktara eklendiğinde oranı %23.5'i aşmaktadır. Şehirde ikamet eden 113.568 Suriyelinin toplam şehir nüfusuna (Karaköprü dahil 2012 yılı şehir nüfusu:586.540) oranı ise %19.4 olarak görülmektedir. Gerek kamplarda, gerek Şanlıurfa şehrinde ve gerekse ilin diğer şehirlerinde ikamet eden Suriyeliler Şanlıurfa şehri ile sürekli ilişki içinde olmakta ve şehrin sosyo-ekonomik ve kültürel ortamını tüketmektedirler. Öte yandan devamlı burada kalma düşüncesi ve isteği; Suriyelilerin kendi istihdam alanlarını oluşturma, örgütlenme ve çeşitli sosyo-ekonomik faaliyetleri gerçekleştirme (eğitim, yardımlaşma, basım-yayım, ticari işletme oluşturma) sonucunu ortaya koymaktadır. Bunun da, özellikle, göç edenlerin miktarının yüksek olmasının da bir sonucu olarak, şehre bir çok yönden etki yapması kaçınılmazdır. İşsizlik, sosyal ve kültürel uyum, demografik yapıya etki, suç gibi diğer etkiler yanında önemli etkilerden birisi de şehrin sosyo-ekonomik ortamındaki görünürlülük materyallerini de (tabela, levha, afiş, duyuru, vs) etkilemektedir. Başka bir ifade ile bu göçler şehrin dilsel görünümünü/manzarasını (linguistic landscape) değiştirmiştir.

Dolayısıyla bu çalışmada, yaşamın birçok kademesinde (ulaşım hizmetleri, eğitim kurumları, işyerleri, binaların duvarları ve direkler, hastaneler, vs.) görülen bu yeni dilsel görünümdeki yapının ortaya çıkışı, boyutu, özellikleri ve dağılışı çalışmanın amacını oluşturmaktadır.

Anahtar Kelimeler: Dilsel görünüm, uluslararası göçlerin etkisi, Şanlıurfa, şehre uyum, görünürlülük materyalleri, Arapça tabelalar

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GREEN PROCESSES IN THE TEXTILE DYEING AND FINISHING

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Abstract: Large amount of water is utilized in the textile dyeing and finishing processes and as a result of that, the treatment of this large amount of effluent creates cost and very important environmental problems. Therefore, the "Green Production" concept is the first key issue as far as the textile wet processes are concerned. In the last two decades, new technologies have been utilized in order to minimize the processing time, energy consumption, water consumption and the amount of effluent. "Green production" is a preventive business strategy in textile dyeing and finishing industry and may include the following emerging technologies:

- use of ultrasonic energy in textile dyeing and finishing,
- use of microwave energy in textile dyeing, drying, and dye fixing,
- use of plasma technology in textile dyeing and finishing,
- use of supercritical fluids in textile dyeing and cleaning,
- use of ozone in bleaching of textiles and also in the treatment of dyeing effluents,
- use of combined enzymatic processes in the pre-treatment of textiles,
- use of the "Direct Dyebath Reuse" technology to minimize the amount of water to be used,
- reuse of recovered chemicals and dyes from processes and
- reuse of decolorized effluent in dyeing and finishing.

This current work will review the recent technology used in the textile wet processes with a particular emphasis on the work carried out in the Turkish textile industry.

Keywords: Green chemistry, Dyeing, Microwave, Ultrasound, Supercritical carbon dioxide

Introduction

Water has been an essential medium in many textile wet processes including pre-treatment, dyeing, finishing and printing. These processes use large amount of water and the effluents of these processes create very big environmental problems and cost in the textile industry as far as the treatment of the polluted water is concerned (Christie, 2007). The Water Stress Index is defined as the ratio of a country's total water withdrawal to its total renewable freshwater resources and it is a measure of the pressure exerted on water resources (Bixio, 2006). A recently published OECD (Organisation for Economic Co-operation and Development) document draws attention to the fresh water availability with a projection to the year 2050 (OECD, 2012). Therefore, in the last two decades, new strategies were put in use and the research has been done to minimize the amount of process water, the amount of chemicals used, the process time and the energy consumed for each process (EC, 2003). In order to that, the following strategies, under the name of "Green Production", are employed:

- use of ultrasonic energy in textile dyeing and finishing,
- use of microwave energy in textile dyeing, drying, and dye fixing,
- use of plasma technology in textile dyeing and finishing,
- use of supercritical fluids in textile dyeing and cleaning,
- use of ozone in bleaching of textiles and also in the treatment of dyeing effluents,
- use of combined enzymatic processes in the pre-treatment of textiles,
- use of the "Direct Dyebath Reuse" technology to minimize the amount of water to be used,
- reuse of recovered chemicals and dyes from processes and
- reuse of decolorized effluent in dyeing and finishing.

"Green production" is a preventive business strategy in textile dyeing and finishing industry and nowadays, more research is carried out on these topics.

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Use of Ultrasonic Energy in Textile Dyeing and Finishing

Ultrasonic waves lie between 20 kHz and 500 MHz frequencies. The chemical power of ultrasound comes from the *cavitation* phenomena and the cavitation occurs as the micro bubbles in water when a negative pressure applies to it. In the collusion of these bubbles, a large amount of energy exists. The use of ultrasonic energy decreases the process time and the required energy for the process. Ultrasonic energy is used in textile processes for pre-treatment (desizing, bleaching and scouring), dyeing and textile finishing processes (Öner, 2009; Yachmenev (2007); Basto, 2007). In the textile sector, a pilot size dyeing machine which was equipped with ultrasonic transducers was constructed and used in dyeing of textile materials (Perincek, 2009); however, no commercial size dyeing machine is yet available.

Use of Microwave Energy in Textile Dyeing, Drying and Dye Fixing

In the electromagnetic spectrum, the microwaves (MW) are in the range between radio and infrared waves. The microwave region of the electromagnetic spectrum corresponds to wavelengths of 1 cm to 1m (30 GHz to 300 MHz) and only the frequencies 2.45 GHz (12.2 cm) and 900 MHz (33.3 cm) are available for dielectric heating. The microwave applicators used for chemical purposes generally operate at 2.45 GHz (12.2 cm) (Tierney, 2005).

It has been reported that the dyeing processes have been enhanced by MW heating and the dyeing rates have been increased (Öner, 2013; Haggag, 1995; Berns, 1979; Kim, 2003; Haghi, 2004; Buyukakinci, 2005; Nourmohammadian, 2008; Yoshimura, 2009; Ohe, 2009; Montazer, 2007). Microwave energy improves the dyeability of flax fibre with reactive dyes (Sun, 2005). Microwave energy is also used for dye fixing and drying in textile processes. More research goes on the construction of commercial size microwave treatment machine to be used in textile processes.

Use of Plasma Technology in Textile Dyeing and Finishing

Plasma technology is one of the environmentally friendly techniques. The enormous advantage of plasma processes concerns the drastic reduction in pollutants and a corresponding cost reduction for effluent treatment (Morent, 2008). Atmospheric pressure plasmas (typically corona plasmas) are used for the ease of generation of gas-phase radicals which react with and modify the polymer surface (Shishoo, 2007). Particularly, the plasma treatment is useful for the polymers which cannot be dyed easily by the conventional methods, e.g. exhaustion or impregnation (Park, 2001; Shahidi, 2007).

Use of Supercritical Fluids in Textile Dyeing and Cleaning

Carbon dioxide has a low critical point (74 bar and 31°C) and it can be used in many applications in industry. As a super critical fluid, it is a very good solvent for hydrophobic materials. Carbon dioxide is a cheap, inert, non-combustible, non-toxic and easily available chemical. There are several reviews in the literature to summarize the use of super critical carbon dioxide in textile processes (Derbent, 2015; Banchero, 2013; Banchero, 2008; Liao, 2012;). Textile fibres containing polyester (Cardozo-Filho, 2015; Giorgi, 2000; Van Der Kraan, 2007; Zheng, 2015), acrylic (Jun, 2005; Zheng, 2017), polyamide (Elmaaty, 2015; Liao, 2000;), wool (Güzel, 2000), Nomex (Kim, 2006), ramie (Liu, 2000), cotton (Fernandez Cid, 2007; Schmidt, 2003) and the blend of polyester/cotton (Maeda, 2004) can be successfully dyed by the supercritical carbon dioxide. It can also be used in the textile cleaning and the finishing processes (Rombaldoni, 2009). A very recently, a Dutch company, DyeCoo has introduced a beam dyeing machine which uses the super critical carbon dioxide technology (DyeCoo, 2017).

Use of Combined Enzymatic Processes in the Pre-Treatment of Textiles

The possibilities of enzymatic processes have been discussed in detail in the literature (Cavaco-Paulo, 2003). It has been suggested that using various types of enzymes, namely amylase, protease, lipase, pectinase, laccase, glucose oxidase, catalase and cellulase, from the beginning to the end of the preparatory processes of textile substrates could be achieved (Quandt, 2000). The combined enzymatic processes of textile materials were also achieved by several researchers (Öner, 2011; Aly, 2010; Hebeish, 2009; Kokol, 2004; Tanapongpipat, 2008; Tzanov, 2001). The use of enzymes enhances the process efficiency, shortens the process time and requires the use of less energy, compared to the conventional methods which are carried out separately. In the Turkish textile companies, the enzymes, namely amylase, pectinase and catalase are widely used in the preparatory processes.

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Reuse of Recovered Chemicals and Dyes from Processes

Dyes and various chemicals can be recovered from the effluents of the processes and these are very valuable. For example, there are several techniques which are used to separate the caustic soda from industrial wastewater, namely neutralization, filtration process, leaching, evaporation, and electrodialysis (ED). In one recent sturdy, caustic soda was recovered from industrial wastewater by two-stage diffusion dialysis (DD) and electrodialysis (ED) processes (Imran, 2017). Also, the recovering and reuse of sodium hydroxide by evaporation is very beneficial as reported in a recent work (Topgül, 2017). A 4-stage evaporator was used to recover NaOH from the mercerization effluent containing 11.8°Bé weak caustic. The total benefit of the system was almost 178 USD/h per 1 ton of fabric (Topgül, 2017). Textile dyes, particularly indigo dye from the denim plant' effluents are successfully recovered and reused for the next process (Wambuguh, 2008; Amaral, 2014).

Use of Ozone in Bleaching of Textiles and also in the Treatment of Dyeing Effluents

Ozone is a very powerful oxidant and the bleaching of cellulosic fabrics by a process containing ozone efficiently is possible (Prabaharan 2001; Arooj 2013). Ozone is also used to decolorize the dyeing effluents. Around 90% reduction of the incoming COD and BOD was reduced effectively (Carriere, 1993; Colindres, 2010; Constapel, 2009; Günes, 2012; Takahashi) .

Conclusion

Water is an essential chemical for the dyeing and finishing industry. However, the prevention at source can be achieved by the use of new technologies, the reuse and the recycling of water. The minimization of water usage in the textile wet processes can be accomplished by putting one or more technologies mentioned above. From the most desirable to less desirable, the hierarchy of pollution control measures are listed below (Christie, 2007):

- Prevention
- Reduction
- Reuse
- Recovery
- Recycling
- Energy recovery
- Disposal

No doubt that the super critical carbon dioxide as a solvent in textile dyeing and finishing will substitute water in near future, since there is no effluent discharged to the environment after the process and more research on this technology is going on. Also, the reuse of spent dyebath, particularly in disperse dyeing of polyester is widely practised in the industry. Prevention is always better than cure and the right strategy can save money, reduce pollution, reduce waste disposal and effluent discharge, and improve product quality.

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HARRAN ÜNİVERSİTESİ OSMANBEY KAMPÜSÜ'NDE BİYOKLİMATİK KONFOR ŞARTLARININ ARAŞTIRILMASI

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Özet: Harran Üniversitesi, karasal koşulların etkisive yüksek yaz sıcaklıklarıyla karakterize edilen karasal Akdeniz iklimi bölgesinde yer alan Şanlıurfa'da kurulmuştur. Üniversitenin merkezi kampüsünü, Şanlıurfa şehir merkezinin 20 km kadar doğusunda yeralan Osmanbey Kampüsü oluşturur. Çok sayıda fakülte, yüksekokul, enstitü, araştırma merkezi, yaşam alanları ve Tıp Fakültesi Hastanesi'ni bünyesinde bulunduran Osmanbey Kampüsü'nde her gün değişmekle birlikte 20.000 civarında insan bulunmakta, bu yönüyle kampüs alanı önemli bir nüfus kitlesini barındırmaktadır.

Bu çalışmada Harran Üniversitesi OsmanbeyKampüsü'nde termal biyoklimatik koşulların analiz edilmesini amaçlanmıştır. Biyoklimatik konfor koşullarını belirlemek içininsan vücudunun enerji dengesini esas alan Fizyolojik Eşdeğer Sıcaklık indisi (PET) kullanılmıştır. PET değerinin hesaplanmasında 2013-2017yılları arasındaki dönemde Osmanbey kampüsünde yer alan Meteoroloji Genel Müdürlüğü'ne ait otomatik meteoroloji istasyonunun saatlik sıcaklık, nem, rüzgâr hızı verileri ile Şanlıurfa Meteoroloji İstasyonuna ait bulutluluk verilerinden yararlanılmıştır. Araştırma kapsamında kampüs alanında insan biyoklimatolojisi açısından termal stres seviyesinin değişimi ortaya konulmuştur.

Keywords: Biyoklimatik konfor, Fizyolojik eşdeğer sıcaklık, Thermal Stres, Harran Üniversitesi

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IDENTIFYING PREDICTIVE GENES FOR SEQUENCE CLASSIFICATION USING ARTIFICIAL IMMUNE RECOGNITION SYSTEM

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Abstract: The small sample data in the high-dimensional data space are encountered in biological applications such as in gene expression microarrays and proteomics mass spectrometry. Due to the fact that such data have characteristics such as high-dimensionality and small sample dimension, their classification becomes hard. Many feature selection algorithms were developed for the purpose of reducing the dimensionality of this kind of data and improving the accuracy of classifiers. In the realization of area discoveries through feature sets, the selected feature subsets skip important information in unnecessary feature sets. This problem comes into prominence with the feature, in the process of performing the discovery of information from the high-dimensional data space. This paper evaluates the proposed ensemble gene selection method based on a local feature selection to Artificial Immune Recognition algorithms in order to find the optimal biological sequences. The unique feature of this study is developing the different type of associated feature groups defined using high-dimensional data in order to find important tumor-related genes. The comparative tests were performed on the training set and test set separately with using support vector machines and k-NN classifiers.

Keywords: Group Based Learning, Gene Selection, Sequence Classification, Machine Learning

Introduction

The discovery of biomarkers from high-dimensional data is an important research topic in the biomedical field. Selecting the most distinctive or critical features for classification is a feature selection problem. Many feature selection algorithms were developed for the purpose of reducing the dimensionality of this kind of data and improving the accuracy performance of the classifiers. A gene selection framework must be established in order to select the most discriminating genes in order to identify biomarkers.

Feature selection is a problem of minimum subset selection from the original feature set for the best accuracy estimation. Generally high dimensional feature selection methods can be classified into two categories: Filters and Wrappers. For filter methods, evaluation of the feature discriminability depends on only the inherent features of the microarray data and subclass information, such as density, correlation, Chi-square statistics, and relief. Wrapper methods search for an optimal feature subset by the evaluation function of a learning algorithm for assessing the goodness of a feature subset. Filters sometimes used as a pre-processing step for other approaches and usually fast.

The idea of the ensemble gene selection framework is converging to original feature groups by creating a set of feature groups is based on the principles of group-based learning method. Ensemble gene selection method depends on feature group formation and feature selection procedures in order to improve the model. In feature grouping stage, different samplings of the original data are generated to create different subset groups. Identifying different type of feature groups relying on data-driven or knowledge-driven group formation method. The data-driven group formation method, exploits the characteristics of target data and the knowledge-driven group formation method is to find group of associated genes or proteins that have coherent expression pattern in the same pathway (He, Yu, 2010). Within the scope of this work, data-driven feature group formation used to pre-select the different type associated gene subset groups. Each type of associative feature group is improved by being optimized with Artificial Immune Recognition Systems and learning is performed at the group level. Within the scope of this study, in the feature selection framework the feature groups were taken as a basis. An attempt to develop the associated feature groups defined using high-dimensional data based on a local feature selection to Artificial Immune Recognition System (LFSAIRS1, LFSAIRS2, Parallel-LFSAIRS1, Parallel - LFSAIRS2). Creating different type associated feature groups from high-dimensional data is mentioned as a associative feature groups in the second part of the paper, the Artificial immune recognition systems with proposed ensemble gene

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selection framework is mentioned in the third part, the data set is mentioned in the fourth part, and the comparative performance measurements of the optimal biological sequences are mentioned in the fifth part.

Associative Feature Groups

The idea of converging to original feature groups by creating a set of feature groups is based on the principles of group-based learning method. Relational features have a very high correlation in high-dimensional data sets makes it possible to use feature groups by being taken as a basis.

In this paper, the first type of the associative feature groups was obtained by the DGF (Dense Group Finder) algorithm. The main part of the DGF is the kernel density estimation and iterative mean shift procedure for all features. Density-based feature groups were obtained using the kernel density estimation designated in equation (1). The *h* parameter used for the kernel bandwidth refers to the number of nearest neighbors, *p* refers to the total number of features in the data set, *fi* refers to any feature, and *K* refers to the kernel function. (C_j+1) was calculated to determine the order of sequential locations of the kernel function. (C_j+1) positions the average by shifting it to a denser peak point using the other features in the local region determined with *h* parameter starting from the average of a certain *fi* feature (Loscalzo et al., 2009).

$$\mathrm{Cj}+1=\frac{\sum_{i=1}^{p}\mathrm{fi}\ \mathrm{K}\ \left(\frac{\mathrm{Cj}-\mathrm{fi}}{\mathrm{h}}\right)}{\sum_{i=1}^{p}\ \mathrm{K}\ \left(\frac{\mathrm{Cj}-\mathrm{fi}}{\mathrm{h}}\right)},\ \mathrm{j}=1,2,\ldots \qquad (1)$$

The second type of the associative feature groups was obtained by the CFG (Correlation-Based Feature Group) algorithm. The CFG is a filter-based feature selection method that sorts the feature subset by the correlation-based intuitive function. The CFG algorithm examines the usefulness of subset of attributes based on a heuristic evaluation function. In choosing a correlation-based feature, each attribute is taken into account in the correlation between the attributes, as well as the predictive predicting of the class label. The value of the heuristic evaluation function used in the evaluation of the attributes is determined by equation 2. The intuitive usability of a subset of *S* attributes with *k* attributes is represented by $meritS$, the mean attribute-class correlation is presented by *rcf* for ($f \epsilon S$), and the correlation between the mean attributes is presented by *rff* parameters.

$$meritS=\frac{\mathrm{k}*\mathrm{rcf}}{\sqrt{\mathrm{k}+(\mathrm{k}-1)*\mathrm{rff}}} \qquad (2)$$

The third type of the associative feature groups was obtained by the IGFG (Information Gain-Based Feature Group) algorithm. This method selects attributes with entropy based scores. The Entropy criterion makes a choice with the help of knowledge in the feature. For this reason, the feature is treated as a distribution and its entropy is found. The entropy of the f_t attribute with *M* data can be found by equation 3.

$$E=-\sum_{i=1}^{M}(ft(i)\log(ft(i)) \qquad (3)$$

Within the scope of this study, an attempt to create feature group sets was made by the DGF, CFG and IGFG algorithms. These feature groups obtained based on the ensemble feature selection framework using data perturbation. These feature group sets were developed with the meta-dynamics of the Artificial Immune Recognition Systems like a single cell in order to find the optimal biological sequences.

Artificial Immune Recognition System

Artificial Immune Systems are a class of adaptive computer algorithm based on metaphor of the mammalian immune system. Application areas of the Artificial Immune Systems are pattern recognition, fault and anomaly detection, data mining, classification, robotics, optimization and anomaly detection. Artificial immune recognition algorithm is one version of the Artificial Immune System which is specifically designed for the classification problems.

Artificial Immune Recognition Systems (AIRS) consist of the stages of initialization, memory cell recognition, resource competition and the selection of memory cells. In this approach, an antigen represents a single data instance and allocated to the closest matching ARB (antibody) in the pool of ARBs. At the initialization stage, the data set is normalized to the range of [0,1]. After normalization, the affinity threshold is calculated by equation (4). At the next stage, antigens are presented to the storage pool with antigen training. At the memory cell recognition stage, a stimulation value is assigned to these cells by stimulating the recognition cells in the memory pool. Affinity is calculated by equation (5), the stimulation values are calculated by equation (6) and (7).

The recognition cell with the highest stimulation value is calculated by equation (8) then $\mathrm{M_{cmatch}}$ cell is cloned and mutated. The number of clones is calculated by equation (9),

$$affinity\ threshold=\sum_{i=1}^{n}\sum_{j=j+1}^{n}\left(\frac{affinity(\mathrm{agi,agj})}{n(n+1)/_2}\right) \qquad (4)$$

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$$affinity(\text{agi}, \text{agj}) = 1 - \text{Euclidean distance}(\text{agi}, \text{agj}) \quad (5)$$

$$stimulation = 1 - \text{affinity} \quad (6)$$

$$stimulation(\text{mc}, \text{ag}) = \begin{cases} \text{affinity}(\text{mc}, \text{ag}) & \text{if mc. class} = \text{ag. class} \\ 1 - \text{affinity} & \text{otherwise} \end{cases} \quad (7)$$

$$\boldsymbol{Mcmatch} = \textbf{argmax}(\textbf{stimulation}(\textbf{mc}, \textbf{ag})) \quad (8)$$

$$\boldsymbol{numClones} = \textbf{stimulation} * \textbf{clonalRate} \quad (9)$$

At the resource competition stage, when mutated clones are added to the ARB (artificial recognition spheres, antibody) pool, competition begins for the time source. According to the stimulation value, limited resource assignment to the ARB pool is made according to the stimulation value. ARBs without enough resources are removed from the system. When the stop criterion is achieved, the process ends, and the ARB with the highest stimulation value is selected as the candidate memory cell. At the selection of memory cells stage dynamically and evolving developed Memory cell pool in the algorithm is used for the classification process (Brownlee, 2005).

The basic steps of the AIRS1 algorithm, the first version of artificial immune recognition systems, and the AIRS2 algorithm, the second version, are same. The main difference between them is that the ARB pool is used as a permanent resource in the AIRS1 algorithm; it is used as a temporary resource in the AIRS2 algorithm. In the case of being used as a permanent resource, ARBs remaining from previous steps cause the algorithm to spend more time by being involved in the competition for limited resources. Therefore, the complexity of the AIRS2 algorithm is less. While AIRS1 uses the mutation parameter that can be defined by the user, AIRS2 uses the concept of somatic hyper mutation where the mutation ratio of a clone is proportional to the affinity (Wang, Chen, Adrian, 2014). While the classes of clones may change after the mutation process in the AIRS1 algorithm, classes are not allowed to change in the AIRS2 algorithm. Parallel AIRS is work into exploiting the parallelism, which caused some loss in the data reduction benefits of artificial immune recognition system. The versions of the Parallel AIRS are Parallel AIRS 1 and Parallel AIRS2. Which are modeled based on the distributed nature and parallel processing feature of the mammalian immune system (Brownlee, 2005). At first, each part of the training data set is assigned to np number of processes. Thus, it is ensured that np number of the memory pool is created by running the AIRS algorithm on each process. As a result, the memory pools obtained are merged.

A. The proposed ensemble gene selection Framework

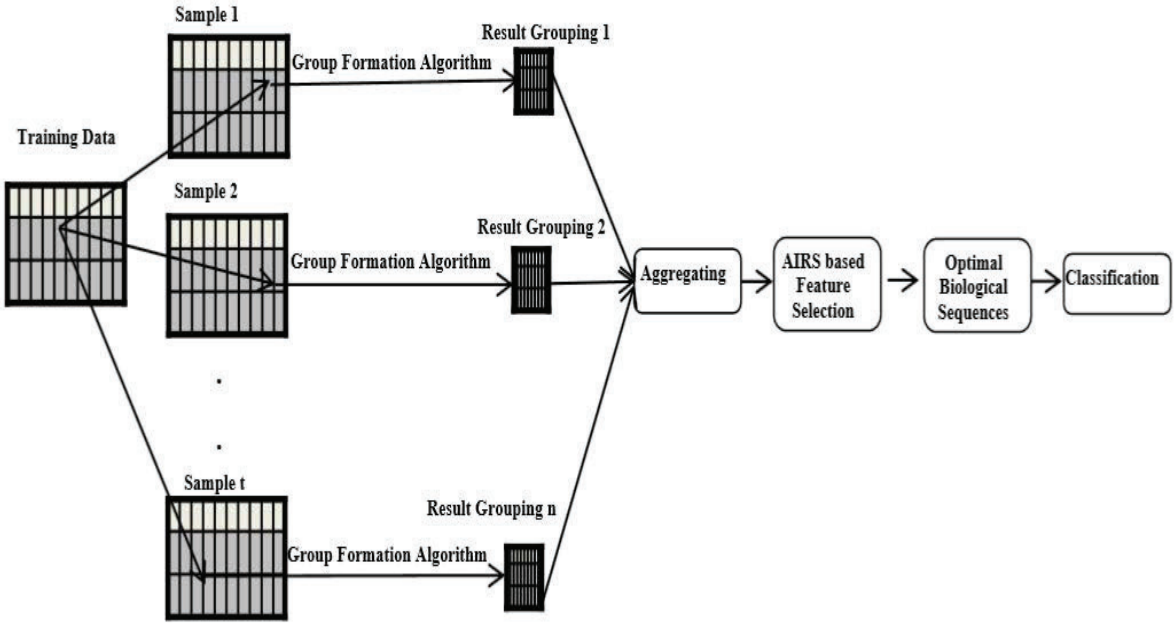

Figure 1. Proposed ensemble gene selection framework

B. Standard Artificial Immune Recognition Systems:

Input: InputPatterns, clone rate, mutationrate, stimthresh, resourcemax, affinitythresh
Output: cell memor ←eInitializeMemoryPool(InputPatterns)

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```
    For (InputPatterni ∈ InputPatterns)
      Stimulate (cellsmemory, InputPatterns)
cellbest esGetMostStimulatedby1NN (InputPatterni, cellsmemory)
  If cellclass,best ≠eInputPatternclass,i
    Then cellmemory  moCreateNewMemoryCell (InputPatterni )
  Else  clonenum  ← cellsstim, best x clonerate x mutationrate
      cellsclones ←lcellsbest
       For (i to clonenum )
 cellsclone ←lCloneAndMutate (cellsbest)
  End
  While (AverageStimulation (cellsclones ) ≤, stimthresh
        For (celli ∈ cellsclones)
         cellsclones loCloneAndMutate (cellsi)
        End
      Stimulate (cellsclones, InputPatterns)
      ReducePoolToMaximumResources (cellsclones, resourcemax)
  End
  cellsc elGetMostStimulated (InputPatterni, cellsclones)
  If (cellsstim , c > cellsstim , best)
  Then
   cellsmemory ←ecellsc
   If (Affinity(cellsc , cell best) ≤ affinitythresh
   Then DeleteCell (cellsbest , cell memory)
   End
 End
  End
 End
 Return (cell memory)
```

The Pseudo code of the standard AIRS is represented (Wang et al, 2014).

C. *Local Feature Selection to Artificial Immune Recognition Systems: LFSAIRS*

1. The initial set of feature group sets are created based on associative group formation algorithm.
2. Do for each Antigen (Ag) until training process is completed:
   - 2.1. Calculating fitness value of the each feature set is calculated by taking into account only best matching cell
   - 2.2. Until termination do :
   - 2.3. The highest fitness value of the feature set is selected as a best feature set
   - 2.4. Generation of l clones of the best feature set
   - 2.5. Mutation of the each clone
   - 2.6. Calculating fitness of the each clone by taking into account only best candidate cell
   - 2.7. Set the highest fitness value of the feature set as a candidate optimum feature subset
   - 2.8. If best candidate cell is sufficient calculate the optimum subset then go step 3. else go 2.3
3. After memory cell replacement stage, set the optimum subset of attributes as the subset of the new attribute. If training process is completed go to Step 4, else go to step 2.
4. Selection of the best optimized feature set
5. Classification of the best optimized feature sets based on test set

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Data Sets

The most common six microarray data sets were used in this study. Table 1 includes information on the genes, samples and class numbers contained in the data sets used in this study (Loscalzo et al, 2008).

Table 1: Microarray Data set

Dataset	Gene	Sample	Class
Colon	2000	62	2
Lungstd	5000	181	2
Prostate	6034	102	2
SRBCT	2308	63	4
Lymphoma	4026	62	3
Leukemia	7129	72	2

The goal of this work is identifying predictive genes for sequence classification at the group level using Artifical Immune Recognition Systems. Experimentally obtained performance values were achieved by dividing the data sets as 70% training and 30% test set. The proposed ensemble gene selection framework is applied only on training set. The goal of the designed framework is to select optimal biological sequences only on the training set in order to avoid over-fitting and selection bias problems. Therefore, the test set independent of the gene selection process. Within the scope of this work, t is the number of bootstraps. Bootstrap was applied on the training data set in order to ensure the resistance of training samples against variations. Then n is a number of the selected feature groups, which are created by DFG, CFG and IGFG algorithms. These group feature selection algorithms are separately running on the each of the bootstrap data sets. We set the t and n parameters respectively to 10 and 10 for all algorithms within the scope this paper. The number of features contained in the feature groups obtained at the end of the each group feature selection algorithm varies to for each data set. Learning was performed at the group level by improving the feature groups presented to the LFSAIRS1, LFSAIRS2, Parallel-LFSAIRS1 and Parallel-LFSAIRS2 like a single cell. Selecting an informative gene subset obtained by classification ability of a gene subset. The fitness function of each candidate solution was calculated according to the KNN classifier accuracy performance. WEKA was used to obtain classifying accuracies. For all algorithms, the classifying accuracy of the optimal candidate solution obtained at the end of each run with using the test data set with 10 cross-fold validations. The performance values added to the results were calculated by taking the average of the number of runs. Moreover, to assessment of the discrimination of more important genes is measured by its occurrence frequency of gen subset formation. Each of the feature groups represents a candidate solution and the presence of the related feature in a feature group was encoded with 1 while the absence of it was encoded with 0. In this study, the affinity threshold value, clonal ratio, mutation ratio, np, total source, stimulating value, hypermutation ratio, run number and iteration number parameters of the Artificial Immune Recognition Systems took the values of 0.1, 10, 0.15,2, 150, 0.9, 2.0, 30 and 50, respectively.

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Performance Results and Discussions

Within the scope of this study, it was focused on the problem of identifying predictive genes for sequence classification in order to find important tumor-related genes.

Table 2: Representative gene subsets obtained by LFSAIRS1 and LFSPAIRS1 based on Associative feature groups

			LFSAIRS1 SVM KNN					LFS PAIRS1 SVM KNN				
Data Set	Group Type	No	Optimal Gene Subsets	10 CV % on Train Set	10 CV % on Test Set	10 CV % on Train Set	10 CV % on Test Set	Optimal Gene Subsets	10 CV % on Train Set	10 CV % on Test Set	10 CV % on Train Set	10 CV % on Test Set
Colon	DFG	1	**{T63133,T57630}**	63.2	69.2	**73.4**	**92.3**	{T47377,H55759,D15057, H77536}	67.3	69.2	73.4	61.5
		2	{T53889,M22632,R83349,U10117,X14830}	61.2	69.2	73.4	61.5	{M83751, M27903}	63.2	69.2	59.1	53.8
	CFG	1	{L35545,H79349}	63.2	61.5	57.1	69.2	{U25265,T47584,X02750}	63.2	69.2	63.2	64.6
		2	{T52003,L35249,L11370}	63.2	61.5	63.2	61.5	**{H22579,X59871}**	**73.4**	**76.9**	**79.1**	**77.9**
	IGFG	1	{H55759,M83254,D15057}	63.2	69.2	69.1	76.9	{R38513,H29293,T67905, U18934}	63.2	69.2	65.3	61.5
		2	{T55558,R41561, M87434}	71.4	69.2	65.3	69.2	{R60217, J00277}	63.2	69.2	67.8	84.6
Lungstd	DFG	1	{32952_AT, 32980_F_AT}	86.8	88.8	95.2	88.2	**{35052_R_AT, 35053_AT, 35064_AT}**	**98.6**	**92.2**	**96.5**	**97.2**
		2	**{33052_AT, 33078_AT, 33087_S_AT}**	**95.8**	**88.8**	**96.5**	**92.8**	{35922_AT, 35932_AT, 36232_AT}	97.2	91.6	96.5	88.8
	CFG	1	{33270_I_AT, 33306_AT}	82	86.1	74.4	77.7	{32704_AT, 33270_I_AT, 33306_AT}	82	86.1	78.6	86.1
		2	{40401_AT, 40686_AT, 40700_AT}	82	88.8	80	91.6	{36370_AT, 36411_S_AT}	82	86.1	80.6	88.8
	IGFG	1	{33301_G_AT, 33307_AT, 33304_AT}	82	86.1	78.6	91.6	{AFFX-THRX-5_AT, 31439_F_AT, 31447_AT, 31477_AT}	84.8	86.1	82	88.8
		2	{32702_AT, 32711_G_AT, 32716_AT}	82	86.1	78.6	92.4	{36720_AT, 36806_AT}	82	86.1	76.5	77.7
Prostate	DFG	1	{32950_AT, 33469_R_AT}	80.2	71.4	71.6	71.4	{33973_AT, 34020_AT}	74	57.6	69.1	57.1
	CFG	1	{32376_AT, 32884_AT}	51.8	66.6	53.0	61.9	{41012_R_AT, 41017_AT, 41023_AT}	56.7	55	59.5	52.8
	IGFG	1	{38933_AT, 38953_AT}	49.3	47.6	76.5	71.4	{33958_AT, 33959_AT}	61.7	57.6	59.2	52.3
		2	{34930_AT, 34931_AT, 34934_AT}	42.8	46.9	60.4	71.4	{34930_AT, 34932_AT, 34934_AT 37469_AT, 37470_AT, 37471_AT	70.3	57.4	59.2	52.3
SRBCT	DFG	1	**{GENE2125, GENE2142, GENE2144, GENE2190, GENE2197}**	**66**	**63.8**	**68**	**84.6**	{GENE1802, GENE1820}	68	63.8	66	69.2
	CFG	1	{GENE1113, GENE1114, GENE1115, GENE1679, GENE1680}	60	63.8	38	69.2	**{GENE971, GENE990, GENE1709, GENE1711}**	**69**	**68.4**	**68**	**69.2**
	IGFG	1	{GENE1007, GENE1008, GENE1009, GENE2305, GENE2306}	62	68.4	68	56.1	{GENE773, GENE774, GENE842, GENE843, GENE844}	64	38.4	56	61.5
Lymphoma	DFG	1	**{GENE654X, GENE627X, GENE659X}**	**81.6**	**76.9**	**93.8**	**84.6**	{GENE3142X, GENE3096X}	65.5	76.9	77.5	84.6
		2	{GENE579X, GENE585X}	81.6	76.9	93.8	61.5	**{GENE770X, GENE761X, GENE507X}**	**83.6**	**84.6**	**81.6**	**92.3**
	CFG	1	{GENE2559X, GENE1194X}	65.3	76.9	67.3	61.5	{GENE58X, GENE1094X, GENE40X}	65.3	76.9	57.1	69.2
	IGFG	1	{GENE2740X, GENE2741X}	65.3	76.9	59.1	69.2	{GENE3145X, GENE3105X}	65.3	76.9	57.1	61.5
Leukemia	DFG	1	**{M24748_CDS2_S_AT, M31211_S_AT}**	**85.9**	**86.6**	**78.9**	**86.6**	{M32639_AT, M34192_AT}	61.4	86.6	66.6	73.3
		2	**{M96740_AT, S46622_AT, S69232_AT}**	**85.9**	**86.6**	**73.6**	**86.6**	**{X04391_AT, X04707_AT}**	**70.1**	**86.6**	**73.6**	**80**
	CFG	1	{M19722_AT, M19961_AT}	59.6	86.6	63.1	86.6	{AFFX-PHEX-M_AT, AFFX-HUMGAPDH/M33197_3_AT}	59.6	86.6	63.1	73.3
		2	**{U40622_AT, U40714_AT}**	**77.8**	**86.6**	**66.6**	**86.6**	{X04327_AT, X07948_AT, X12433_AT}	61.4	86.6	56.1	73.3
	IGFG	1	{D87002_CDS2_AT,HG2846-HT2983_AT}	59.6	86.6	54.3	73.3	{U61263_AT, U62531_AT, U63717_AT}	63.1	86.6	57.8	80

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Table 3: Representative gene subsets obtained by LFSAIRS2 and LFSPAIRS2 based on Associative feature groups

			LFSAIRS2 SVM KNN					LFSPAIRS2 SVM KNN				
Data Set	Group Type	No	Optimal Gene Subsets	10 CV % on		10 CV % on		Optimal Gene Subsets	10 CV % on		10 CV % on	
				Train Set	Test Set	Train Set	Test Set		Train Set	Test Set	Train Set	Test Set
Colon	DFG	1	{T99498, X15183}	69.3	69.2	67.3	53.8	{U37673,H51015,R54422, R46502}	69.3	61.5	73.6	61.5
		2	{T63539,T93284,U29607}	69.3	69.2	65.3	69.2	{L08069, R93337, T89175}	67.3	61.5	65.3	69.2
	CFG	1	{U25265, T47584, R39130}	63.2	69.2	48.9	61.5	{R21901, R39531, T92736, X14830}	63.2	69.2	59.1	46.1
		2	{M37510, L13738}	63.2	69.2	65.3	46.1	{V00523, T72889}	63.2	69.2	48.9	84.6
	IGFG	1	{D00763,X66839}	63.2	69.2	57.1	69.2	{R09479, M73481,H79349, T41207, T54364, R56052}	63.2	69.2	59.1	69.2
Lungstd	DFG	1	**{34171_AT}**	**91.7**	**86.1**	**86.3**	**91.6**	{33969_AT, 34028_AT}	89.6	83.3	87.5	83.3
	CFG	1	{39640_AT,41037_AT, 2047_AT}	82	86.1	84.8	91.6	**{31806_AT, 31840_AT}**	**90.3**	**86.1**	**91**	**86.1**
	IGFG	1	{33324_S_AT,33334_AT}	82	86.1	81.3	80.5	{31980_AT, 32010_AT, 32383_AT, 32396_F_AT}	82.7	86.1	80	83.3
		2	{33336_AT, 33337_AT, 33698_AT}	83.4	86.1	88.9	86.1	{40719_AT, 40721_G_AT}	82	88.8	83.4	91.6
Prostate	DFG	1	{34718_AT,35172_AT}	76.5	61.9	62.9	47.6	**{37822_AT, 37823_AT, 38156_AT, 38170_AT}**	**90**	**72.3**	**86.4**	**71.4**
		2	{41405_AT, 41439_AT, 41616_AT}	66.6	67.2	61.7	47.6	**{40727_AT, 41016_AT, 41032_AT}**	**88.8**	**76.1**	**83.9**	**71.4**
	CFG	1	{33714_AT, 33809_AT, 34764_AT}	65.4	42.8	58	47.6	{32663_AT, 32735_AT}	53	52.3	66.6	66.6
	IGFG	1	{36768_AT, 36769_AT, 36770_AT}	61.7	57.1	62.9	57.1	{36763_AT, 36764_AT, 36766_AT, 37051_AT, 37054_AT, 37056_AT}	60.4	52.3	60.4	66.6
SRBCT	DFG	1	**{GENE403, GENE415, GENE2048, GENE2081}**	**58**	**61.5**	**72**	**61.5**	{GENE234, GENE253, GENE274}	54	53.8	64	69.2
	CFG	1	{GENE1709, GENE1711}	62	58.4	62	66.1	**{GENE1639, GENE1676, GENE1680}**	**61.3**	**58.9**	**63.2**	**72.4**
	IGFG	1	{GENE767, GENE768, GENE769}	62	58.4	62	63	{GENE864, GENE865}	62	54.6	61.3	60.2
Lymphoma	DFG	1	**{GENE1764X, GENE3594X}**	**77.5**	**76.9**	**77.5**	**84.6**	**{GENE2226X, GENE2902X}**	**81.6**	**76.9**	**77.5**	**92.3**
		2	**{GENE2368X, GENE2369X, GENE2370X, GENE2109X, GENE2108X}**	**93.8**	**76.9**	**89.7**	**76.9**	**{GENE2774X,GENE704X, GENE699X}**	**83.6**	**76.9**	**81.6**	**76.9**
	CFG	1	{GENE1910X, GENE2060X, GENE330X, GENE235X}	65.3	76.9	63.2	53.8	{GENE1241X, GENE891X}	65.3	76.9	55.1	61.5
		2	{GENE1269X, GENE1194X}	63.2	76.9	69.2	53.8	{GENE2598X,GENE2616X, GENE2010X}	65.3	76.9	61.2	69.2
	IGFG	1	{GENE2648X,GENE2647X, GENE2684X}	65.3	76.9	55.1	61.5	**{GENE526X, GENE527X}**	**71.4**	**76.0**	**85.7**	**84.6**
Leukemia	DFG	1	**{M32639_AT, M34192_AT, U40282_AT, U41387_AT}**	**82.4**	**86.6**	**73.3**	**77.1**	**{M72885_RNA1_S_AT, X58528_S_AT}**	**82.4**	**86.6**	**77.1**	**86.6**
	CFG	1	**{M22382_AT, M23533_AT, X17620_AT, X56465_AT}**	**76.6**	**86.6**	**71.9**	**86.6**	**{D50855_S_AT, Y10807_S_AT}**	**74.9**	**86.6**	**76.6**	**86.6**
	IGFG	1	{U83117_AT, X16546_AT, X78712_AT}	59.6	86.6	61.4	73.3	{M17446_S_AT, U50327_S_AT}	61.4	86.6	59.6	73.3

The average classifier accuracy on the training set and test set separately with using support vector machines and k-NN classifier shown in Table 2 and 3. For Colon data set, 2-gene subsets {T63133, T57630} with 73.4% training accuracy has 92.3% prediction accuracy with KNN classifier based DFG for LFSAIRS1. 2-gene subsets {H22579, X59871} with 73.4% training accuracy has 76.9% prediction accuracy with SVM classifier and 79.1% training accuracy has 77.9% prediction accuracy with KNN classifier based CFG for LFSPAIRS1. For Lungstd data set, 3-gene subsets {33052_at, 33078_at, 33087_s_at} with 95.8% training accuracy has 88.8% prediction

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accuracy with SVM classifier and 96.5% training accuracy has 92.8% prediction accuracy with KNN classifier based DFG for LFSAIRS1. 3-gene subsets {35052_r_at, 35053_at, 35064_at} with 98.6% training accuracy has 92.2% prediction accuracy with SVM classifier and 96.5% training accuracy has 97.2% prediction accuracy with KNN classifier based DFG for LFSPAIRS1. 1-gene subset {34171_at} with 91.7% training accuracy has 86.1% prediction accuracy with SVM classifier and 86.3% training accuracy has 91.6% prediction accuracy with KNN classifier based DFG for LFSAIRS2. 2-gene subset {31806_at, 31840_at} with 90.3% training accuracy has 86.1% prediction accuracy with SVM classifier and 91% training accuracy has 86.1% prediction accuracy with KNN classifier based CFG for LFSPAIRS2. For Prostate data set, 4-gene subsets {37822_at, 37823_at, 38156_at, 38170_at} with 90% training accuracy has 72.3% prediction accuracy with SVM classifier and 86.4% training accuracy has 71.4% prediction accuracy with KNN classifier based DFG for LFSPAIRS2. 3-gene subsets {40727_at, 41016_at, 41032_at} with 88.8% training accuracy has 76.1% prediction accuracy with SVM classifier and 83.9% training accuracy has 71.4% prediction accuracy with KNN classifier based DFG for LFSPAIRS2. For SRBCT data set, 5-gene subsets {GENE2125, GENE2142, GENE2144, GENE2190, GENE2197} with 66% training accuracy has 63.8% prediction accuracy with SVM classifier and 68% training accuracy has 84.6% prediction accuracy with KNN classifier based DFG for LFSAIRS1. 4-gene subsets {GENE971, GENE990, GENE1709, GENE1711} with 69% training accuracy has 68.4% prediction accuracy with SVM classifier and 68% training accuracy has 69.2% prediction accuracy with KNN classifier based CFG for LFSPAIRS1. 4-gene subsets {GENE403, GENE415, GENE2048, GENE2081} with 58% training accuracy has 61.5% prediction accuracy with SVM classifier and 72% training accuracy has %61.5 prediction accuracy with KNN classifier based DFG for LFSAIRS2. 3-gene subsets {GENE1639, GENE1676, GENE1680} with 61.3% training accuracy has 58.9% prediction accuracy with SVM classifier and 63.2% training accuracy has 72.4% prediction accuracy with KNN classifier based CFG for LFSPAIRS2. For Lymphoma data set, 3-gene subsets {GENE654X, GENE627X, GENE659X} with 81.6% training accuracy has 76.9% prediction accuracy with SVM classifier and 93.8% training accuracy has 84.6% prediction accuracy with KNN classifier based DFG for LFSAIRS1. 3-gene subsets {GENE770X, GENE761X, GENE507X} with 83.6% training accuracy has 84.6% prediction accuracy with SVM classifier and 81.6% training accuracy has 92.3% prediction accuracy with KNN classifier based DFG for LFSPAIRS1. 2-gene subsets {GENE1764X, GENE3594X} with 77.5% training accuracy has 76.9% prediction accuracy with SVM classifier and 77.5% training accuracy has 84.6% prediction accuracy with KNN classifier based DFG for LFSAIRS2. 5-gene subsets {GENE2368X, GENE2369X, GENE2370X, GENE2109X, GENE2108X} with 93.8% training accuracy has 76.9% prediction accuracy with SVM classifier and 89.7% training accuracy has 76.9% prediction accuracy with KNN classifier based DFG for LFSAIRS2. 2-gene subsets {GENE2226X, GENE2902X} with 81.6% training accuracy has 76.9% prediction accuracy with SVM classifier and 77.5% training accuracy has 92.3% prediction accuracy with KNN classifier based DFG for LFSPAIRS2. 3-gene subsets {GENE2774X,GENE704X, GENE699X}with 83.6% training accuracy has 76.9% prediction accuracy with SVM classifier and 81.6% training accuracy has 76.9% prediction accuracy with KNN classifier based DFG for LFSPAIRS2. 2-gene subsets {GENE526X, GENE527X} with 71.4% training accuracy has 76% prediction accuracy with SVM classifier and 85.7% training accuracy has 84.6% prediction accuracy with KNN classifier based IGFG for LFSPAIRS2. For Leukemia data set, 2-gene subsets {M24748_cds2_s_at, M31211_s_at} with 85.9% training accuracy has 86.6% prediction accuracy with SVM classifier and 78.9% training accuracy has 86.6%prediction accuracy with KNN classifier based DFG for LFSAIRS1. 3-gene subsets {M96740_at, S46622_at, S69232_at} with 85.9% training accuracy has 86.6% prediction accuracy with SVM classifier and 73.6% training accuracy has 86.6% prediction accuracy with KNN classifier based DFG for LFSAIRS1. 2-gene subsets {U40622_at, U40714_at} with 77.8% training accuracy has 86.6% prediction accuracy with SVM classifier and 66.6% training accuracy has 86.6% prediction accuracy with KNN classifier based CFG for LFSAIRS1. 2-gene subsets {X04391_at, X04707_at} with 70.1% training accuracy has 86.6% prediction accuracy with SVM classifier and 73.6% training accuracy has 80% prediction accuracy with KNN classifier based DFG for LFSPAIRS1. 4-gene subsets {M32639_at, M34192_at, U40282_at, U41387_at} with 82.4% training accuracy has 86.6% prediction accuracy with SVM classifier and 73.3% training accuracy has 77.1% prediction accuracy with KNN classifier based DFG for LFSAIRS2. 4-gene subsets {M22382_at, M23533_at, X17620_at, X56465_at} with 76.6% training accuracy has 86.6% prediction accuracy with SVM classifier and 71.9% training accuracy has 86.6% prediction accuracy with KNN classifier based CFG for LFSAIRS2. 2-gene subsets {M72885_rna1_s_at, X58528_s_at} with 82.4% training accuracy has 86.6% prediction accuracy with SVM classifier and 77.1% training accuracy has 86.6% prediction accuracy with KNN classifier based DFG for LFSPAIRS2. 2-gene subsets {D50855_s_at, Y10807_s_at} with 74.9% training accuracy has 86.6% prediction accuracy with SVM classifier and 76.6% training accuracy has 86.6% prediction accuracy with KNN classifier based CFG for LFSPAIRS2.

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Conclusion

In this paper, we proposed an ensemble gene selection framework to select informative gene subsets. The informative gene subsets obtained from the different type of the associative feature groups mine many tumor-related genes. Based on the obtained optimal gene subsets, we aim to find reliable accuracy on the training set and test set separately. The significance of a gene subset is measured by its frequency occurrence. Each type of the associative feature groups obtained by group-based learning was presented as a candidate solution to Artificial Immune Recognition Systems in order to improve with its meta-dynamics. The presented framework makes it possible to obtain more robust tumor-related genes. The prediction accuracies obtained by SVM and KNN classifiers. The classifier results obtained were compared with six commonly used microarray data sets.

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İLKÖĞRETİM ÖĞRENCİLERİNİN BİLGİSAYAR OYUNLARINDAKİ OYUN TÜRÜ TERCİHLERİNE YÖNELİK BİR ARAŞTIRMA

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ÖZET: Bilgisayar oyunları eğitim faaliyetlerine çok çeşitli biçimlerde etki etmektedir. Öğrenciler bilgisayar oyunları ile birlikte eğlenerek öğrenmektedirler. "Çocuk tepkisinin cevabını anında almakta, bu da ona doğru ve yanlışlarını görüp anlama fırsatı vermektedir. Çocuğun bilgisayarla hangi yaşta tanışması ve program öğrenmeye ne zaman başlaması gerektiği sıkça tartışılmaktadır. Bu konuda oldukça farklı görüşler olmakla birlikte; bazı eğitimciler çocuğun, okulöncesi çağda bilgisayarla tanışması gerektiğini savunmaktadırlar. Bu çalışmadaki amaç ilköğretim öğrencilerinin daha çok hangi tür bilgisayar oyunları oynamayı tercih ettiklerini öğrenmektir.

İlköğretim öğrencilerine uygulanan anket sorularında öğrencilere oyun türlerinin özelliklerinden oluşan sorular sorulmuştur. Öğrencilerin bu sorulara verdikleri yanıtlara göre öğrencilerin bilgisayar oyunlarında ki oyun türleri tercihleri konusunda sonuca varılmıştır. Yapılan çalışmada genel olarak öğrenciler bilgisayar oyunlarının yarar sağladığını, fakat aşırı bilgisayar oynamanın da bağımlılık yapabileceğini düşünüyorlar. Aynı zamanda cinsiyet farklılığının da oyun türleri seçiminde etkisi olduğu görülmüştür.

Anahtar Kelimeler: Eğitim, Bilgisayar oyunları, Oyun türleri

GİRİŞ

Eğitim açısından bilgisayarlar çok önemli paya sahiptirler. Bilgisayarların önemli bir ürünü olan bilgisayar oyunları öğrencilere eğlenirken aynı zamanda öğrenme imkanı sağlamaktadır. Özellikle bilgisayar oyunları çağın vazgeçilmez teknolojik ürünler arasında yerini almıştır.

Oyun, insan hayatının her döneminde var olan bir etkinliktir. Oyun, insan hayatının her döneminde var olan bir etkinlik olmasıyla birlikte yaşamın ilk yıllarında çocuğun yaşadığı dünyayı tanıması, sevgilerini, kıskançlıklarını, mutluluklarını, düşmanlıklarını, iç çatışmalarını, hayallerini, düşüncelerini ifade edebilmesi için en uygun yöntem olarak kabul edilmektedir. Oyun [Zembat ve diğerleri, 1999] çocuk için ciddi bir uğraş ve değerli bir aktif öğrenme yoludur.

Bilgisayar oyunlarının insanlar arasındaki artan popülaritesi, hem dikkatlerin oyunlar üzerlerine çekilmesine hem de akademik anlamda oyunlarla ilgili araştırılmaların yapılmasına sebep olmaktadır. Bilgisayar oyunları sahip oldukları zengin görsel içerik ile öğrencilerin öğrenme süreçlerini kısaltan, anlamlı öğrenme kazanımları sağlayan özelliklere sahiptir. Bu özellikleri ile bilgisayar oyunları hem eğitimciler hem de öğrenciler arasında eğitim sürecinde kullanım bakımından önem kazanmaktadır.

Bilgisayar oyunlarının öğrencilerdeki etkileşimi aktif tutacak tasarım özelliklerine sahip olması ve öğrencilerin gerek oyun ortamı gerekse fiziksel ortamda birbirleri ile etkileşime girerek, sosyalleşmelerinin pekiştirilmesine olanak vermesi gerekmektedir. Bilgisayar oyunları sosyalleşme açısından oldukça uygun araçlardır.

Etkin bir öğretim için farklı yöntemleri öğrencilere sunmak gerekmektedir. Eğitimde önemli olanın düz yazıyı öğrencilere öğretmek değil onlara eğitim ve bilginin yanında kazanması gereken değerleri de kazandırmaktır. Bu açıdan farklı bir yöntem olan eğitsel oyunları derslerde kullanılması faydalı olmaktadır.

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Eğitimde bilgisayar oyunlarından olumlu olarak yararlanılabilirken bazen de bilgisayar oyunları öğrencileri olumsuz yönde etkileyebilmektedir. Çeşitli bilgisayar oyun türleri vardır. Bunlar savaş, macera, zeka, spor, strateji vb. türlerdir. Bu çalışmada ilköğretim öğrencilerinin bilgisayar oyun türlerinden hangilerini oynamayı daha çok tercih ettikleri belirlenmiştir.

İnsanlar oyun oynarken rahatlamakta, zihinsel faaliyetleri en üst seviyeye gelmekte ve de sosyalleşmektedirler. İnsanlar oyun oynadığı süre içerisinde zihin faaliyetleri en üst seviyeye çıkmakta ve zihin sadece oyunla ilgilendiği için öğrenme en üst seviyeye gelmektedir. Örneğin vücudun da yanıklar olan bir hastanın sargıları her gün değiştirilmek zorundadır, fakat sargılar değiştirilirken hasta çok acı çekmektedir hastanın çektiği acıyı en aza indirmek için 3 boyutlu gözlükle oyun oynatarak sargılar hasta daha az acı çekerek değiştirilebilmiştir.

Eğitsel oyunları gelişen teknolojiyle beraber bilgisayar ortamında hazırlamak ve sunmak hem kolay olmakta hem de daha az maliyetli olmaktadır. Aynı zamanda daha etkili olmaktadır.

"Çocuğun bilgisayarla hangi yaşta tanışması ve program öğrenmeye ne zaman başlaması gerektiği sıkça tartışılmaktadır. Bu konuda oldukça farklı görüşler olmakla birlikte; bazı eğitimciler çocuğun, okulöncesi çağda bilgisayarla tanışması gerektiğini savunmaktadırlar."(Arı, Bayhan,1999)

Eğitsel oyunlar genelde ilköğretim çağındaki öğrenciler için hazırlanmaktadır. Bunun sebebi ilköğretim çağındaki öğrencilerin öğrendikleri soyut kavramları somutlaştırmakta zorlanmasını söyleyebiliriz. Örneğin alan kavramını anlatırken eğitsel oyun kullanarak şekillerle konuyu öğrencilere anlatırsak çok daha etkin olur. Aynı zamanda yaptıracağımız uygulamaları eğitsel oyun aracılığıyla yaptırırsak öğrenme çok daha kalıcı olacaktır.

Bilgisayar oyunları sadece öğrencilerin dikkat ve motivasyonunu yükselten birer ders materyali olarak (Kili, 2005) kullanılırken, başlı başına bir oyun da ders destekleyici materyali olarak kullanılmak yerine, dersin ana materyali olarak da kullanılabilmektedir.

YÖNTEM

Bu makale bir tarama araştırma çalışması olarak tasarlanmıştır. Ana amacı ilköğretim öğrencilerinin daha çok hangi tür bilgisayar oyunlarını oynadıklarını araştırmak ve sunmaktır. Anket planı kullanılarak nitel ve nicel veriler toplanmıştır.

Bu bölümde, araştırmanın amacına ulaşabilmesi için, geçerli ve güvenilir sonuçlar elde edilebilmesi için alınan önlemler ayrıntılı olarak açıklanmış; araştırma modeli, araştırmanın evren ve örneklemi, veri toplama aracı ve geliştirilmesi, verilerin toplanması, verilerin çözümlenmesi ve yorumlanması konularına yer verilmiştir.

Araştırma Modeli

Bu araştırmanın yürütülmesinde genel tarama modeli kullanılmıştır. Araştırma ile ilköğretim çağındaki öğrencilerinin daha çok hangi tür bilgisayar oyunlarını oynadıklarını tespit etmek amaçlanmaktadır.

Evren ve Örneklem

Bu araştırmanın evrenini, ilköğretim çağındaki öğrenciler oluşturmaktadır. Evrenin çok geniş ve dağınık olması nedeniyle araştırma iki çalışma evreni üzerinde yürütülmüştür. Çalışma evreni olarak Ankara Keçiören Mecidiye İlköğretim okulu 8.sınıf öğrencileri ve Ankara Kazan Atatürk İlköğretim okulu 7.sınıf öğrencileri seçilmiştir.

Veri Toplama Aracı ve Geliştirilmesi

Bu araştırmada veri toplama aracı olarak anket kullanılmıştır. Ölçek, ilköğretim çağındaki öğrencilerinin daha çok hangi tür bilgisayar oyunlarını oynadıklarını tespit etmek için araştırmacı tarafından hazırlanmıştır . Ölçeğin hazırlanmasında öncelikle konuyla ilgili Türkçe literatür (tez, makale, bildiri, kitap, bilimsel araştırma, internet) incelenmiştir. Literatür incelemesinden elde edilen veriler yardımıyla ölçme aracında yer alacak durumlar tespit edilmiştir. Daha sonra durumlar öğrencilerin görüşlerini almak üzere anket maddelerine dönüştürülmüştür.

Anketin yapı geçerliliğini ve güvenirliğini belirleyebilmek için 50 öğrenciye uygulayarak ön denemesi yapılmıştır.

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Katılımcılar

Bu çalışmaya Ankara'da ki Ankara Keçiören Mecidiye İlköğretim okulu 8.sınıf öğrencilerinden ve Ankara Kazan Atatürk İlköğretim okulu 7.sınıf öğrencilerinden toplam 100 öğrenci katılmıştır.

Tablo 1 de gösterildiği gibi, katılımcıların % 68'i Keçiören Mecidiye İlköğretim okulundan, % 32'si Kazan Atatürk İlköğretim okulundandır. Veriler Keçiören Mecidiye İlköğretim okulunda 8.sınıf öğrencilerinden, Kazan Atatürk ilköğretim okulunda 7.sınıf öğrencilerinden toplanmıştır.

Katılımcıların %64'ü erkek, %36'sı bayandır. Öğrencilerin yaşları 12 ila 15 arasında değişmektedir.

Tablo 1 : Katılımcıların Özellikleri

		CİNSİYET					
OKULLAR	Sınıf	Bayan	Bayan%	Erkek	Erkek%	Toplam	Toplam%
Mecidiye ilköğretim okulu	8	26	26	42	42	68	68
Atatürk ilköğretim okulu	7	10	10	22	22	32	32
TOPLAM		36	36	64	64	100	100

Kullanılan Araçlar

Veri toplanması sırasında bir tarama aracı kullanılmıştır: Anket planı.

Anket iki kısımdan ve toplam 19 sorudan oluşmaktadır. İlk kısım katılımcıların demografik özellikleri ile bilgisayar oyunlarına yönelik genel algılarını araştırmaktadır. İkinci kısım ise ilköğretim öğrencilerinin daha çok hangi tür bilgisayar oyunlarını oynadıklarını araştırmaktadır.

Verilerin Toplanması

Veriler 100 öğrencinin normal ders saatinde, ders başlangıcında toplanmıştır. Bu derslerin öğretmenlerinden izin alınarak anket kullanılmıştır. Yanıt dönümü %100'dür. Katılımcılar anketleri yaklaşık 5 dakika içinde cevaplamışlardır.

Katılımcılara anketler dağıtılmadan önce araştırmanın amacı ve anket yönergeleri sözlü olarak anlatılmıştır.

Araştırmada önce verilerin toplanmasıyla ilgili literatür incelenmiş, Türkçe yayınlar belirlenmiş (tez, makale, bildiri, internet, kitap ve diğer bilimsel yayınlar) üniversite kütüphaneleri ve internet taramaları yapılmıştır. Elde edilen bilgilere dayalı olarak hazırlanan veri toplama aracının ön denemesi 18 Nisan 2015 tarihinde yapılmıştır. Sonuçlar değerlendirildikten ve gerekli düzenlemeler yeniden yapıldıktan sonra

24 Nisan 2015 tarihinde araştırmacı tarafından okullara gidilerek uygulanmıştır. 15 Mayıs tarihinde tamamlanmıştır.

Veri Analizi İşlemi

Veri analizi yöntemi betimsel ve istatistiksel veri analizi aşamasından oluşmaktadır. Betimsel veri analizinde Excel programı kullanılarak veri depolanmış, oranlar ve yüzdeler hesaplanmıştır. Daha sonra, çıkarımlar yapılmıştır.

Sınırlılıklar

Bu çalışmanın göz önüne alınması gereken bazı sınırlamaları bulunmaktadır.

Araştırma evreni 2015-2016 eğitim öğretim yılında Ankara Keçiören Mecidiye İlköğretim okulunda eğitim gören 8.sınıf öğrencileri ve Kazan Atatürk İlköğretim okulunda eğitim gören 7.sınıf öğrencileri ile sınırlıdır.

- Çalışmanın geçerliliği ve güvenirliği katılımcıların, bu çalışmada kullanılan anket sorularına verdikleri cevaplar sırasındaki dürüstlüklerine bağlıdır.

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- Katılımcıların algıları ortamdaki değişikliklere ve deneyimlere göre değişebiliyorsa, güvenirlik mümkün olmayabilir.

BULGULAR VE YORUM

Bu bölümde araştırmanın amaçları doğrultusunda elde edilen bulgular ve yorumlara yer verilmiştir.

Katılımcıların Bilgisayar Oyunu Oynamaya Yönelik Genel Algıları

Aşağıda, Tablo 2' de gösterildiği üzere, bu konuda ankete verilen olumsuz cevaplardan en büyük orana sahip olanlar bilgisayar oyunu oynamanın çok vakit aldığı (%70), bağımlılık yaptığı (%64) cevaplarıdır. Katılımcıların yarıya yakını da bilgisayar oyunu oynamanın vakit kaybı olduğu yönünde cevap vermiştir (%45).

Katılımcıların yüzde 72'si kızlar ve erkekler farklı türde bilgisayar oyunları oynamayı tercih ederler demiştir. Katılımcıların % 59' u ise bilgisayar oyunu oynamak bazı yararlı bilgi ve becerilerin gelişmesine yardım eder cevabını vermiştir.

Tablo 2: Bilgisayar Oyunu Oynamaya Yönelik Genel Algılar

	Evet / Hayır
Bilgisayar oyunu oynamak bazı yararlı bilgi ve becerilerin gelişmesine yardım eder mi?	59 - (%59) 41 - (%41)
Bilgisayar oyunu oynamak vakit kaybı mı dır?	45 - (%45) 55 - (%55)
Kızlar ve erkekler farklı türde bilgisayar oyunları oynamayı mı tercih ederler?	72 - (%72) 28 - (%28)
Bilgisayar oyunu oynamak çok vakit alır mı?	70 - (%70) 30 - (%30)
Bilgisayar oyunu oynamak bağımlılık yapar mı?	64 - (%64) 36 - (%36)

Katılımcıların daha çok hangi tür bilgisayar oyunlarını tercih ettiklerine yönelik algılar

Ankette bu alanda ilköğretim öğrencilerinin daha çok hangi tür bilgisayar oyunlarını oynamayı tercih ettiklerini öğrenmeye yönelik sorular soruldu. Macera, savaş, zeka, spor ve strateji gibi bilgisayar oyun türlerini içeren soruları katılımcılar yanıtladı.

Anket sorularına verilen cevapların yüzdeleri göz önüne alındığında katılımcıların

çoğunun spor ve savaş oyunlarını tercih ettikleri görünmektedir. Zeka ve strateji türü bilgisayar oyunlarını ise daha çok katılımcıların tercih etmediği gözlenmiştir.

Erkek katılımcıların en çok tercih ettiği oyun türü savaş oyunları olduğu gözlemlenirken, bayan katılımcıların tercih etmediği oyun türü savaş oyunları olmuştur.

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Tablo 3: Daha çok hangi tür bilgisayar oyunlarını tercih ettiklerine yönelik algılar

Bilgisayar oyunlarında ki tercihiniz;	**Katılıyorum**	**Kararsızım**	**Katılmıyorum**
Bir şehir , dükkan vb. bir yeri geliştirip yönetebildiğim oyunları oynamayı tercih ederim.	43 - % 43	9 - % 9	48 - % 48
Fiziksel mücadeleler ile birlikte bilinmeyenlerin çözüldüğü oyunları oynamayı tercih ederim.	63 - % 63	5 - % 5	32 - % 32
Üretim ve gelişim imkanı sağlayan oyunları oynamayı tercih ederim.	35 - % 35	11- % 11	54 - % 54
İpuçlarını takip ederek sonuca götüren oyunları oynamayı tercih ederim.	67 - % 67	6 - % 6	27 - % 27
Sonuca ulaşmak için sadece düşünmeyi gerektiren oyunları oynamayı tercih ederim.	41 - % 41	3 - % 3	66 - % 66
Fiziksel mücadeleye bağlı üstünlük kurma oyunlarını oynamayı tercih ederim.	71 - % 71	2 - % 2	27 - % 27
Ufak bulmacaların olduğu ilerlemeli oyunları oynamayı tercih ederim.	55 - % 55	7 - % 7	38 - % 38
Silah kullanabildiğim oyunları oynamayı tercih ederim.	68 - % 68	3 - % 3	29 - % 29
Can hakkının sınırsız olduğu düşündürücü oyunları oynamayı tercih ederim.	33 - % 33	6 - % 6	61 - % 61
Kendi yönetimimi uygulayabileceğim oyunları oynamayı tercih ederim.	48 - % 48	3 - % 3	49 - % 49
Satranç, dama vb. oyunları oynamayı tercih ederim.	45 - % 45	4 - % 4	51 - % 51
İçersinde ölüm, kan vb. durumlarının olduğu oyunları oynamayı tercih ederim.	64 - % 64	3 - % 3	33 - % 33
Futbol, basketbol gibi oyunları bilgisayar ortamında oynamayı tercih ederim.	75 - % 75	6 - % 6	19 - % 19
Sevdiğim sporları bilgisayar ortamında oynamayı tercih ederim.	73 - % 73	4 - % 4	23 - % 23

SONUÇ VE ÖNERİLER

Son yıllarda bilgisayar oyunları en popüler eğlence araçlarından birisi olmuştur. Oyunların insanlar arasındaki artan popülaritesi, hem dikkatlerin kendi üzerlerine çekilmesine hem de akademik anlamda oyunlarla ilgili araştırılmaların yapılmasına sebep olmaktadır. Bilgisayar oyunları sahip oldukları zengin görsel içerik ile öğrencilerin öğrenme süreçlerini kısaltan, anlamlı öğrenme kazanımları sağlayan özelliklere sahiptir. Bu özellikleri ile bilgisayar oyunları hem eğitimciler hem de öğrenciler arasında eğitim sürecinde kullanım bakımından önem kazanmaktadır.

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Bilgisayar oyunlarının öğrencilerdeki etkileşimi aktif tutacak tasarım özelliklerine sahip olması ve öğrencilerin gerek oyun ortamı gerekse fiziksel ortamda birbirleri ile etkileşime girerek, sosyalleşmelerinin pekiştirilmesine olanak vermesi gerekmektedir. Bilgisayar oyunları sosyalleşme açısından oldukça uygun araçlardır.

Etkin bir öğretim için farklı yöntemleri öğrencilere sunmak gerekmektedir. Eğitimde önemli olanın düz yazıyı öğrencilere öğretmek değil onlara eğitim ve bilginin yanında kazanması gereken değerleri de kazandırmaktır. Bu açıdan farklı bir yöntem olan eğitsel oyunları derslerde kullanılması faydalı olmaktadır.

Bilgisayar oyunlarının bir çok faydası bulunmasına rağmen, zararlı oldukları yanları da vardır. Özellikle ilköğretim çağındaki öğrenciler üzerinde savaş gibi, şiddet içeren oyun türleri olumsuz yönde etki etmektedir. Bu çalışmanın yapılmasında ki amaç ilköğretim öğrencilerin daha çok hangi tür bilgisayar oyunları oynamayı tercih ettiklerini öğrenmekti.

Bu çalışmaya Ankara'daki iki farklı ilçedeki iki okulda eğitim gören ilköğretim öğrencileri katılmıştır.

- Öğrencilerin yarısından fazlası bilgisayar oyunu oynamanın bazı yararlı bilgi ve becerilerin gelişmesine yardım edeceğini düşünüyor.

- Öğrencilerin yarıya yakını bilgisayar oynamanın vakit kaybı olduğunu düşünüyor.

- Öğrenciler büyük çoğunluğu kızlar ve erkeklerin farklı türde bilgisayar oyunlarını oynamayı tercih ettiklerini düşünüyorlar. Zaten araştırma sonucunda erkeklerin en çok tercih ettikleri oyun türü savaş oyunları olurken, kızların en az tercih ettikleri oyun türü savaş oyunlarıdır.

- Araştırmaya katılan öğrencilerin büyük bölümü bilgisayar oyunları oynamanın çok vakit aldığını düşünüyor.

- Öğrencilerin yarısından fazlası bilgisayar oyunlarını oynamanın bağımlılık yapacağını düşünüyor.

Yapılan çalışmada genel olarak öğrenciler bilgisayar oyunlarının yarar sağladığını, fakat aşırı bilgisayar oynamanın da bağımlılık yapabileceğini düşünüyorlar. Aynı zamanda cinsiyet farklılığının da oyun türleri seçiminde etkisi olduğu görülmüştür.

İlköğretim öğrencilerine uygulanan anket sorularında öğrencilere oyun türlerinin özelliklerinden oluşan sorular sorulmuştur. Öğrencilerin bu sorulara verdikleri yanıtlara göre öğrencilerin bilgisayar oyunlarında ki oyun türleri tercihleri konusunda sonuca varılmıştır.

- Öğrencilerin en çok oynamayı tercih ettikleri oyun türünün başında spor ve savaş oyunları gelmektedir.

- Öğrencilerin anket sorularına verdikleri cevaplar ışığında en az tercih edilen bilgisayar oyun türlerinin ise strateji ve zeka oyunları olduğu sonucuna varılmıştır.

- Kız ve erkek öğrencilerin ortak olarak tercih ettikleri oyun türü ise macera oyunları olmuştur.

- Erkek öğrenciler savaş oyunları ilk sırada tercih ederken, kız öğrencilerin en az tercih ettikleri oyun türü savaş oyunları olmuştur.

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IMMUNOLOGICAL NUMERATION AND CHARACTERIZATION OF LEUKOCYTES BY FLOW CYTOMETRY

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Abstract: There is a wide spectrum of techniques available to evaluate functional aspects of the immune system in both humans and animals. Examples of these techniques involve investigations to measure the proportions of the differential leukocyte populations, the total number of leukocytes, phagocytosis, oxidative burst, chemotactic response, natural killer cell activity, cytotoxic T-lymphocyte activity and lymphocyte proliferation. These methods may involve cell purification in cultures or using whole-blood methods that provide a biological environment which is more identical to the in vivo situation in the body due to the fact that it retains all blood components and all physiological factors that may affect immune function in one way or another.

Monitoring of the immune response usually based on total and differential leukocyte numeration and characterization by staining of leukocytes in cell suspensions or blood smears and then characterizing by microscopic, electronic or computerized machines such as the automated haemocytometer and the flow cytometer.Automated machines allow analysis and separation of labeled cells in suspension. The principle of this technique depends on analysis, separation and sorting of different populations of cells based on their size and fluorescence profile. It has been widely used in physiology and immunology laboratories to measure quality of blood and immunomodulation caused by various factors. The current paper sheds light on principles of automated haemo- and flow cytometric analysis used to investigate quality of cellular immune components in whole blood samples, as well as some of their applications in more sophisticated immunological protocols.

Keywords: Immunological Numeration, Leukocytes, flow cytometry

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INCOMPLETE DISCUSSION ON THE TAXATION OF LABOR AND CAPITAL REVENUES: GROWTH? JUSTICE?

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Abstract: With the liberalization of the markets, the mobilization of capital has prevented the capital outflow from the country due to the increased capital movements and the implementation of a new tax system which will not lower the level of tax revenues. This framework first introduced a dual income tax system that began to be implemented in Scandinavian countries in the 1990s.In this study; in the taxation of labor and capital incomes, the dual income tax system has been dealt with in terms of qualifications and selected countries. In this framework, the system which promotes the efficiency of the tax system and the realization of economic growth is quite criticized in terms of justice as the opposite. Therefore, the fact that the capital incomes are taxed lower than the labor incomes is a controversial issue in terms of justice. The applicability of the dual income tax system seems to be rather difficult in the short term when the dual income tax system is examined in selected countries as well as selected countries, considering the low national income per capita, the structure of the tax system, the declaration of labor incomes at low levels, the lack of tax authorities and high informality..

Keywords: Dual Income Tax, Labour, Capital, Economic Growth, Justice, Turkey.

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INTEGRATING KANSEI, KANO DAN REFINED IVA KANO-HWWP FOR SERVICE EXCELLENCE (CASE STUDY : XXX COMPANY)

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In recent month, online business has grown fast. Customers entering the online business are growing significantly. As business competition grows in the business world, it is not enough for XXX Company to survive and make continuous improvements. To begin a strategic move towards innovation, it is very important to listen to customer latent needs (emotional needs). Kansei Engineering (KE) has shown superiority in investigating and modeling customer emotion for product development. In dealing with customer needs, service quality tools such as SERVQUAL and KANO have been applied extensively, but none have been able to incorporate and model customer emotional needs. To fill this niche, this study proposes an integrated approach involving KE, KANO and Refined IVA KANO-HWWP. The approach aims to help organizations to identify services attributes and Kansei words related to customer satisfaction, to evaluate customer satisfaction, to determine priority orders of service attributes, and to analyze the proposal may be considered by the organization for service excellence development. This research resulted in several plans that need to be done, they are safety education program, customer service basic, routine **maintenance, developing online booking system, and held an insurance program for the passenger.**

Keywords: Service Excellence, Kansei, KANO, Refined IVA KANO-H

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INVESTIGATING PRIMARY SCHOOL STUDENTS' LEVELS OF KNOWLEDGE OF CYBER CRIME

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The rapid spread of communication Technologies in the World and in our country has led t an increase in cybercrimes and to committing crimes more easily. Cybercrimes should be considered as an issue which can emerge in every field today. In order to be able to struggle with cybercrimes, the definition and scope of cybercrimes should be known first.

This study investigates the degree to which cybercrimes are considered in primary education schools and how much students – who are to have a voice in the society of the future- are trained about the issue.

Keywords: Informatics,communication technologies ,cybercrimes

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INVESTIGATION OF BURSA, ESKIKARAAGAC USING VERTICAL ELECTRICAL SOUNDING METHOD

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Abstract: The aim of this research is to study the ground resistivity of a region located at Bursa, Eskikaraağaç village by using vertical electrical resistivity (VES) method which is one of the geoelectrical methods. For that purpose, two Wenner arrays were applied on the ground. The measured VES data is analyzed via software named RES2DINV. The program gives layer thicknesses and real resistivity values on two dimensional underground resistivity sections. Interpretations on the possible locations of water can also be made. These interpretations can later be verified by drilling groundwater wells.

Keywords: Vertical Electrical Sounding, RES2DINV, Wenner array

Introduction

Today, climate change leads to shortage of water while the demand from limited resources increases with population. Drilling is unknowingly used for the purpose of searching and finding water. Whereas, geoelectrical methods provides some information about aquifer layers and water existence before drilling. Geoelectrical methods are the most common methods in exploration geophysics. The method, which makes use of the resistivity feature of earth, is used in search for underground assets such as water, geothermal energy, minerals and petrol.

In this study, geophysics resistivity measurements have been conducted on a previously chosen field over the aquifer at Eskikaraağaç village. Resistivity measurement was taken using Wenner arrays. Two pieces of Wenner arrays were made in total. A program called RES2DINV (Loke, 2000) was used in the evaluation of these measurements. Consequently, real resistivity values and thicknesses of geological layers were obtained and mapped in two dimensions. By considering real resistivity values and the two-dimensional map, inference about water existence was made.

Geoelectrical Methods

Basically, geoelectrical methods are implemented in three different ways. These are Self Potential (SP), Induced Polarization (IP) and Vertical Electrical Sounding (VES). Vertical electrical sounding method is based on the principle of measuring the potential difference formed by electric current delivered to the ground by two current electrodes. The aim of this method is to determine the depth and resistivity of underground layers by using surface potential measurements. VES method has different geometrical arrays depending on the problem on the ground. The most common used arrays are Schlumberger, Wenner and Dipol-Dipol. Basic differences between arrays are investigation depth and horizontal solution accuracy. Comparing Wenner and Schlumberger; both electrode arrays have the same current transmission horizontally, however, investigation depth is more in Schlumberger method. For the same opening width, accuracy of measurement is much better in Wenner array. According to these comparisons; generally, Wenner is preferred for shallow studies. As to Schlumberger, it can be used both shallow and deep research (Başokur, 2004). In Figure 1, A and B are current, M and N are potential electrodes in a Wenner array. In practice, electrode current is emitted from two points like A and B and then potential difference is measured from separate two points like M and N.

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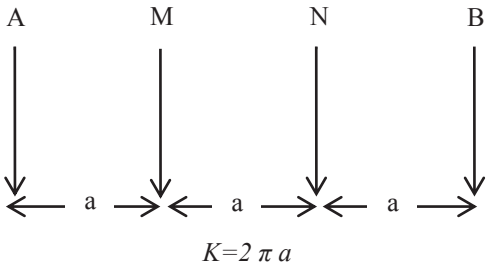

Figure 1. Wenner array

After calculating the geometric factor (K), apparent resistivity is calculated with Eq. 1.

$$\rho = \left(\frac{\Delta V}{I}\right) K \qquad (1)$$

ρ= Apparent resistivity (ohm-m)

ΔV= Voltage (mV)

I= Current (mA)

K= Geometric factor

Essentially, earth consists of complex structures rather than isotropic semi-infinite media. Because of this reason, resistivity relationships do not give real ground resistivity values. Resistivity value obtained with current given into the ground and obtained using several equations is named as apparent resistivity. Apparent resistivity is equivalent to real resistivity in case of isotropic semi-infinite media (Başokur, 2004). To obtain real resistivity of layers and thickness of layers graphical methods are used. Generally, on a logarithmic paper, apparent resistivity value is placed on vertical axis and electrode spacing on horizontal axis and several methods are used to obtain value of real resistivity and thickness of layers. These methods are given below;

a. Successive approximation methods

b. Asymptotic estimate

c. Rough estimate methods

d. Estimate with model curves

d.1. Estimate with double layer model curves

d.2. Estimate with three layer model curves

d.3. Estimate with assistance point cards

e. Direct comment methods

While Successive approximation methods have been the least used methods, Asymptotic estimate were the most used methods until computers improved (Coşkun, 2005). Programs, such as IPI2WIN (Bobachow, 2002), RES2DINV (Loke, 1997) are widely used today.

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Field Study

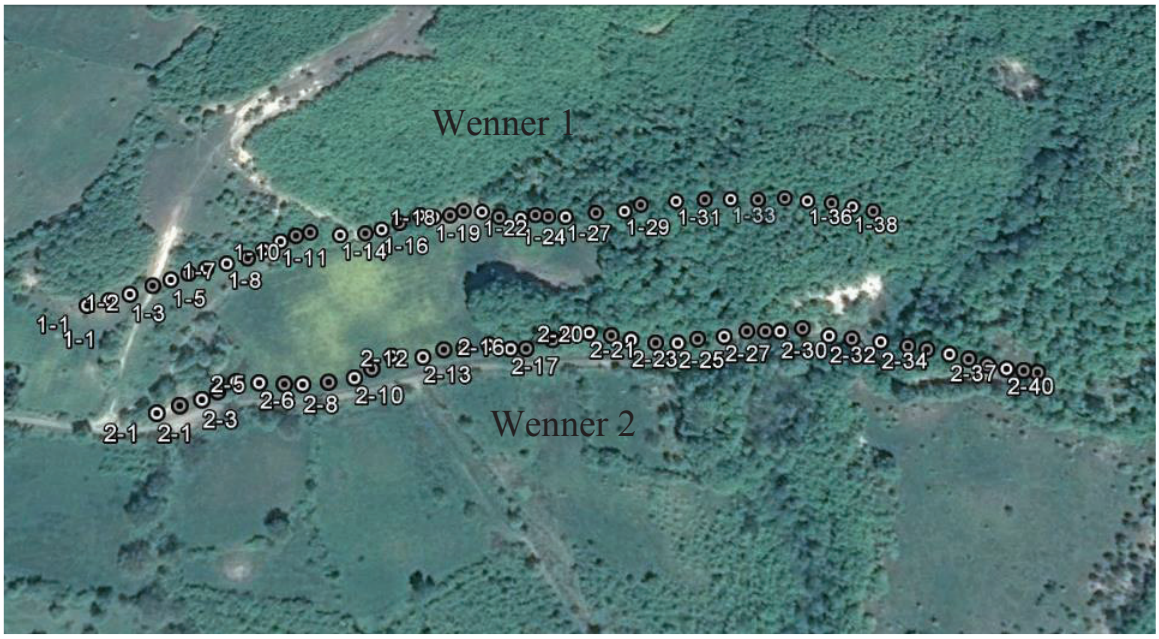

Figure 2. Measuring points

Wenner arrays (Multiple-electrode resistivity method) is implemented in two profiles (Figures 2-3-4). 39 electrodes were used, electrode spacing was selected as 10 meters. Totally, 380 meters of opening is made for Wenner 1. 42 electrodes were used, electrode spacing was selected as 10 meters. Totally, 410 meters of opening is made for Wenner 2.



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Figure 3. Wenner 1

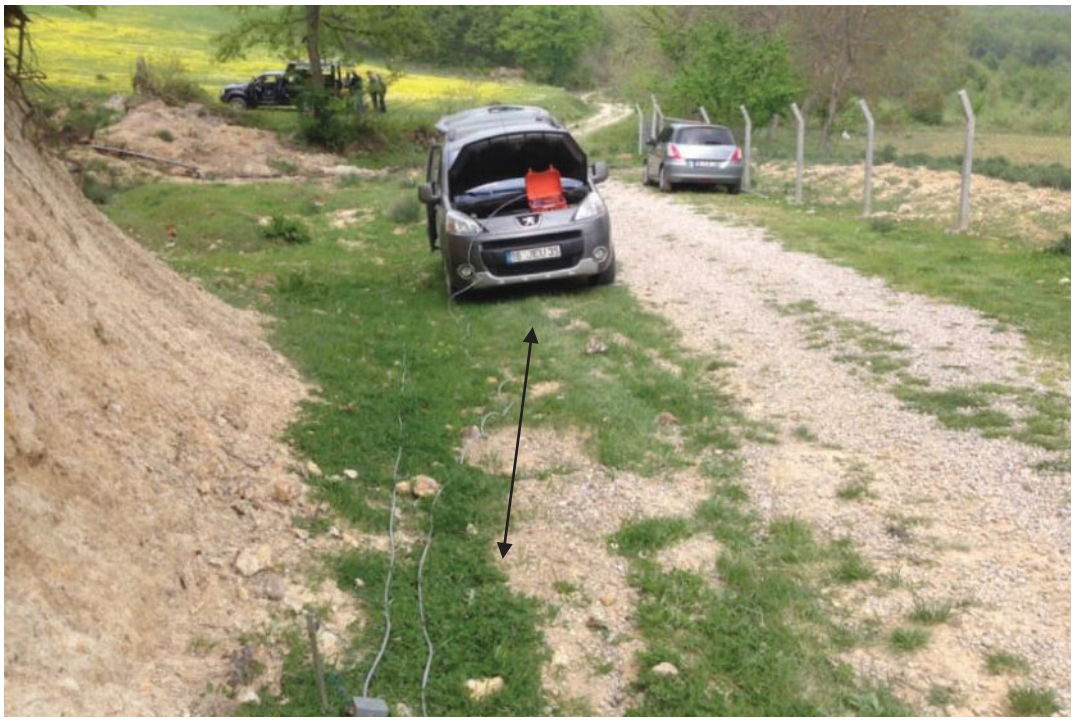

Figure 4. Wenner 2

RES2DINV's Results

After records taken from multichannel resistivity device were transferred to a computer in DAT format, they were evaluated by RES2DINV program for the two Wenner arrays (Figure 5 and Figure 6). In the evaluation, real resistivity, layer thicknesses and also possible well location were obtained. Formations are indicated in Figure 5 and Figure 6. Alluvial formations are available in different regions in Figure 5, Figure 6. For this reasons possible well location is chosen at x=85 m along Wenner 1 array.

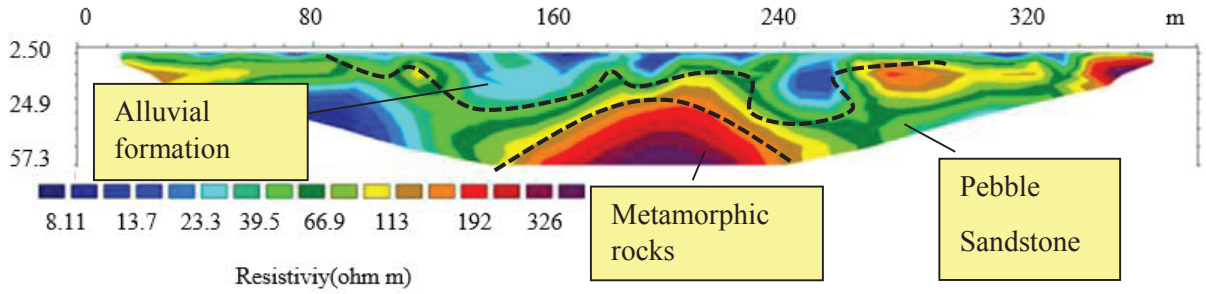

Figure 5. RES2DINV's results for Wenner 1 array

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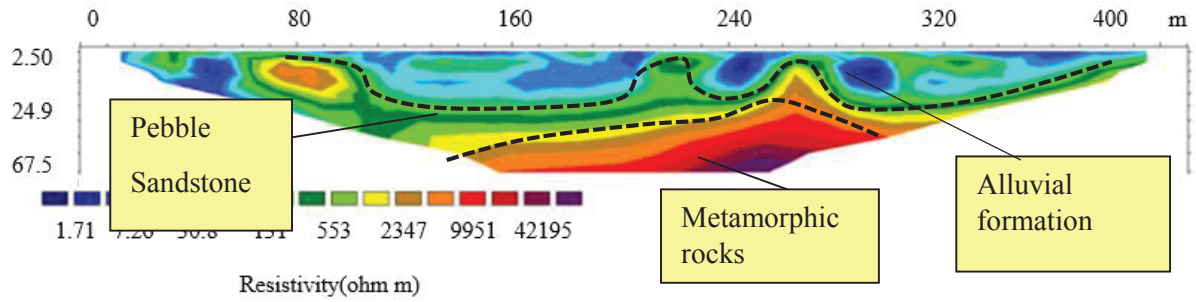

Figure 6. RES2DINV's results for Wenner 2 array

Conclusion

Considering the two-dimensional maps in Figure 5 and Figure 6, when resistivity values are small, water containing formations are thought to be available. If the location is indicated with blue color, it may be alluvial formation. If the location is indicated with yellow or green colors, it may be pebble, sandstone. Dark red unit is considered to be the metamorphic rocks.

By referring to the two-dimensional maps, comments can be made about the location of the well to be drilled. While determining the location of a well, it is necessary to consider drilling method and formation. The suggested well location in this study lies along Wenner 1 line at around x=85 m which is located away from alluvial formations. Mud rotary drilling method is preferred for suggested well. The reason for this method is that it is more economical than others.

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INVESTIGATION OF ELECTRICAL PROPERTIES IN MALIC ACID-ADDED BULK MGB2 SUPERCONDUCTING SAMPLES

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Abstract: The effects of malic acid (C4H6O5) addition on lattice parameter, critical temperature (Tc), electrical properties of bulk MgB2 have been systematically studied. The amount of C4H6O5 was varied between 0 and 15 wt%(0%, 4%, 6%, 8%, 10%, 12%, 15%) of the total MgB2. All samples were prepared from magnesium powder, amorphous boron powder, malic acid (C4H6O5) and toluene (C7H8) using two-step solid state reaction method. The electrical measurements of malic acid added bulk MgB2 samples were performed using a standard four-probe method under different magnetic fields in zero fields cooling regime. The upper critical field Hc2 has been estimated from temperature dependences of resistivity curves in both directions of the magnetic fields perpendicular and parallel to the c-axis. The upper critical magnetic field Hc2(0) at T = 0K for 90% of Rn was calculated by the extrapolation Hc2(T) to the temperature T = 0K. XRD analysis revealed that up to addition level of 15wt% nearly single- phase MgB2 bulks containing only a little amount of MgO impurity. It was seen, malic acid adding content increased to 10 wt% ,MgB2 phase peak intensity was significantly reduced and broadened and then it almost disappeared when the adding content 15wt%. It was observed that the lattice parameters and volume small drop with 10 wt% and large decrease with increasing malic acid addition level. The a-axis lattice parameter decreased from 3,0876 Å for pure sample to 3,0565 Å for 15wt% malic acid added sample.

This work was supported by Turkish Science and Technology Council-TUBITAK under the project numbers 113T008.

Keywords: MgB2, the upper critical magnetic field, malic acid

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INVESTIGATION THE MICROSTRUCTURAL, MECHANICAL AND THERMO-ELECTRICAL PROPERTIES OF THE DIRECTIONALLY SOLIDIFIED SN-8.8ZN EUTECTIC ALLOY

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Abstract: Weighed quantities of Sn and Zn metals in a graphite crucible were placed in a vacuum melting furnace, and the metals were completely melted. The molten alloy was poured into graphite crucibles in a casting furnace. The molten alloy solidified from bottom to top in casting furnace. The directional solidification of the produced alloy was performed in a Bridgman-type directional solidification furnace. The samples were directionally solidified at a constant temperature gradient (4.16 K/mm) under different solidification rates (8.3-790 mm/s). The dependence of microhardness, ultimate tensile strength, ultimate compressive strength and compressive yield strength on solidification rate were determined. The phases of the Sn-Zn alloy were determined by energy dispersive X-ray spectroscopy analysis (EDX).Variations of electrical resistivity for Sn-Zn eutectic alloy were also measured at the temperature in range 28–176 ^{o}C usingthe standard four-point probe method.The enthalpy of fusion and the specific heat were determined by differential scanning calorimetry analysis (DCS) from heating trace during the transformation from solid to liquid.The thermal conductivity values were obtained from the Wiedemann-Franz equation. The results obtained from this work were compared with the literature data.

Keywords: Directional solidification, eutectic, microhardness, tensile strength, compressive strength, resistivity, thermal conductivity.

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İSRAİL İLE FLİSTİNLİLER ARASINDA YAPILAN OSLO BARIŞ ANLAŞMASININ ARAP ŞİİRİNE YANSIMASI

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Bilindiği üzere Filistin meselesi, Birinci Dünya Savaşı'ndan sonra Filistin topraklarının Osmanlı yönetiminden çıkması, İngiliz Mandası yönetimine girmesiyle başlamış ve günümüze kadar devam etmiştir. O günden günümüze kadar bu mesele uluslararası gündemi hep meşgul etmiştir. Bu tarihi süreçte Arap-İsrail Devletleri arasında yaşanan toprak ihtilafı ve işgal nedeniyle aralarında birçok savaşa meydana gelmiştir.

1991 Körfez Savaşı'ndan sonra Amerika Birleşik Devleti, yıllardır süre gelen Filistin-İsrail anlaşmazlığını barışçıl yöntemlerle sona erdirmek için taraflar arasında bir Orta Doğu Konferansı düzenlemek istemiştir. İsrail, Amerika'nın baskılarıyla 30 Ekim 1991'de İspanya'nın başkenti Madrit'te, Amerika ve Rusya'nın katılımıyla düzenlenecek barış konferansına katılmayı kabul etmiş ve Arap heyetleriyle görüşme masasına oturmuştur. Ancak bu görüşmelerde herhangi bir ilerleme kaydedilmeyince görüşmeler bu defa Washington'a taşınmıştır. Burada da görüşmeler tıkanma noktasına gelince İsrail, Filistin Kurtuluş Örgütü'nün doğrudan görüşmelere katılması itirazlarını kaldırmıştır. Washington'daki Filistin Kurtuluş Örgütü ile İsrail heyetleri arasında yapılan ikili görüşmelerden sonuç alınamayınca bu defa görüşmeler gizlice 20 Ocak 1993'de Oslo'ya intikal etmiştir. Burada yapılan gizli görüşmeler sonunda ilerleme kaydedilerek İsrail'in işgal ettiği Filistin toprakları Gazze ve Eriha'dan aşamalı olarak çekilmeyi ve buraları özerk bir bölge olarak Filistinlilere devretmeyi, buna karşılık Filistin'in de İsrail devletini tanıması şeklinde iki heyet arasında bir mutabakata varılmıştır. Bu mutabakat 13 Eylül 1993'de Washington'da taraflar arasında imzalanarak tüm dünyaya ilân edilmiştir.

Ancak bu anlaşma Arap dünyasında, olumlu ve olumsuz tepkilere neden olmuştur. Bu tepkiler aynı zamanda şiir dünyasına yansımıştır. Sayıları çok az olsa da kimi şairler, bu anlaşmayı desteklerken, çoğunluk da karşı çıkmıştır. Karşı çıkan şairler, bu anlaşmanın Filistin sorununa barışçıl, adil ve kalıcı bir çözüm getirmediği düşünmüştür. Onlara göre barışçıl girişimler hiçbir zaman bir sonuç vermeyecektir. Silahla alınan toprakların ancak ve ancak silah zoruyla geri alınabilinecektir. Destekleyenler şairler ise, Filistin halkının barıştan başka bir alternatifleri bulunmadığı, yangından kurtarılması gerekenin kurtarılması gerektiği savını ileri sürmüşlerdir.

Bu çalışmamızda, Arap şairlerinin Oslo Barış Anlaşması'yla ilgili yazmış oldukları şiirleri ele alınacak, ortaya koydukları tepkileri ve düşünceleri üzerinde durulacaktır. Konuyla ilgili siyasîlerin ve Arap entelektüellerinin görüşlerine de yer verilecektir. Ayrıca bu anlaşmanın Filistin halkı için siyasî açıdan kayıp ve kazanımlarının neler olduğunu tespit edilecektir.

Keywords: Filistin, İsrail, Oslo, Arap şiir, Barış

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KALDIRMA ARAÇLARININ KULLANIMINDA KARŞILAŞILAN İŞ KAZALARI İSTATİSTİKLERİ VE ALINMASI GEREKEN ÖNLEMLER

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Özet: Dünyada ve Türkiye'de, sanayileşme ve teknolojik ilerlemeyle beraber, işyerlerindeki çalışanların güvenliği ile ilgili ortak sorunlar ortaya çıkmaya başlamıştır. Gelişen teknolojiyle birlikte çalışanlar, daha önce karşılaşmadıkları yeni risk ve tehlikelerle karşı karşıya kalıyor. Başlangıçta fazla önemsenmeyen bu sorunların işletmelerin çalışmasını tehlikeye atması ve iş verimini olumsuz etkilemesi sonucu, sağlık ve güvenlikle ilgili tedbirlerin alınması kaçınılmaz olmuştur. Her geçen gün iş kazalarıyla maddi ve manevi kayıpların büyük boyutlara ulaşması konunun önemini daha da arttırmaktadır. Bu çalışma ile çalışma hayatını kolaylaştıran kaldırma araçlarında yaşanan iş kazalarının boyutları gösterilmiş ve kazalardan korunmak için alınabilecek önlemler belirtilmiştir. Bu çalışmada 2013-2016 yılları arasında kaldırma araçlarında yaşanan iş kazaları iş sağlığı ve güvenliği açısından değerlendirilmiştir.

Anahtar Kelimeler: Kaldırma Araçları, İş Kazaları

WORK INSPECTION STATISTICS AND REQUIRED PRECAUTIONS FOR THE USE OF LIFTING VEHICLES

Abstract: In the world and in Turkey, common problems with the safety of employees in the workplace have begun to emerge together with industrialization and technological developments. With the developing technology, employees face new risks and danger which they have not encountered before. As result of these problems which were initially ignored and adversely affect work efficiency, taking health and safety precautions has become inevitable. The fact that pecuniary and intangible losses reach to big dimensions with every business day increases the importance of this matter. This study shows the dimensions of occupational accidents in lifting vehicles(forklift) that facilitate life and work, and measures which taken to protect them from accidents. In this study, occupational accidents in lifting vehicles between 2013 and 2016 were evaluated in terms of occupational health and safety.

Keywords: Lifting Tools, Work Accidents

Giriş

Çalışma hayatı içerisinde gerek çalışanlar gerekse devletler açısından en önemli sorunlardan biri, meydana gelen iş kazaları ve ortaya çıkan meslek hastalıklarıdır. Uluslararası Çalışma Örgütü (ILO)'nun tahminlerine göre 2003 yılında Dünya genelinde 358 bin ölümlü, 337 milyon yaralanmalı iş kazası meydana gelmiş ve 1,95 milyon insan meslek hastalıkları sonucu hayatını kaybetmiştir. Gelişmiş ülkelerdeki iş kazaları sayısının gelişmemiş veya gelişmekte olan ülkelere nazaran daha az olduğu bilinmektedir. Ülkemizde günden güne artan iş kazaları nedeniyle, iş sağlığı ve güvenliği konusunda ulusal mevzuatımızda değişiklikler yapılmış, ancak alınan önlemler

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yeterli ve etkin olamamıştır. Ölümlü iş kazalarının oranında azalma olmakla birlikte yine de gelişmiş ülkelere kıyasla bu oran yüksektir (ÇSGB, 2014).

İş sağlığı ve güvenliği konusunda yapılacak çalışmaların nedenli zaruri bir ihtiyaç olduğu aşikardır. Bu çalışma ile Türkiye'de kaldırma araçlarıyla yapılan işlerde meydana gelen kazaların araştırılması, meydana gelebilecek kazaların, meydana gelmeden önce proaktif yaklaşım anlayışıyla, uzuv ve can kayıplarının yaşanmaması, en aza indirgenmesi, kazaların önlenmesi için alınabilecek önlemler ve bunlar için araştırılan ve elde edilen istatistikler ele alınmıştır. Böylece, işyerlerinde işlerin aksamamasına, can kayıplarının yaşanmamasına, mal kaybı ve zaman kayıplarının oluşmamasına, katkı sağlanması hedeflenmektedir.

Yapılan araştırmalar sonucunda, literatürde "Kaldırma Araçlarının Kullanımında Karşılaşılan İş Kazaları İstatistikleri ve Alınması Gereken Önlemler" alanında yapılmış yeterli ölçüde bir çalışma bulunamamıştır. Bu çalışmayla ve elde edilen veriler yayınlandığında literatüre ve saha uygulamalarına büyük katkı sağlanacağı düşünülmektedir. Aynı zamanda Türkiye'de kaldırma araçları kullanımında yaşanan iş kazaları, iş kazalarının nedenleri, 2013-2016 yılları arasında kaldırma araçlarında yaşanan kazaların, ölümlü, uzuv kayıplı, yaralanmalı niteliklerine göre tasnif edilmiş sayısal değerlerine ve ölümlü kazaların, yaşa, eğitim durumuna, kazanın gerçekleştiği iline göre ayrılmış çalışmasına yer verilecektir. T.C. Sosyal Güvenlik Kurumunu, Hizmet Sunumu Genel Müdürlüğü, Veri Yönetimi Daire Başkanlığı biriminden kaldırma araçlarında meydana gelen kazalar ile ilgili veril alınmış olup kazalar tek tek irdelenmiştir.

Materyaller

Herhangi bir yükü bulunduğu yerden kaldırıp yer değiştirerek bir başka yere indiren veya istifleyen, gerektiğinde bu yükün yer değiştirme işlemini, yükü kısa mesafelerde taşıyarak gerçekleştiren araçlara kaldırma araçları denir (Şimşek, 2016). Kaldırma makineleri günümüzde oldukça önemli ve fonksiyoneldir. İnşaat, maden, yol yapımı, liman işleri ve fabrikalarda kaldırma işlerinde yaygın olarak kullanılmaktadırlar ve vazgeçilmezdir. Kaldırma makinelerinin çeşitleri çok fazladır. Yaygın olarak kullanılan ve gün geçtikçe önemi artan kaldırma araçlarından başlıcaları şunlardır;

- **Vinçler**
- **Forkliftler**
- **Asansörler**

Belirlenen yükleri kaldırmak, başka bir yöne hareket ederek ya da dönerek aktarmak, yüklemek, boşaltmak, yerlerini değiştirmek vb. işlemlerin gerçekleştirilmesi için kullanılan ekipmanlara vinç denir. Vinçler; sahip oldukları kaldırma tertibatının dışında döndürme, yürütme gibi tertibatları bulunan, yükleri istediği yöne hareket ettirme kabiliyeti olan iş makineleridir (Su, 2015). Vinçler genel olarak hareket kabiliyetlerine ve kaldırma kabiliyetlerine göre sınıflandırılır. Bununla birlikte, kullanıldıkları, monte edildikleri ve çalıştıkları yerlere göre, yapılarına ve yapacakları işlere göre, bom yapılarına göre ve enerji kaynaklarına göre de sınıflandırılabilir (Urul, 2013).

Bir yükün yatay ve dikey hareketini yapan bir istifleme araçlarına forklift denir. Forklift (istif makinesi), herhangi bir yükü çatallı kolları ile alıp kaldırarak belirli bir mesafeye taşıyıp istif etmeye yarayan taşıma ve kaldırma makineleridir. Sanayi kesimlerinde depolama, gümrük, stoklama, ambarlama vb. iş yerlerinde ekonomik olarak iş yapan makinelerdir. Bu makineler ile malzemelerin yükleme, boşaltma ve taşıma hizmetleri yapılır (Gerek, 2006). Forkliftlerin yük kaldırma kapasiteleri 1-40 ton arasında değişir. Genelde yük kaldırma yükseklikleri 3-7 metredir. Özel maksatlarla 8-9 metreye yük kaldıran modelleri vardır. Dolgu veya havalı lastikler kullanılabilir. Havalı lastik, operatör konforu sağlar ve ekonomiktir ancak çivi veya metal çapakların bulunduğu mekânlarda patlayacağından bu tür mekânlarda dolgu lastik kullanmak daha mantıklıdır. Direksiyon donanımı, arka lastiklere kumanda eder ve dönme işlemi arka tekerleklerle yapılır (Delikanlı, 2015).

İnsanlık tarihinin en eski problemlerinden birisi de düşey kaldırma olmuştur. İnsanlar bu konuda kaldıraç ile işe başlayıp, çıkrık benzeri sistemlerle problemlerini çözmeye çalışmışlardır. Yüzyılımızda yüksek bina yapımına doğan ihtiyaç, düşey taşımacılığında gelişimini beraberinde getirmiştir. Düşey taşımacılıktaki gelişmeler ve kazanılan teknik başarı, daha yüksek bina yapımında etkili olmuştur. Birbirini etkileyerek büyüyen iki sektör kendi

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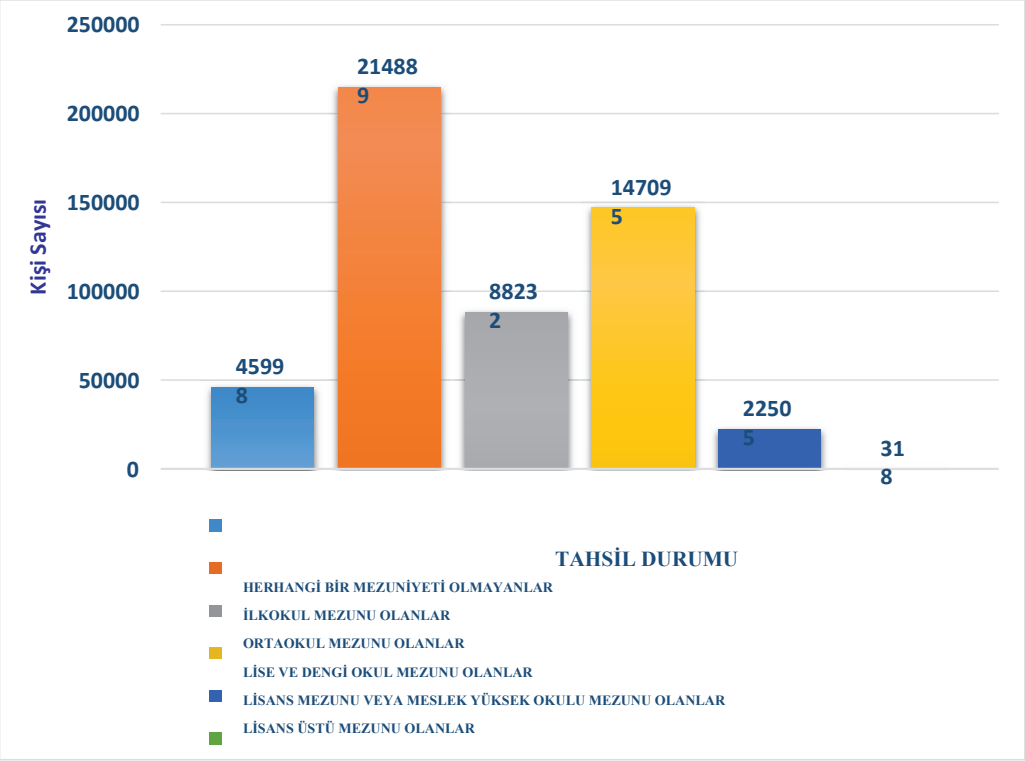
içinde daha ileri teknoloji, güvenlik ve konfor standartlarını geliştirmiş, bugünkü seviyelere gelinmiştir. (Dizdar vd, 2001) 17. yüzyılın başlarında VELAYER adındaki bir Fransız mimar bu ilkel aleti biraz daha geliştirmiş ve karşı ağırlık ile daha iyi dengede çalışmasını sağlamıştır. Karşı ağırlık ile çalışan ve elle çevrilerek hareket ettirilen bu alete uçan sandalye adı verilmiştir. Bu dönemlerde Amerika'da daha büyük bir dolap yapılmış ve bu dolap iki katlı bir binada kullanılmıştır. Bu aletin en önemli özelliği ise basınçlı hava ile çalışması ve böylelikle insan gücüne ihtiyaç duyulmaması idi. 1867 yılında EDOUX adında bir Fransız mühendis uluslararası Paris sergisi münasebeti ile yeni bir kaldırma makinası yapmış ve adını ASANSÖR koymuştur. Bu makina ziyarete gelen misafirleri en yüksek noktaya kadar çıkartıp indirmiştir. 1880 yılında asansör teknolojisi bir kademe daha ileri gitmiş ve bu kez Alman fizikçi SİEMENS asansörlerde elektrikten faydalanmıştır. 1889 yılında ise Paris'te açılan bir sergide ünlü Fransız mühendis EİFFEL adını verdiği ve ismini ölümsüzleştiği kule içerisine birde asansör kurmuştur. EİFFEL kurmuş olduğu bu asansör ile insanları zahmetsiz bir şekilde kuleye çıkarmış ve insanlara Paris'i seyrettirmiştir. 1850 yılı ile 1860 yılları arasında İngiltere'deki tekstil fabrikalarında asansör yaygın olarak kullanılmıştır. Asansörlerin bu kullanımı daha sonra endüstriden ticarete ve oradan da halkın kullanımına olacak şekilde yaygınlaştırılmıştır. 1892 yılında Ülkemizde ilk asansör, İstanbul'da Pera Palas'a inşa edilmiştir. Beyoğlu'nda ilk elektrik kullanan bina olmakla birlikte, Türkiye'nin en eski elektrikli asansörü de Pera Palas otelinde bulunmaktadır (TMMBO, 2014).

Bulgular

Bu çalışmada, Türkiye'de 2013-2016 yılları arasında kaldırma araçlarında yaşanan kazaların araştırılması, istatistiksel verilerle açıklanmaya çalışılmıştır. Araştırmada elde edilen bulguların kaldırma araçlarında yaşanmış kazaların sayısal değerleri ve niteliksel kayıpları kazaların önlenmesi konusunda ne derece önemli boyutta kayıplar yaşandığını ortaya koymaktadır. Bu vesile ile alınacak önlemlerin ne derece önemli ve zaruri olduğu çok açıktır. 2013-2016 yılları arasında, kaldırma araçlarında yaşanan kazalarda kazazedelerin tahsil durumları Şekil 1'de, kaldırma araçlarında yaşanan kazaların içeriği Şekil 2'de, kaldırma araçlarında ölümlü kazalardaki, kazazedelerin yaş gruplarına göre sınıflandırılması Şekil 3' de, araştırılan meslek alanlarındaki ölümlü kazaların

Şehirlere göre dağılımı ise Şekil 4'de verilmiştir.



Şekil 1. 2013-2016 yılları arasında, kaldırma araçlarında yaşanan kazalarda kazazedelerin tahsil durumları

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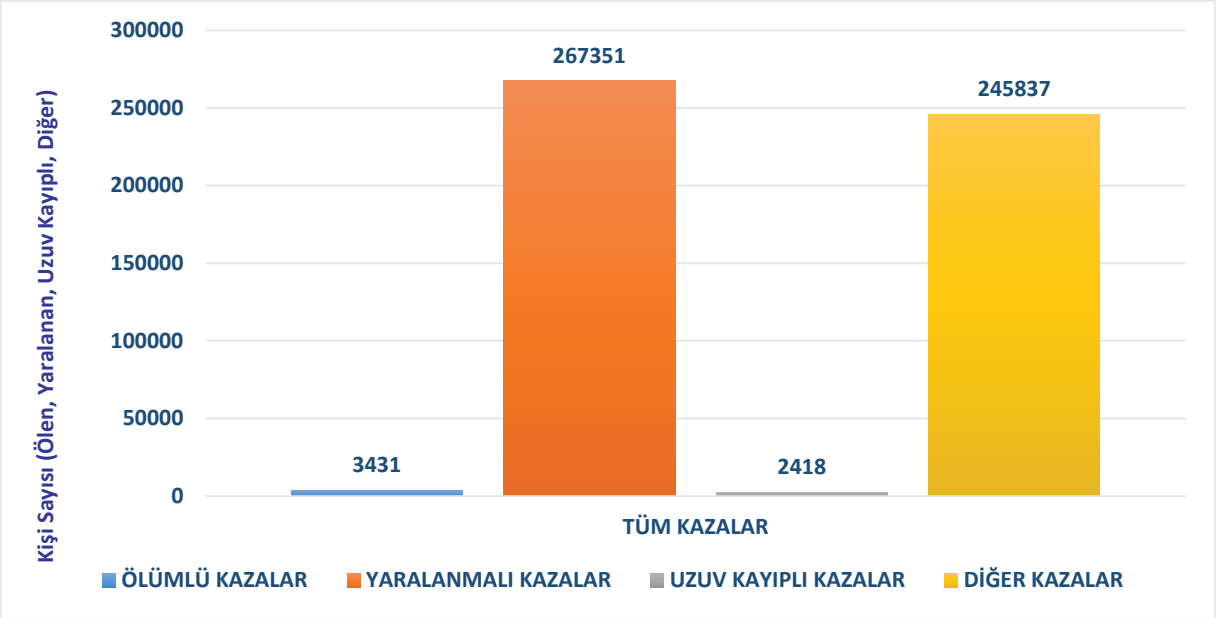
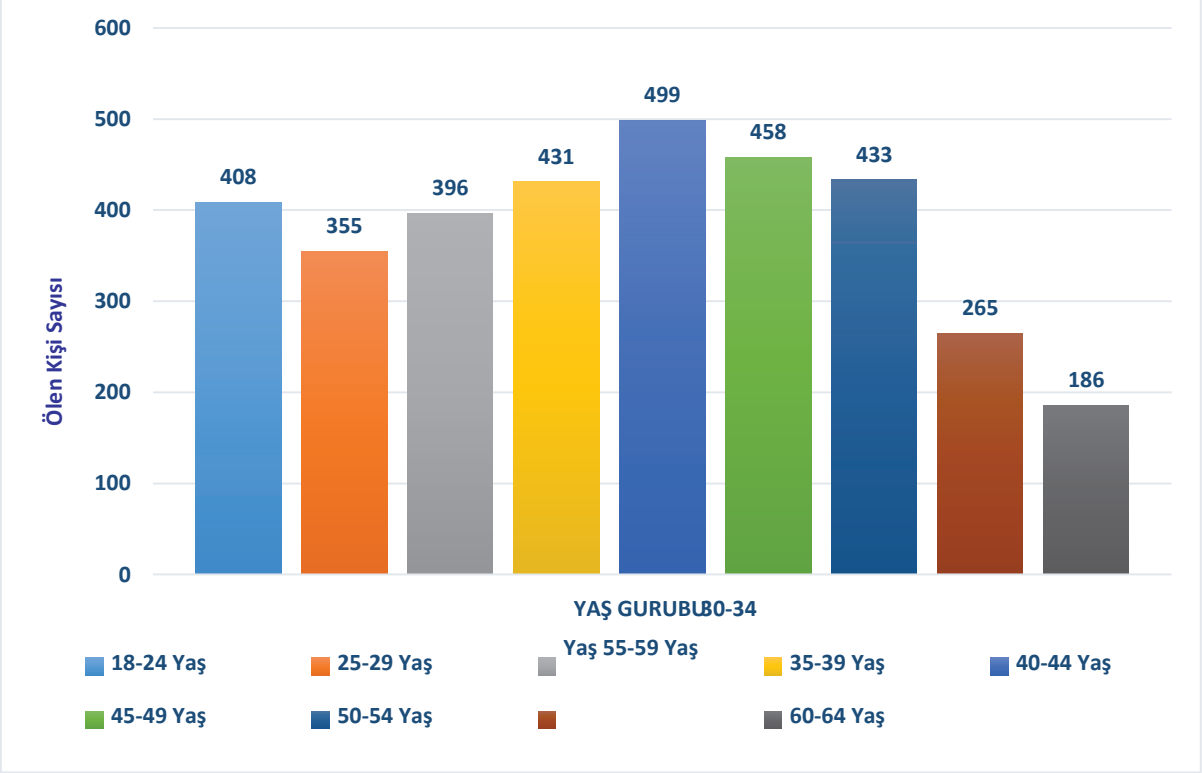


Şekil 2. 2013-2016 yılları arasında, kaldırma araçlarında yaşanan kazaların içeriği



Şekil 3. 2013-2016 yılları arasında, kaldırma araçlarında ölümlü kazalardaki, kazazedelerin yaş gruplarına göre sınıflandırılması

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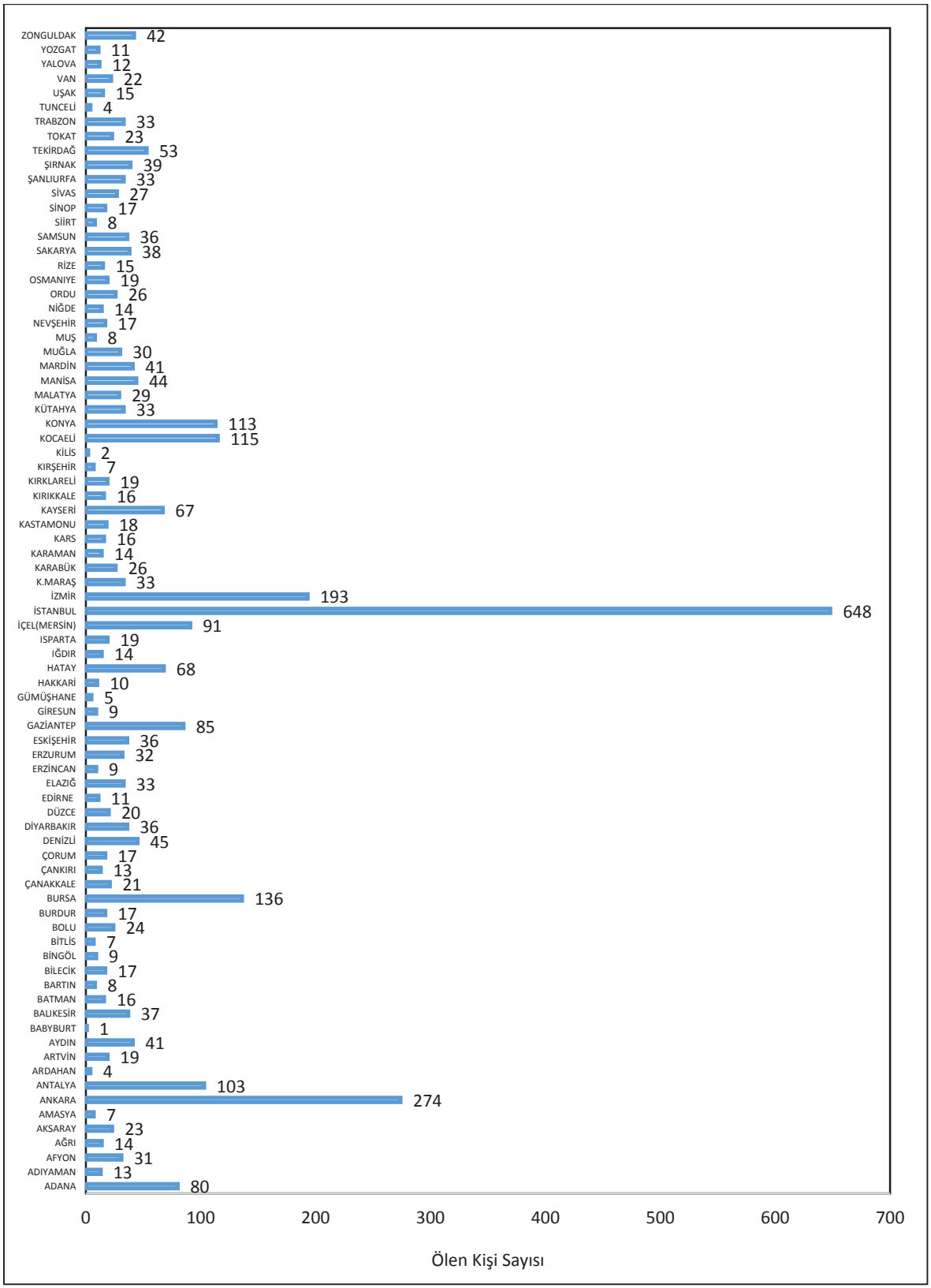

Şekil.4. 2013-2016 yılları arasında, araştırılan meslek alanlarındaki ölümlü kazaların Şehirlere göre dağılımı

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Sonuçlar

Bu çalışmanın amacı; ülkemizde kaldırma araçlarıyla yapılan işlerde meydana gelen kazaların araştırılması, istatiksel verilerle ve kullanılan metodolojiye ait bilgilerle, meydana gelebilecek kazaların, proaktif yaklaşım anlayışıyla meydana gelmeden önce alınabilecek önlemleri ve dikkat edilmesi gereken hususları açıklanmaya çalışılmıştır. Türkiye de kaldırma araçlarında en çok yaşanan kazazedelerin tahsil durumu ilkokul mezunu çalışanlar olduğu gözlenmektedir. İlkokul mezunu olan kazazedelerin sayısında artış görülürken lisansüstü mezunu olan kazazedelerin sayısı 318 dir. Görüldüğü gibi eğitim seviyesinin kazaların meydana gelmesinde etkili olduğu görülmekle birlikte eğitim seviyesi yükseldikçe kaza geçiren kişi sayısı düşmektedir. Kaldırma araçlarında meydana gelen kazalar daha çok yaralanma ile sonuçlanmaktadır. Ölümle sonuçlanan kazalar ise dah çok orta yaş grubunda olmaktadır. Ölümlü kazların en çok yaşandığı iller ise nüfus yoğunluğuna paralel olarak artmakta olup en çok ölümlü kaza İstanbul en azı ise Bayburt'dur. Araştırmada elde edilen bulguların, kaldırma araçlarında yaşanmış kazaların sayısal değerleri ve niteliksel kayıpları, kazaların önlenmesi konusunda ne derece önemli boyutta kayıplar yaşandığını gözle önüne sergilemiştir. Bu vesile ile alınacak önlemlerin ne derece önemli ve zaruri olduğu çok açıktır. Sonuç olarak elde edilen verilerin konunun önemini kamuoyuna duyurmak ve konunun hassasiyetini vurgulamak gerektiğini düşünmekteyiz.

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Dünya nüfusunun ve sanayileşmenin hızlıca artması doğal olarak enerji ihtiyacının da artmasına sebep olmaktadır. Günümüzde enerji ihtiyacının büyük bir kısmı fosil yakıtlardan karşılanmaktadır. Ancak fosil yakıtların çevre ve insan sağlığı üzerindeki olumsuz etikleri nedeniyle ülkeler, çevre dostu alternatif enerji kaynakları kullanımına yönelmiştir. Bu alternatif enerji kaynaklarından biri de atıklardır. Özellikle büyük şehirlerde önemli çevresel ve sağlık sorunlarına yol açabilen katı atıklar, enerji üretiminde kullanılması ile hem atıkların bertaraftı sağlanmakta hem de enerji üretilerek ülke ekonomisine katkı sağlanmaktadır. Katı atıklardan enerji üretimi ise son yıllarda büyük önem kazanmış ve bu alanda yapılan yatırımlar her geçen gün artmaktadır. Sunulan bu çalışmada katı atıklardan enerji üretim süreci Samsun'daki uygulamalar örnek verilerek değerlendirilmiştir.

Keywords: Katı atık, Alternatif enerji kaynakları, Biyogaz

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KURDISH RECOGNITION SYSTEM DIGIT

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Abstract: The security problems arising with the developing technology have put secure systems in quest of being developed with new techniques. The voice processing technology among these techniques has gained great importance. This situation has directed the reliability ensuring the man-machine interaction together with the voice processing applications such as speech recognition, speaker recognition, converting audio to text or converting text to audio to the design of high and correct systems. In this study, a digit speech recognition system consisting of the audio examples of digits from 0 to 9 in Kurdish spoken in Turkey was realized. For this purpose, audio recordings were obtained from 102 adult speakers who speak Kurdish. The feature vectors of the audio data acquired from these recordings were obtained with the Mel-Frequency Cepstral Coefficient by using different windowing methods, and the success rates were compared by conducting the recognition process with Dynamic Time Warping according to the feature vectors obtained.

Keywords: Speech processing, Kurdish, MFCC, DTW.

Introduction

Nowadays, speech recognition systems play an important role especially in personal applications that require password verification. Therefore, such applications have led to the widespread use of speech recognition systems and the development of speech recognition systems of different languages and dialects based on different voice features. This development first occurred in English, and then its applications were developed in French, Spanish, German, Danish, Japanese and Chinese. The aim of this study is to develop a speech recognition system in the Kurdish language.

Kurdish is an inflected language within the Indo-Iranian language group. Kurdish is the most spoken language after Turkish in Turkey, after Arabic, Turkish and Persian in the Middle East and Asia (Khan & Lescot., 1971, Wikipedia). The fact that a Kurdish speech recognition system to be created in this context can be used by wide masses also makes this article important.

Speech is a complex biometric signal produced as a result of various transformations that occur at the acoustic and articulation level (Trivedi., 2013). Speech recognition is the automatic extraction of linguistic information by obtaining acoustic models from speech signals (Karadaş., 2014). Speech recognition systems design systems with the capability to make easier, quicker, and more effective and more reliable processes with the human and machine interaction that supports artificial intelligence, speech-to-text and text-to-speech application areas. The most frequently used speech recognition applications in daily life are disabled aid applications, robotics applications, telephone banking applications and automatic pager applications.

The speech recognition process consists of the procedures of receiving the voice signal as an input, processing the voice and recognizing the voice signal as an output. In a general speech recognition system, a speech signal received by a microphone or telephone is first passed through a pre-treatment stage, and the distinguishing feature (property) vectors are extracted to perform the recognition of the speech expression, and a model is created by training these feature vectors extracted. Then, the model of the test speech signal, which will be questioned in terms of which speech expression it is, is extracted and then whether there is a match is determined by comparing it with the previously modelled (by training) templates. The block diagram of a speech recognition system is presented in Figure 1.

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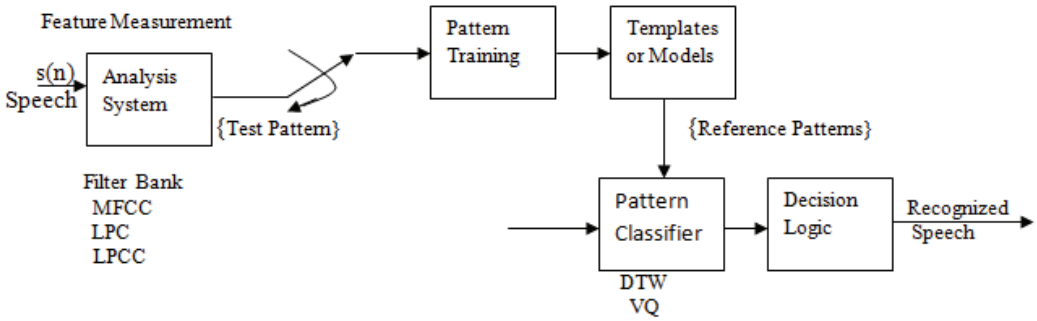

Figure 1: Block diagram of a speech recognition system (Rabiner & Juang., 1993).

The process steps that make up a typical speech recognition system defined in Figure 1 consist of 4 main blocks:
Feature Measurement (Extraction):
The most basic process to be performed in order to process speech signals of different individuals in speech recognition systems is to extract important information (distinguishing features specific to the speech expression) from the speech patterns of each speaker. However, speech patterns should be filtered from the noise effect resulting from various factors to perform this process. For this purpose, the speech patterns should be first put through a pre-treatment stage by being subjected to a filtering method before the feature extraction process.

The most frequently used Filtering and feature extraction methods are as follows:

- Wiener Filter
- Spectral Subtractive
- Kalman Filter
- Mel Frequency Cepstrum Coefficients (MFCC)
- Linear Predictive Coding (LPC)
- Linear Predictive Cepstral Coefficients (LPCC)

Pattern Training:
The feature that makes up the template corresponding to the speech expression of the same class is used in obtaining the parameters. A whole template that represents the feature parameters of each speech class is called a Reference Template.

Pattern Classification:
The classification process is the recognition of the speech signal by comparing the test speech signal with Reference Template examples. The most frequently used techniques to perform this process block are as follows:

- Dynamic Time Warping (DTW),
- Vector Quantization (*VQ)*

Decision Logic:
A similarity score is obtained between the speech signal put through the test process and the Reference Template in the final block of the speech recognition system. The highest similarity score will perform the recognition process.
The materials and methods used for the development of an automatic digit recognition system were theoretically summarized in the remaining parts of this study, and then it was concluded with the conclusion part after presenting the experimental results obtained.

Materials and Methods

In this study, database sampling that consists of Kurdish speech samples was created to recognize Kurdish digits. With this database created, distinguishing features (feature vectors) of each speech signal were obtained using the MFCC method. Feature vectors were obtained by using the MFCC method together with Hamming, Hanning and Rectangular windowing techniques. Afterwards, the feature vectors obtained were modelled by training with DTW. At the test stage, whether there is any speech was questioned by comparing the given speech signal with the templates in the training set.

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As a result of this study, a digit recognition system was developed in Kurdish, and its effects on the Kurdish speech recognition system were investigated by applying different windowing approaches to the MFCC feature extraction method.

Database Sampling

For an automated speech recognition system to be realized, it is primarily required to create databases that contain the voice signals suitable for the systems that are aimed to be realized. Detailed information on the database features used in this study is presented in Table 1.

Table 1: The features that make up the dataset.

	Number of speakers	Age interval	Number of words	Number of repetitions	Words told
Adult Male	76	19-55	10	3	0,1,2,3,4,5,6,7,8,9.
Adult Female	26	19-52			

As is seen in Table 1, the numbers were taken from 102 adult speakers from different age and gender groups. Speeches taken from each speaker from 0 to 9 were recorded as a single file. 3 records were taken from each speaker. Therefore, three (Record1, Record2 and Record3) speech files were collected for each speaker. In this study, each record file was used as training and test data alternately as is shown in Table 2. So, for each record, the DTW algorithm is repeatedly applied to one out of the 3 folds, while two different folds are held out each time.

Table 2: Training and Test data sampling.

Training Data	Test Data
Record1	Record2 and Record3
Record2	Record1 and Record3
Record3	Record1 and Record2

It is necessary to determine the voiced (spoken) parts in any file recorded, and remove the silent parts. In this study, the determination of the voiced and silent parts was made with signal energy and spectral centre parameters.

The voice records were obtained from silent environments or office environments with little noise. General Mobile Discovery II+ brand cell phone and the Easy Voice Recorder Pro voice recording programme loaded in this phone were used in taking the voice signals. The digital recording format is mono, 16 bit, 22050 Hz and PCM Wave file format.

Methods Used

This part is about the methods used.

I. Wiener

Wiener filter is a method performed in the frequency space.

The Wiener filtering method is expressed by the following Equation 1 equality:

$$x(m) = \sum_{k=0}^{P-1} w_k y(m-k) \qquad (1)$$

- m: means the time series,
- $y^T = [y(m), \dots, y(m-P-1)]$: input value,
- x(m) : filter output value, and
- $w^T = [w_0, w_1, \dots, w_{P-1}]$: means the coefficient vector of Wiener filter.

Error signal is expressed with the following Equation 2 equality:

$$e(m) = x(m) - w^T y \qquad (2)$$

The Wiener filter coefficients are obtained with the value that minimizes the average squared error expressed with $e^2(m)$.

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II. MFCC

MFCC is one of the most widely used feature extraction methods in speaker recognition systems. MFCC is a numerical technique analysis that imitates the perception of human ears and is calculated based on FFT (Fast Fourier Transform) (Karasartova., 2011). The flow diagram of the steps that are necessary to obtain the MFCC coefficients is presented in Figure 2.

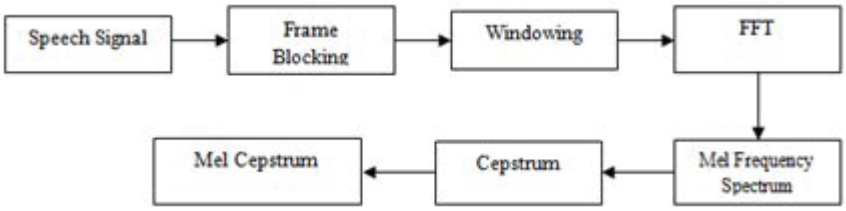

Figure 2: MFCC block diagram.

1) Frame Blocking: It means obtaining the characteristic features of the speech signal in a more stable state by processing it at small time intervals.

2) Windowing: Windowing can be defined as dividing a speech signal into a time period of a particular length. More generally, windowing is the multiplication of a framed signal with a special function.

Windowing methods,

- Hamming,
- Hanning,
- Rectangular,
- Barlett and Kaisser.

The most frequently used methods for windowing are Hamming and Rectangular windowing examples. Hamming, Hanning and Rectangular windowing methods were used in this study. The functions of windowing methods are in the following equations (N: means the number of samples).

Hamming Window:

The Hamming window is expressed by the following Equation 3equality:

$$w(n) = 0.54 - 0.46\cos\left(\frac{2\pi n}{N-1}\right),\ 0 \le n \le N-1 \qquad (3)$$
$$w(n) = 0, \quad otherwise$$

Hanning Window:

The Hanning window is expressed by the following Equation 4 equality:

$$w(n) = \frac{1}{2}\left\{1 - \cos\left(\frac{2\pi n}{N-1}\right)\right\},\quad 0 \le n \le N-1 \qquad (4)$$
$$w(n) = 0, \quad otherwise$$

Rectangular Window:

The Rectangular window is expressed by the following Equation 5 equality:

$$w(n) = 1,\ 0 \le n \le N-1 \qquad (5)$$
$$w(n) = 0, \quad otherwise$$

3) FFT (Fast Fourier Transform): Fast Fourier Transform (FFT) takes the windowed frame from the time domain to the frequency domain. The Fast Fourier Transform signal is expressed by the following Equation 6 equality:

$$X_n = \sum_{k=0}^{N-1} x_k\, e^{-2\pi jkn/N}, 0 \le n \le N-1 \qquad (6)$$

4) Mel Frequency Spectrum: In this process block, the signal with "f" frequency in Hz unit is taken from Mel filter bank that consists of triangular waves that permeate the band. Therefore, the value of the signal in M(f) frequency unit is obtained with this process. The number of filters in Mel filter bank defines MFCC coefficient value.

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The algebraic equality of the process of transforming the Mel spectrum and FFT frequency values in Hz into Mel frequency unit is as follows:$M(f) = 2595.log_{10}\left(1 + \frac{f}{700}\right)$.

5) Mel Cepstrum: The signal obtained from Mel Filter bank is taken to the time domain from the frequency domain using DCT (Discrete Cosinus Transform) after taking its logarithm, and Mel frequency Cepstrum Coefficients values are obtained.

III. DTW (Dynamic Time Warping)

DTW is a classification method based on dynamic programming. This method is used to find the similarity between the same speech expression told by the speaker at different times and speeds. In the DTW method, the distance values that give the best match are calculated by comparing the model obtained from the feature vector of the test speech signal with the Reference Template models created from the training dataset. Afterwards, the Reference Template that is at a minimum distance to the test signal from these distance values calculated decides on the match model.

Results and Discussion

Kurdish digits from 0 to 9 were used in this study. The success rates of the MFFC method using Hamming, Hanning and Rectangular windowing techniques are compared with each other. The percentage of correct recognition of each technique based on its recognition result is shown in Table 3, and the Computational process time is shown in Table 4.

Table 3: The recognition accuracy results.

	DTW		
MFCC	**Hamming**	**Hanning**	**Rectangular**
	%99.03	%98.96	%99.26

Table 4: Comparation computational process results.

	Computation Time (Hours)		
MFCC	**Hamming**	**Hanning**	**Rectangular**
	23.363	22.790	22.234

According to the results obtained in Table 3 and Table 4, the Rectangular windowing technique yields better results than other windowing techniques in terms of recognition and computational process time in practice.

Conclusion

Within the scope of this study, it was aimed to develop a digit recognition system based on Kurdish speech patterns by modelling the feature vectors obtained with the Hamming, Hanning and Rectangular windowing approaches of the MFCC feature extraction method using the DTW method. Therefore, the analysis of different windowing techniques on the Kurdish voice system was examined. Furthermore, general information is provided on the methods used in the speech recognition field in this study. Following this study, it was aimed to reveal the speech recognition system that gives the best performance based on the voice structure of Kurdish by training MFCC and different windowing samples with the HMM (Hidden Markov Model) method.

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KÜRESEL TEKNOLOJININ TOPLUMSAL YAPIYA ETKISI BAĞLAMINDA DÖNÜŞEN EMEK

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Günümüz toplumunun üretim sürecinde insan emeğine duyulan ihtiyaç giderek azalmaktadır. Kapitalist toplumların da asıl önemsediği; minimum maliyet ile maksimum kar elde etmektir. Teknoloji de bu eylemi mümkün kılmaktadır. Teknoloji ile beraber küreselleşme de ivme kazanmaktadır. Teknoloji, bizlere emeğin tanımını yeniden yapmayı gerekli kılmaktadır. Söz konusu emek, bilim ve teknolojideki gelişmelerin ışığında insan emeğinden makina emeğine dönmüş; ancak makinaya sözünü geçirecek olan yine insandan başkası olmamıştır.

Küreselleşme hareketi altında yatan ekonomik amaçlar ile birlikte hareket etmektedir. Küreselleşmede öncü ülkeler arasında başı çeken Amerika'dır. Yirminci yüzyılın başında önemli rakiplerinden biri Japonya iken Avrupa ülkelerinin daha fazla söz sahibi olduğu bir döneme geçiş yapılmıştır.

Bu içerik ile mevcut tanımlamalardan yola çıkılarak teknoloji ile sürekli değişerek yeniden şekillenen ve bu bağlamda teknoloji ekseninde küreselleşen dünyada "emek" olgusunun yeni karşılığına dair argümentatif bir çalışmaya yer verilmiştir.

Keywords: Küreselleşme, teknoloji, emek

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LENGTH-WEIGHT RELATIONSHIPS AND CONDITION FACTOR OF TENCH, TINCA TINCA (L., 1758) INHABITING SIDDIKLI KÜÇÜKBOĞAZ DAM LAKE, KIRŞEHIR, TURKEY.

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In this study, length-weight relationship and condition factor values of totally 102 Tench, *Tinca tinca* (L., 1758) specimens, captured from Sıddıklı Küçükboğaz Dam Lake between September 2015 and August 2016, were examined.Sex composition was 49.02 % female, 43.14 % male and %7.84 undetermined sexes. The overall sex ratio (F:M) was 1.0:0.88. Total lengths of fish ranged from 12.0 to 37.5 cm and their weights ranged from 21.48 to 783.24 g. The parameter b values of length-weight relationships were found as 3.232 in female and 3.157 in male. The positive allometric growth was observed in both sexes ($b > 3$, $p < 0.001$). The mean condition factor values of female and male were 1.305 and 1.330, respectively.

Acknowledgements: This work was supported by the Ahi Evran University Scientific Research Projects Coordination Unit (Project No: TBY. E2.17.004).

Keywords: Length-weight relationship, condition factor, Tinca tinca, Sıddıklı Küçükboğaz Dam Lake

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MARDİN'DE GÜNLÜK MAKSİMUM YAĞIŞLARIN ANALİZİ VE SEL AFETİYLE İLİŞKİSİ

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Aşırı yağışların araştırılması ve doğasının tanımlanması, bu yağışların neden olduğu doğal afetlerin yönetilebilir boyutlarının anlaşılmasını sağlar. İklim değişikliğiyle bağlantılı ekstrem yağış olaylarının dünyanın birçok bölgesinde sıklığının artacağı yönündeki öngörüleri içeren çok sayıdaki bilimsel yayın, karar vericiler için önemli birer uyarı niteliğindedir. Günümüzdeki kentlerin ve kırsal yerleşmelerin altyapı dayanıklılığı ve yeterliliğinin gözden geçirilmesi, yapılaşma projelerinin hazırlanması ve farklı sektörlerdeki yatırım planlarının yapılması, iklim değişikliğine uyum politikaları çerçevesinde düşünmeyi gerektirmektedir.

Çalışma alanı olarak Mardin'in seçilmesinde, son yıllarda yaşanan aşırı yağışlar sonucunda sel felaketlerinin sıklığının artmış olması belirleyici olmuştur. Mardin'de son oniki yılın yedisinde (2006-2017 yılları arasında 2008, 2011, 2012, 2013 ve 2016 yılları hariç), çoğu taşra ilçelerde olmak üzere, aşırı yağışlar sonucunda su baskınları yaşanmış ve buna bağlı olarak can ve mal kayıpları yaşanmıştır. Sadece 2006 yılının Kasım ayındaki sel afetinde 2,8 milyon $ mal kaybı (489 konut, 36 işyeri, 206 km karayolu, 95000 dekar tarım arazisi zarar görmüş ve toplam 488 baş çiftlik hayvanı telef olmuştur.) yaşanmıştır.

Bu çalışmada materyal olarak Meteoroloji Genel Müdürlüğü'nün Mardin'deki meteoroloji istasyonunda kaydedilen, 1983-2016 yıllarını kapsayan (34 yıl) günlük yağış tutarları kullanılmıştır. Bu verilerden, her yıl için gerçekleşen maksimum günlük yağış tutarları çekilerek istatistik hesaplamalarında kullanılmıştır. Mardin'de her yıl için gözlenmiş günlük maksimum yağışların istatistiksel olarak incelenebilmesi ve tahminlerin yapılabilmesi için farklı yağış gruplarına göre histogram oluşturulmuş ve olasılık yoğunluk fonksiyonu hesaplanmış, En Küçük Kareler yöntemi kullanılarak günlük maksimum yağışların trend analizi yapılmıştır. Yapılan analizler sonucunda aşağıdaki bulgulara ulaşılmıştır: (I) Günlük maksimum yağışların ortalaması 49 mm, standart sapması 19 olarak hesaplanmıştır. (II) 34 yıllık gözlem verilerinden 12 yılın maksimum günlük yağışları, ortalama maksimum yağıştan (49 mm) daha fazla gerçekleşmiştir. (III) Günlük maksimum yağışların trend analizine göre hafif bir azalma trendi gözlenmiştir (R^2=0,03). (IV) Günlük maksimum yağışın 40 mm ve daha az olma olasılığı %32,4; 40 mm ve üzerinde olma olasılığı %67,6 olarak hesaplanmıştır. Günlük maksimum yağışın 80 mm ve daha az olma olasılığı %94,1; 80 mm ve üzerinde olma olasılığı %5,9 olarak hesaplanmıştır. Mardin'de 2006 tarihindeki sel felaketinde, 2 Kasım ve önceki günün toplam yağışının 38,5 mm olduğu göz önüne alındığında, günlük toplam 35-40 mm'lik eşik değerin dikkatle takip edilmesi gerektiği sonucu ortaya çıkmaktadır. (V) 2006, 2007, 2009, 2010 ve 2015 yıllarında Mardin'de (ve taşra ilçelerinde) gerçekleşen sel afetlerine neden olan yağışların 35 mm ile 80 mm arasında değişmesi, diğer faktörlerle birlikte günlük toplam yağışların önemini açıkça göstermektedir.

Keywords: Mardin, Maksimum günlük yağış, Sel afeti, Yağış analizi, Aşırı yağış olasılığı

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MATHEMATICAL MODELLING OF NEUTRAL–TYPE NEURAL NETWORKS

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Abstract: In this study the mathematical models and stability analysis of a special neural network model (neutral–type neural networks) are investigated. Neutral–type neural networks have a more complex mathematical models than other type neural networks because they have derivative form in each side of the differential equation. So to develop a mathematical model and analyse the existence, uniqueness and stability of the equilibrium point of this type of models are very important. In this study, the mathematical models and stability analysis of some neutral-type neural networks in the literature are examined.

Keywords : Neural networks, stability analysis, Lyapunov functionals

Introduction

The stability analysis of the equilibrium point in neural networks is a very important subject and have been intensively studied in the recent literature. A neural network whose stability properties are obtained can easily be applied to various problems. So determining the affect of the time delays on the equilibrium and stability properties of neural networks have importance. In the recent literature, many researchers have studied the equilibria and stability properties of neural networks and presented various sufficient conditions for the uniqueness and stability of the equilibrium point for neural networks with time delays. The stability citeria of different type neural networks have different properties and must be analysed independently. The stability analysis needs a mathematical knowledge and problem solving ability. In the stability analysis, Lyapunov- Krasovskii functionals, Linear Matrix Inequality (LMI), Razumikhin approaches, Lyapunov – Metzler LMIs, partial Lyapunov functionals are frequently used for the stability analysis.

Materials and Methods

One of the oldest studies about neutral – type neural networks (Agarwal and Grace, 2000) analyses stability of the model whose differential equation is given below (Eq.1). In this model, τ and σ refer the delay.

$$\frac{d}{dt}\big(x(t)+c(t)x(t-\tau)\big)+p(t)x(t)+q(t)x(t-\sigma)=0 \qquad (1)$$

The models given in some studies (Park and Kang, 2001; Fridman 2001), it can be easily seen that there are some similarities. The formulations are given in (Eq. 2) and (Eq. 3) respectively. In these studies, novel Lyapunov – Krasovskii functionals were presented for linear – delayed neutral – type systems. The stability conditions were given in the terms of LMI.

$$\frac{d}{dt}\big[x(t)-\textstyle\sum_{j=}^{m} B_j x(t-h_j)\big]=A_0x(t)+\sum_{j=1}^{m}A_jx\big(t-h_j\big),\ \ t\geq 0 \qquad (2)$$
$$x(0)=g^0,\qquad x(t)=g^1(t),\quad t\in[-h,0)$$

$$\dot{x}(t)-\textstyle\sum_{i=0}^{m} D_i\dot{x}\,(t-h_i)=\sum_{i=0}^{m}A_ix(t-h), \qquad (3)$$
$$x(t)=\emptyset(t),\qquad t\in[-h,0]$$

Park (2002) and Park (2003) investigate similar models given in (Eq. 4) and (Eq. 5). The most important difference between these models is the characteristics of the delay. In Park (2002), the delay is dependent to time while it is not in Park (2003). In Park (2002), sufficient delay – independent conditions were presented for aymptotic stability of the model and these conditions were expressed in terms of LMI. In Park (2003), the model in the previous study was improved and transformed to a time – independent model.

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$$\dot{x}(t) - C\dot{x}\big(t - h(t)\big) = \big(A + \Delta A(t)\big)x(t) + \big(B + \Delta B(t)\big)x\big(t - h(t)\big), \quad (4)$$
$$x(t_0 + \theta) = \emptyset(\theta), \qquad \theta \in \big[-\bar{h}, 0\big], \qquad (t_0, \emptyset) \in R^+ \times C_\tau^v$$

$$\dot{x}(t) - C\dot{x}(t - h) = (A + \Delta A)x(t) + (B + \Delta B)x(t - h), \quad t \geq 0 \quad (5)$$
$$x(t) = \emptyset(t), \qquad t\epsilon[-h, 0]$$

In Park and Kwon (2005), the given model is a more improved version of the model in Park (2003). In this study, the problem of finding a state – feedback controller is analysed. Based on the Lyapunov method, a delay-dependent criterion for determining the stability of systems is obtained in terms of matrix inequalities. The differential equation of the model is given by (Eq. 6).

$$\frac{d}{dt}[x(t) - A_2 x(t - h)] = \big(A + \Delta A(t)\big)x(t) + \big(A_1 + \Delta A_1(t)\big)x(t - h) + \big(B + \Delta B(t)\big)u(t)$$
$$x(s) = \emptyset(s), \qquad s \in [-h, 0] \quad (6)$$

A similar study, Park and Kwon (2005) handles another model given by (Eq. 7). In this study, the stability criterion is derived in terms of linear matrix inequalities which can be easily solved by efficient convex optimization algorithms. Numerical examples are included to show the effectiveness of the proposed method. The original system in the study was transformed to an equivalent neutral system form. After that, delay – independent stability criteria in terms of LMI were developed by constituting Lyapunov functionals and with numerical examples, it was shown that these criteria are less conservative than those in other literature.

$$\dot{x}(t) = Ax(t) + A_1 x(t - h) + A_2 \dot{x}(t - h) \qquad x(s) = \emptyset(s), \qquad s \in [-h, 0] \quad (7)$$

The models in some studies (Kharitonov, 2005; Park et al, 2008) are given with the differential equations below (Eq. 8 and Eq. 9) respectively. In Kharitonov (2005) analysis of quadratic Lyapunov functionals with a prescribed time derivative for neutral type time delay systems is done.

$$\dot{x}_i(t) =$$
$$-a_i x_i(t) + \sum_{j=1}^n w_{ij1} g_j\Big(x_j(t)\Big) + \sum_{j=1}^n w_{ij2} g_j\big(x_j(t - \tau)\big) + \sum_{j=1}^n d_{ij}\dot{x}_j(t - \tau) + g_i$$
$$i = 1,2, \dots, n \qquad x_i(t) = \emptyset_i(t), \qquad -\tau \leq t \leq 0 \quad (8)$$

$$\dot{x}_i(t) =$$
$$-a_i x_i(t) + \sum_{j=1}^n w_{ij}^1 \bar{f}_j\Big(x_j(t)\Big) + \sum_{j=1}^n w_{ij}^2 \bar{g}_j\Big(x_j(t - h)\Big) + \sum_{j=1}^n v_{ij}\dot{x}_j(t - h) + b_i$$
$$i = 1,2, \dots, n \qquad x_i(t) = \emptyset_t(t), \qquad -h \leq t \leq 0 \quad (9)$$

A general model of neutral – type neural network model and its stability were analysed in another study (Yang et al, 2007) with the model given by (Eq. 10).

$$\dot{x}(t) = Ax(t) + Bx(t - \tau) + C\dot{x}(t - \tau) \quad (10)$$

When looked at Zhang and You (2007) and Kharitonov (2008), it is seen that the investigated models have some similarities. In Zhang (2007), based on the newly established integral inequalities, the neutral-delay-dependent and discrete-delay-dependent stability criterion are derived without using a fixed model transformation. The equations of the models are given by (Eq. 11) and (Eq. 12).

$$\dot{x}(t) - C\dot{x}(t - \tau) = Ax(t) + Bx\big(t - h(t)\big) + f(x, (t), t) + g\big(x\big(t - h(t)\big), t\big) \quad (11)$$
$$\dot{x}(t) - C\dot{x}(t - \tau_2)$$
$$= Ax(t) + Bx\big(t - \tau_1(t)\big) + f_1(x(t), t) + f_2(x(t - \tau_1(t)), t) + f_3(\dot{x}(t - \tau_2), t) \quad (12)$$

In Yu (2009), it was shown that neutral – type neural networks can be bidirectional like classical neural networks. The model is given below (Eq. 13).

$$\dot{x}_i(t) = -a_i x_i(t) + \sum_{j=1}^m w_{1ji} g_j\Big(y_j(t - d)\Big) + \sum_{j=1}^n w_{2ij}\dot{x}_j(t - h) + I_i, \ i = 1,2, \dots, n$$
$$\dot{y}_j(t) = -b_j y_j(t) + \sum_{i=1}^n r_{1ij} g_i\big(x_i(t - h)\big) + \sum_{i=1}^m r_{2ji}\dot{y}_i(t - d) + J_j, \quad j = 1,2, \dots, m \quad (13)$$

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In Deng et al (2009), another BAM neutral – type model was handled (Eq. 14) and asymptotic stability analysis was implemented by Lyapunov – Krasowkii functionals and differential equations.

$$\dot{x}_i(t) = -a_i x_i(t) + \sum_{j=1}^{m} w_{1ji}\, \tilde{f}_j\left(y_j(t-\tau)\right) + \sum_{j=1}^{n} w_{2ij}\dot{x}_j(t-h) + I_i, \quad i = 1, \dots, n$$
$$\dot{y}_j(t) = -b_j y_j(t) + \sum_{i=1}^{n} v_{1ij}\tilde{g}_i\left(x_i(t-\sigma)\right) + \sum_{i=1}^{m} v_{2ji}\, \dot{y}_i(t-d) + J_i, \quad j = 1, \dots, m \qquad (14)$$

In both Park and Kwon (2009) and Xiong et al (2009), the global exponential stability of uncertain switched neutral system with time – varying delays are analysed. To improve the results, LMI and Razumikhin approaches were used. With numerical simulations, the criteria is shown as less conservative. The models in these studies are given by (Eq. 15) and (Eq. 16) respectively.

$$\dot{x}(t) - D\dot{x}(t-\tau) = A_{0\sigma}x(t) + A_{1\sigma}x(t-h(t)), \qquad t \geq 0$$
$$x(t) = \emptyset(t), \qquad t \in [-H, 0] \qquad (15)$$

$$\dot{x}(t) - D\dot{x}(t-\tau) = [A_{0\sigma} + \Delta A_{0\sigma}(t)]x(t) + [A_{1\sigma} + \Delta A_{1\sigma}(t)]x\big(t-h(t)\big), \qquad t \geq 0$$
$$x(t) = \emptyset(t), \quad t \in [-H, 0] \qquad (16)$$

In Liu and Zong (2009), new rules for the stability of a switched neutral – type system was investigated. By using partial Lyapunov functionals which are more suitable for switched neutral – type systems, some switching rules are developed and expressed in terms of Lyapunov – Metzler LMIs. These results were supported with simulation examples. The model is given by (Eq. 17).

$$\Xi_0 = \begin{cases} \dot{x}(t) - C_{\sigma(t)}\dot{x}(t-\tau) = A_{\sigma(t)}(t)x(t) + B_{\sigma(t)}(t)x(t-\tau) \\ \qquad +f_{\sigma(t)}\big(t, x(t)\big) + g_{\sigma(t)}(t, \dot{x}(t-\tau)) \\ \qquad x(t_0+\theta) = \varphi(0), \qquad \forall\theta\epsilon[-p, 0] \end{cases} \qquad (17)$$

In another study, Souza et al (2008), exponential stability of the model given below (Eq. 18) was investigated.

$$\frac{d}{dt}[x(t) + Cx(t-h)] = A_0x(t) + A_1x(t-h) + \int_{-h}^{0} G(\theta)x(t+\theta)d\theta, \quad t \geq 0 \qquad (18)$$

The model whose asymptotic stability properties was analysed by novel Lyapunov - Krasowskii functionals is expressed with the differential equation below (Eq. 19) in Liena et al (2009).

$$\frac{d}{dt}[x(t) + px(t-\tau)] = -ax(t) + b\tanh[x(t-\sigma)] \qquad (19)$$

The functions used in this study are equivalent to neutral forms of original equations. In LMI form, delay – dependent and delay – independent conditions were both obtained.

In Jun-e Feng et al (2009), stability conditions which guarantee the existence, uniqueness and global asymptotic stability of equilibrium point were presented. For this reason, a LMI approach was implemented. Finally, a numeric example is given for the comparison of other studies in the literature. The model is given by the equation (Eq. 20).

$$\dot{x}_i(t) = -c_i x_i(t) + \sum_{j=1}^{n} w_{ij}\, g_j\left(x_j(t)\right) + \sum_{j=1}^{n} a_{ij}g_j(x_j(t-\tau))$$
$$+ \sum_{j=1}^{n} b_{ij}\int_{-\infty}^{t} k_j(t-s)g_j\left(x_j(s)\right)ds + \sum_{j=1}^{n} d_{ij}\dot{x}_j(t-\tau) + \mathcal{J}_i \qquad (20)$$
$$\dot{x}_i(t) = \emptyset_i(t), \qquad -\infty \leq t \leq 0$$

A robust stability analysis is done in Lee et al (2010), of the model given by (Eq. 21). In this study, a new delay – dependent stability condition who has nonlinearity was developed. With Lyapunov – Krasovskii functionals, a less conservative LMI conditions were derived. The efficiency of the presented model was tested with two numerical examples.

$$\dot{x}(t) = -Ax(t) + W_1\bar{f}\big(x(t)\big) + W_2\bar{f}\big(x(t-h(t))\big) + V\dot{x}\big(t-\tau(t)\big) + b \qquad (21)$$

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In the model expressed by (Eq. 22) of the study Li ansd Li (2007), the initial function must be known. The initial functions was assumed as partial and continuous. In this study, exponential stability analysis was made. Single system is the subject of the study but it can easily be expanded to multi-delayed systems.

$$\frac{dx(t)}{dt} + D_1 \frac{dx(t-h)}{dt} + A_0 x(t) + A_1 x(t-h) = 0, \qquad t \geq 0 \qquad (22)$$

Robust H_∞ analysis and synthesis problem was solved in neutral – systems whose equation is given below (Eq. 23).

$$\frac{d}{dt}[x(t) - E(\sigma)x(t-r)] = A(\sigma)x(t) + A_d(\sigma)x(t-\tau) + B_u(\sigma)u(t) + B_w(\sigma)w(t)$$
$$x(t) = \emptyset(t) \quad \forall t \in [-\bar{\tau}, 0] \qquad (23)$$

In Chen and Zhang (2008), for a suitable Lyapunov – Krasovskii functional choice, a LMI – based approach was derived. The reults obtained by this approach constituted less conservative results for the analysis and design of H_∞. The efficiency of the presented methods are shown with the comparison of numerical examples with other examples in the literature (Eq. 24).

$$\frac{d}{dt}[x(t) - E(\sigma)x(t-r)] = A(\sigma)x(t) + A_d(\sigma)x(t-\tau) + B_u(\sigma)u(t) + B_w(\sigma)w(t)$$
$$x(t) = \emptyset(t) \quad \forall t \in [-\bar{\tau}, 0] \qquad (24)$$

The model presented in Park et al (2008) was given by the equation (Eq. 25) or equivalently by the equation (Eq. 26). The numerical analysis of the study showed that it is robust stable.

$$\dot{x}_i(t) = -a_i x_i(t) + \sum_{j=1}^{n} w_{ij}^1 \bar{f}_j\left(x_j(t)\right) + \sum_{j=1}^{n} w_{ij}^2 \bar{g}_j\left(x_j\left(t-h(t)\right)\right)$$
$$+ \sum_{j=1}^{n} y_{ij} \dot{x}_j\left(t-\tau(t)\right) + b_i, \quad i = 1,2,\dots,n \qquad (25)$$

$$x_i(t) = \emptyset_t(t), -\max[h(t), \tau(t)] \leq t \leq 0$$
$$\dot{x}(t) = -Ax(t) + W_1\bar{f}\left(x(t)\right) + W_2\bar{g}\left(x(t-h(t))\right) + V\dot{x}\left(t-\tau(t)\right) + b \qquad (26)$$

In Qiua and Caoa (2009), sufficient and necessary conditions were derived for the global exponential stability of the model (Eq. 27).

$$\frac{\partial x_i(t,y)}{\partial t} = \sum_{k=1}^{m} \frac{\partial}{\partial y_k}\left(D_{ik} \frac{\partial x_i(t,y)}{\partial y_k}\right) - a_i x_i(t,y) + \sum_{j=1}^{n} b_{ij} \tilde{f}_j(x_j(t,y))$$
$$+ \sum_{j=1}^{n} c_{ij} \tilde{g}_j\left(x_j(t-\tau,y)\right) + \sum_{j=1}^{n} h_{ij} \frac{\partial x_j(t-\tau,y)}{\partial t} + I_i, y \in \Omega, \quad i = 1,2,\dots,n \qquad (27)$$

The obtained results are depended to the dimension of time delay and space. These conditions were generally less conservative than the ones independent to delay and space.

Results and Discussion

Equilibrium and stability properties of different classes of neural networks such as Cohen–Grossberg neural networks, Hopfield-type neural networks and cellular neural networks have been intensively studied in the past decade and have been applied to various engineering problems. Neutral-type of neural networks can be also applied to engineering problems but they have complex mathematical models. In order to increase the propability of using neutral networks in engineering problems, the mathematical models must be analyzed well.

Conclusion

In this study, the mathematical models and stability analysis of neutral-type neural networks in the literature studies are examined. As seen from the examinations, different types of stability (global exponential stability, exponential stability, asymptotic stability, global asymptotic stability, robust stability) are examined in different types of models. For these stability analysis, Lyapunov- Krasovskii functionals, Linear Matrix Inequality (LMI),

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Razumikhin approaches, Lyapunov – Metzler LMIs, partial Lyapunov functionals are frequently used and delay-dependent, delay-independent, time-dependent and time-independent conditions are obtained.

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MEDICAL IMAGE FUSION USING DIFFERENTIAL EVOLUTION ALGORITHM

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Abstract: Image fusion is an operation that includes composing multi-sensor or multi-focus images in order to express them in a single image that contains features of source images. Fused image can be easily analyzed by both users of the image and computers, and provide information that cannot be acquired analyzing source images separately. Medical image fusion methods occupy important part of multi-sensor image fusion area. Multimode medical image fusion has attracted more attention due to the high interest arise from clinical applications recently. By fusing CT images, which are sensitive to bone tissue and MR images, which are sensitive to soft tissue, detail in both soft and bone tissues can be achieved. A novel, Differential Evolution Algorithm and Wavelet Transform based fusion method is proposed in this paper. Performance of the proposed method has been compared with the existing methods such as Laplacian Pyramid, Shift Invariant Discrete Wavelet Transform and better results have been observed.

Keywords: Image Fusion, Wavelet Transform, Differential Evolution Algorithm, Image Quality Index.

Introduction

Image fusion is a process that combines characteristic parts of two or more source images to express them in a single fused image. Image fusion is used in a variety of fields such as computer vision, automatic object detection, medical imaging and robotics. Data to be fused are image sets include different views of the same scene. Different views can be arisen from different imaging conditions or usage of different sensors. Both improprieties can be corrected and more meaningful information can be extracted using image fusion. Principal goals of image fusion are, extraction of useful information, prevention of mind bending artificial parts and robustness to miss-registration (Waltz,1986).

First requirement of an accomplished image fusion process is registration of source images. Un-registered or miss-registered images can cause undesirable results, so the fusion process remains an ineffective effort. Numerous registration schemes have been already proposed in literature (Maintz and Viergevet,1998). Registration has not been dealt in this paper because it is not in the scope of this work. In terms of the domain which fusion process is carried out, image fusion techniques can be classified into two categories: spatial-domain and transform-domain techniques. The easiest way of fusing images in spatial domain is averaging source images' grey level values. The unfavorable side of this process is reduced overall contrast of fused image. Transform-domain techniques are fusing images using coefficients of transform domains such as Discrete Wavelet Transform (DWT) (Manjunath,1995), Laplacian Pyramid (LP)(Burt and Adelson,1983) and Shift Invariant Discrete Wavelet Transform (SIDWT) (Rockinger,1997).

Image fusion has been getting one of the most important fields of image fusion in recent years. Many fusion methods each using different methods have been proposed and have included in literature. Each method has advantages, disadvantages, goals and appropriate usage areas. With respect to image source, image fusion methods can be classified into two different categories: Multi-focus image fusion and multi-sensor image fusion. Multi-focus image fusion methods fuse images which are acquired from different focused cameras. On the other hand, multi-sensor image fusion methods fuse images which are acquired from different sensors such as Infrared (IR) and Image Intensified (II).

Medical image fusion methods occupy important part of multi-sensor image fusion area. Multimode medical image fusion has attracted more attention due to the high interest arise from clinical applications recently. For example radiotherapy plans are generated practicing upon datum acquired from different medical images. Dose calculation depends on Computed Tomography (CT) images but tumor tracking mostly depends on Magnetic Resonance (MR) images. CT imaging results high grey level values in denser tissues but low grey level values in sparse tissues. Imaging human body with CT results higher grey level values in bone tissues, lower grey level values in soft tissues. Gaps between tissues give the lowest grey level values and seem black in CT images. MR imaging is sensitive to Hydrogen atom situated in tissues. Thus soft tissues include Hydrogen atom give higher grey level

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values. As for tissues that do not include Hydrogen atom, they give lower grey level values. By fusing CT images, which are sensitive to bone tissue and MR images, which are sensitive to soft tissue, detail in both soft and bone tissues can be achieved.

Wavelet Transform

Wavelet theory and wavelet analysis is a relatively recent branch of mathematics. Wavelet transform uses mother wavelet function to analyze signal in different frequencies. Sub-wavelets or child-wavelets can be produced by translating and scaling this mother wavelet. A continuous wavelet transform is performed by applying an inner product to the signal and the sub-wavelet functions. For a particular scaling τ and translation s, the wavelet coefficient for a signal x can be calculated as

$$CWT_x^{\psi}(\tau,s)=\Psi_x^{\psi}(\tau,s)=\frac{1}{\sqrt{|s|}}\int x(t)\psi^*(\frac{t-\tau}{s})dt \quad (1)$$

Wavelet coefficients represent the information contained in a signal at the corresponding dilation and translation. The original signal can be reconstructed by applying the inverse transform:

$$x(t)=\frac{1}{c_{\psi}^2}\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\Psi_x^{\psi}(\tau,s)\psi^*(\frac{t-\tau}{s})\frac{1}{s^2}d\tau ds \quad (2)$$

where c_{ψ} is the normalization factor of the mother wavelet (Gonzalez-Audicana et al., 2005). τ parameter determines the measure of the distance of the wavelet function from origin. As for s parameter, it is the measure of dilation or contraction of the wavelet function. The bigger the s parameter, the more dilated the wavelet function and the smaller the s parameter, the more contracted the wavelet function.

The Wavelet Transformation process is carried out as follows:

1. First of all, the mother wavelet function must be chosen. Existing wavelet families such as Daubechies or Haar can be chosen or a mother wavelet function can be designed which is suitable to the problem.
2. Initial values are assigned for the translation and scaling parameters.
3. Transformation coefficient is calculated according to these parameters.
4. Translation and scaling parameters are changed and the process in third step is iterated.

Discrete Wavelet Transform

Because translation and scaling parameters can take infinite values, continuous wavelet transform results contain redundant data. In DWT, translation and scaling parameters take discrete values. For simplicity, it will be assumed that the dilation and translation factors are chosen so as to have dyadic sampling, but the concepts can be extended to other choices of factors.

A signal can be thought as a multi-resolution space, so there are many frequency sub-spaces in this space. In Figure 1, a multi-resolution representation of a signal can be seen. Just using mother wavelet, only W sub-spaces can be obtained. In order to obtain one of the V sub-spaces, infinite number of decomposition levels must be implemented. Instead of this process, a scaling function can be used to represent V sub-space in any decomposition level.

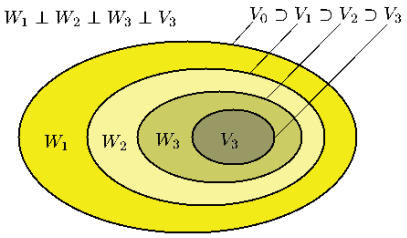

Figure 1. Multi-resolution representation of a signal.

DWT process can be carried out by filtering signal with a set of low-pass and high-pass filters. In this process, high-pass filter represents the mother wavelet function and low-pass filter, represents the scaling function. The decomposition process for 2D input signal can be seen in Figure 2. In this figure H0 represents low-pass filter and H1 represents high-pass filter. In 2D DWT process, firstly filters are applied as horizontal then filters are applied as vertical.

During this iterative process, particular frequency part of signal is obtained in each iteration and remaining part of signal, which is LL sub-band, can be decomposed continuously. In order to convey scaling operation, signals are

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sub-sampling at each iteration. DWT process uses dyadic values for scaling and translation parameters so redundancy of CWT can be reduced. Original input signal can be obtained using inverse DWT (IDWT), which is an operation implements steps of DWT process reversely.

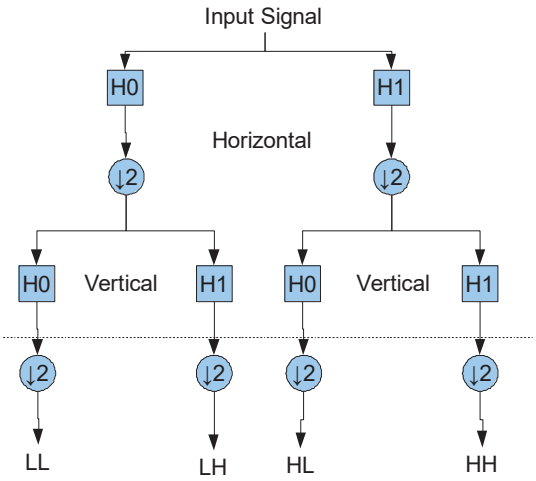

Figure 2. Two dimensional DWT process

Image Fusion Using DWT

Image fusion using DWT can be carried out by transferring appropriate DWT coefficients from source images to a map which named fused map, and applying IDWT on this map. Select operation constitutes the foundation of the fusion algorithm. Fusion Decision Map selects the appropriate coefficients according to fusion rules. This process is schematized in Figure 3.

Fusion rules can be divided into three groups: Pixel based fusion, window based fusion and region based fusion. When constructing the fused map we must decide which coefficient is better for an accomplished fusion operation. This decision can be made by evaluating individual pixels in source images' coefficient maps correspondingly and selecting one of two coefficients. This fusion scheme is named pixel based fusion. For example selecting the maximum of two coefficients is a pixel based fusion method using frequently. Instead of only dealing with individual pixels, neighborhood of a pixel is used in selection operation in window based fusion scheme. In this scheme, windows sized 3X3 or 5X5 can be used. On the other hand, region based fusion scheme use regions like edges or such regions to guide the fusion.

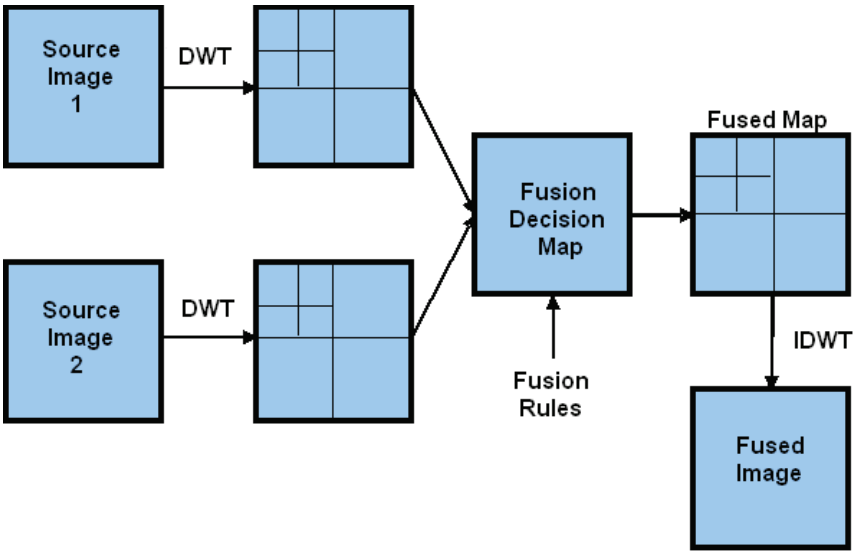

Figure 3. DWT based fusion process

Differential Evolution Algorithm

Problems that encountered in daily life can be simulated as linear or non-linear (stochastic) optimization problems. But most of the problems are non-linear problems and many techniques have been developed in order to solve

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these type problems (Storn and Price, 1995). Intuitive algorithms, especially population-based intuitive algorithms give better and faster results on non-linear optimization problems because they search many points in search space. Differential Evolution Algorithm (DE) is a population-based stochastic optimization algorithm that can be used to minimize nonlinear and non-differentiable continuous space functions with real-valued parameters. DE is, Genetic Algorithm (GA) based algorithm and crossover, mutation and selection operations are also used in DE. DE differs from GA in its generation of new candidate solutions and by its use of a 'greedy' selection scheme. The main steps of a basic DE are shown in figure. For each generation, the operators are repeated until a predefined stopping criterion is satisfied, for example maximum generation number. The basic operators of DE are briefly explained in the following sections and basic diagram of DE can be seen in Figure 4.

Parameters

NP : Number of Population $NP \geq 4$ (1, 2, 3, …. , *i*)

D : Dimension of problem (1, 2, 3, …, *j*)

CR : Crossover Rate [0.1, 1.0]

G : Generation size (1, 2, 3, … , G_{max})

F : Fraction rate

$x_{j,i,G}$:*j* parameter of vector *i* at *G* generation

$n_{j,i,G+1}$: intermediate vector subjected to mutation and crossover

$u_{j,i,G+1}$: vector generated for the next generation of $x_{j,i,G}$

$r_{1,2,3}$: Randomly selected vectors which will be used in calculating new vector. $r_{1,2,3} \varepsilon \{1, 2, 3,\ldots, NP\}$ $r_1 \neq r_2 \neq r_3 \neq i$

$x_j^{(l)}, x_j^{(u)}$: Lower and upper boundaries.

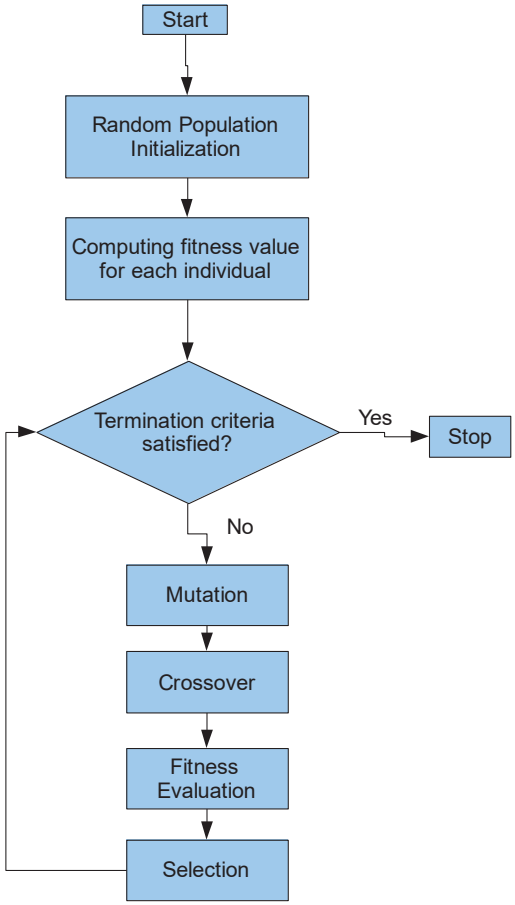

Figure 4. Flowchart of basic DE algorithm

Initial Population

An optimization task consisting of *D* parameters can be represented as a *D*-dimensional vector. NP is number of

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vectors set by user. NP must be bigger than three because DE needs three vectors in order to generate new vectors. Initial population (P_0) randomly generated as follows:

$$\forall_i \leq NP \wedge \forall_j \leq D : x_{j,i,G=0} = x_j^{(l)} + rand[0,1](x_j^{(u)} - x_j^{(l)}) \quad (3)$$

Mutation

Mutation operation performs random changes on present vector. Through these changes solution point that existing vector represents changes. Except from vector which will be mutated, three vectors selected. Difference of two of these vectors is calculated. Later this difference vector is multiplied with F parameter which is generally in [0, 2] interval. This factorized vector acquired after multiplication operation is summed with third selected vector. So vector, which will be used in crossover operation has been obtained ($n_{j,i,G+1}$). This process is given at equation X.

$$\forall_j \leq D : n_{j,i,G+1} = x_{j,r_3,G} + F.(x_{j,r_1,G} - x_{j,r_2,G}) \quad (4)$$

Crossover

To increase diversity of the population, DE employs crossover operation that incorporates successful solutions from the previous generation.

$$\forall_j \leq D : x_{j,u,G+1} = \begin{cases} x_{j,n,G+1} & if\ rand[0,1] \leq CR \vee j = j_{rand} \\ x_{j,i,G} & else \end{cases} \quad (5)$$

Evaluation Of Fusion Result

In order to evaluate the fusion performance and to determine parameters will be used in fusion process, some metrics are required. There are many proposed metrics in literature. Mutual Information (MI) and Image Quality Index (IQI) are two of them and will be mentioned below.

Mutual Information

MI, which is a measure of statistical dependency between two random variables, is one of the fundamental concepts of Information Theory. MI gives amount of data, a variable includes related with other variable and is expressed as follows (Qu et al., 2002):

$$I_{XY}(x,y) = \sum_{x,y} P_{XY}(x,y) \log \frac{P_{XY}(x,y)}{P_X(x) P_Y(y)} \quad (6)$$

Here, *x* and *y* denotes two random variables, $P_{XY}(x,y)$ denotes joint distribution and $P_X(x)$ and $P_Y(y)$ denotes marginal distribution of *x* and *y* respectively. In fusion process MI can be used in diverse ways. One of these ways is, calculating MI values of source images with fused image individually and add them. This type metric calculation is given below:

$$I_{FX}(f,x) = \sum_{f,x} P_{FX}(f,x) \log \frac{P_{FX}(f,x)}{P_F(f) P_X(x)}, \quad (7)$$

$$I_{FY}(f,y) = \sum_{f,y} P_{FY}(f,y) \log \frac{P_{FY}(f,y)}{P_F(f) P_Y(y)}, \quad (8)$$

$$m_{fxy} = I_{FX}(f,x) + I_{FY}(f,y). \quad (9)$$

Where $I_{FX}(f,x)$ and $I_{FY}(f,y)$ denotes MI value of source image *x* and fused image *f* and MI value of source image *y* and fused image *f* respectively. m_{fxy} indicates metric value of overall fusion process.

Image Quality Index

Wang and Bovik's IQI can be defined as follows where $x = (x_1, x_2, \ldots x_n)$ and $y = (y_1, y_2, \ldots y_n)$ denotes real valued series, $\bar{x}$ represents average of x series, σ_x^2 and σ_{xy} indicates variance of *x* and covariance of *x* and *y* (Wand and Bovik, 2002):

$$\sigma_x^2 = \frac{1}{n-1} \sum_i^n (x_i - \bar{x})^2, \qquad \sigma_{xy} = \frac{1}{n-1} \sum_i^n (x_i - \bar{x})(y_i - \bar{y}). \quad (10)$$

$$Q_0 = \frac{4 \sigma_{xy} \bar{x} \bar{y}}{(\bar{x}^2 + \bar{y}^2)(\sigma_x^2 + \sigma_y^2)}. \quad (11)$$

Because image signals are non-stationary, calculating Q_0 regionally is more suitable approach. Following equation describes the regionally calculated Q_0 value by windowing operation. Windowing operation is performed by sliding window pixel by pixel on the image signals.

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$$Q_0(a,b)=\frac{1}{|W|}\sum_{w\in W}Q_0(a,b|w), \quad (12)$$

Piella and Heijmans developed Wang and Bovik's quality index and they approached following metric (Piella and Heijmans, 2003):

$$Q_E(a,b,f)=Q_W(a,b,f)\cdot Q_W(a',b',f')^{\alpha}. \quad (13)$$

Where,

$$Q_W(a,b,f)=\sum_{w\in W}c(w)(\lambda(w)Q_0(a,f|w)+(1-\lambda(w))Q_0(b,f|w)), \quad (14)$$

$$c(w)=C(w)/(\sum_{w'\in W}C(w')), \quad (15)$$

$$Q_0(a,b,f)=\frac{1}{|W|}\sum_{w\in W}(\lambda(w)Q_0(a,f|w)+(1-\lambda(w))Q_0(b,f|w)), \quad (16)$$

$$\lambda(w)=\frac{s(a|w)}{s(a|w)+s(b|w)}. \quad (17)$$

Here *a* and *b* denotes source images and f denotes fused image. *a', b'* and *f'* indicates, edge image of *a*, *b* and *f* respectively. α is a parameter that determines edge image's preponderance to real image.

Proposed DWT fusion method

Medical image fusion methods occupy important part of multi-sensor image fusion area. Multimode medical image fusion has attracted more attention due to the high interest arise from clinical applications recently. By fusing CT images, which are sensitive to bone tissue and MR images, which are sensitive to soft tissue, detail in both soft and bone tissues can be achieved. Also many other medical images like PET (Positron Emission Tomography) can be used in image fusion process on demand.

As mentioned above, DWT splits image as four sub-bands at every decomposition level. HH sub-band includes horizontally and vertically high frequency data, HL sub-band includes horizontally high and vertically low frequency data, LH sub-band includes horizontally low and vertically high frequency data and LL sub-band includes vertically and horizontally low frequency data. In Figure 5. sub-bands acquired after three levels of decomposition can be seen.

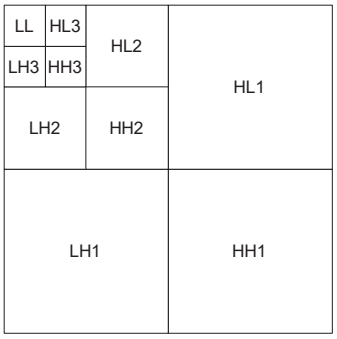

Figure 5. Sub-bands acquired after three levels of decomposition.

Acquired DWT coefficients by decomposing source images with intended level can be used to fuse source images. Maximum of corresponding coefficients can be selected or average of coefficients can be calculated, but we preferred multiply coefficients with a parameter and add them. In order to preserve interval of source images' grey level values, first source image's coefficient is multiplied with a parameter, later corresponding second image's coefficient is multiplied with the same parameter's one's complement and lastly these two values are added. This process can be described mathematically as follows:

$$Af=A1*\alpha+B1*(1-\alpha) \quad (18)$$

where *A1* and *B1* are first source image's and second source image's corresponding coefficients respectively. *Af* is calculated coefficient of fused image. After calculating all coefficients of fused image, fused coefficient map will be formed. Then inverse DWT is applied to this map and fused image will be acquired. The important part of this scheme is to determine number of parameters and to select appropriate parameters. In this paper we prefer one parameter for each decomposition level and one for LL sub-band. As a result of this preference, if decomposition level is chosen as two then number of parameters will be three and this fusion scheme can be schematized as in Figure 6. Next step is to select appropriate parameters and we prefer to select these parameters by DE.

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Fitness function

Primary step in an optimization process is designing the fitness function. Through fitness function optimization algorithm can evaluate fitness of parameters and produce new and more appropriate parameters. The fundamental task of fitness function is to try parameters which are produced by optimization algorithm on problem and return a fitness value. In this paper Piella and Heijmans' IQI has been used as a fitness value. Because of the time and source consuming effect of this metric a few steps has been declined and Piella and Heijmans' IQI has been changed, as a consequence following metric has been used as a fitness value.

$$Q_E(a,b,f)=Q_0(a,b,f)\cdot Q_0(d',b',f')^{\alpha} \quad (19)$$

Fusing medical images by the method proposed above has a deficiency. Fused images with this method have low overall contrast. In order to improve the overall contrast we have subtracted first source image from second source image, then add this difference result to the fused image by above method and lastly add this addition value with a constant. This operation can be seen in equation X. This constant plays a role in factorizing subtraction result and changes image to image, so we also prefer this constant to be selected by DE.

$$\begin{aligned} Difference &= A-B+\alpha_D \\ F &= Difference+F' \end{aligned} \quad (20)$$

Where A and B are two source images and F' is fused image acquired by way of process as mentioned earlier or it can be called as intermediate fused image. α_D is the constant selected by DE and F is the fused image after these contrast reducing operations. The overall fusion process is schematized at Figure 7.

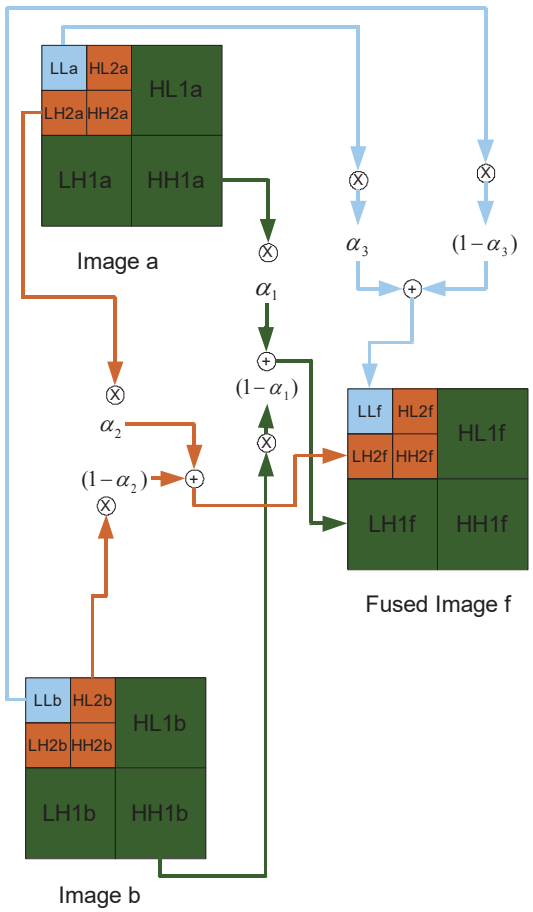

Figure 6. Fusion scheme after two levels of decomposition.

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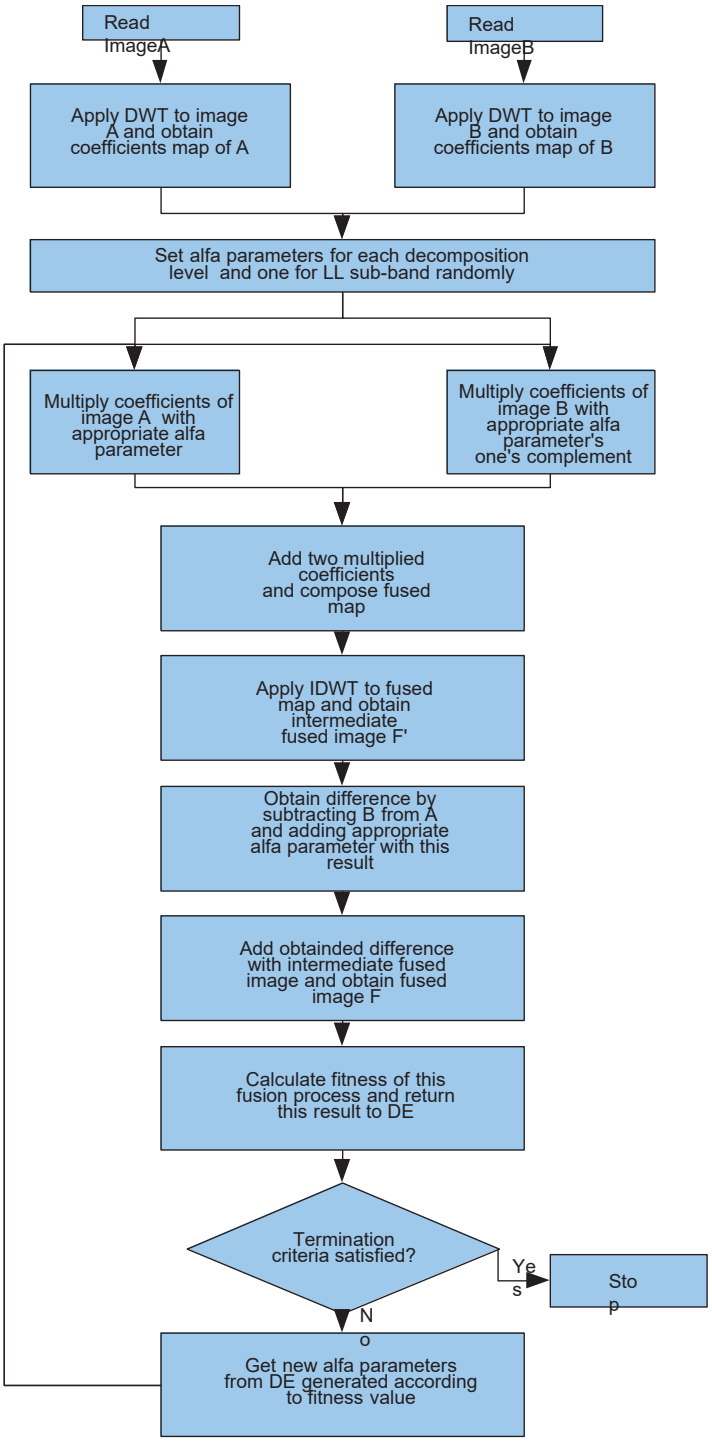

Figure 7. Overall fusion process.

Experimental results

For testing the proposed fusion method four sets of source images have been fused and the results have been compared with the results of existing fusion methods such as LP and MP. Sizes of image sets used in experiments are 256X256. Decomposition level for DWT has been selected four. Four for decomposition levels, one for LL sub-band and one for adding to difference of source images, number of parameters to be optimized will be 6 so is dimension of problem. NP for DE has been selected as 100 and search space is [0, 1] interval. For F, (0,5, 0,6, 0,7, 0,8, 0,9, 1, 2) and for CR, (0,4, 0,5, 0,6, 0,7, 0,8, 0,9) values assigned and for each F-CR pair DE has been run 30 times and obtained metric results have been showed in tables.

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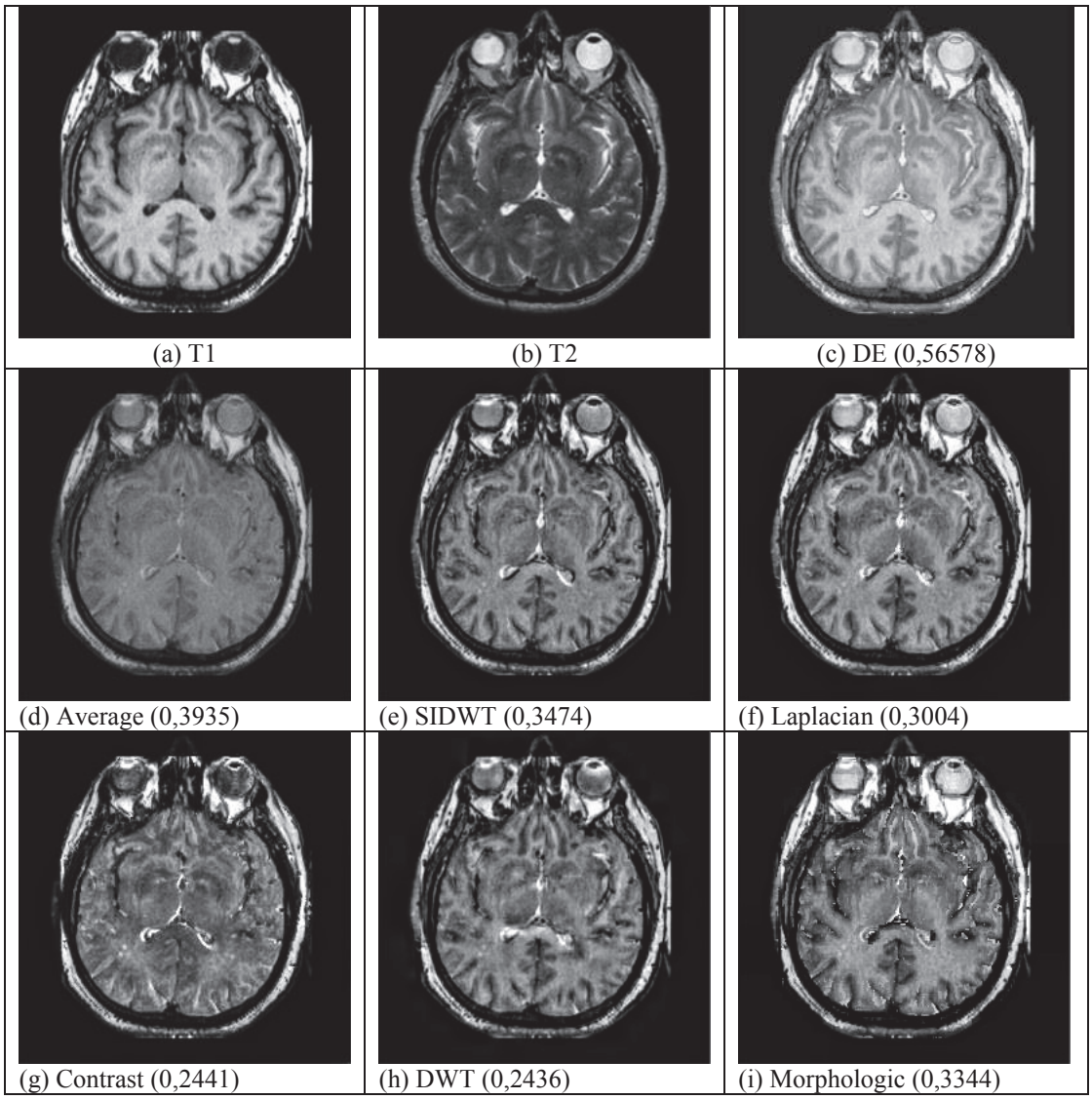

Figure 8. Fusion results of T1 and T2 source images with different fusion algorithms

Table 1. Fusion results of proposed scheme under different DE parameters

F / CR		0,5	0,6	0,7	0,8	0,9	1	2
0,4	Avg.	0,50591	0,54901	0,53447	0,53968	0,50639	0,49557	0,47503
	Std.	0,04151	0,00714	0,00954	0,00824	0,03532	0,02452	0,08353
0,5	Avg.	0,53484	0,55879	0,52159	0,53446	0,49108	0,50424	0,48108
	Std.	0,03053	0,00636	0,01502	0,00712	0,05210	0,00712	0,05532
0,6	Avg.	0,52496	0,53384	0,55045	0,50156	0,53716	0,50084	0,48537
	Std.	0,04378	0,02721	0,02152	0,04750	0,03934	0,03960	0,05901
0,7	Avg.	0,49460	0,55227	0,55321	0,55916	0,52450	0,48146	0,47524
	Std.	0,04836	0,01267	0,00918	0,00400	0,02832	0,04196	0,07767
0,8	Avg.	0,49937	0,52243	0,50083	0,56389	0,49354	0,49541	0,48973
	Std.	0,03003	0,06092	0,04310	0,00119	0,03356	0,01258	0,03371
0,9	Avg.	0,50944	0,52804	0,53781	0,51687	0,53443	0,50717	0,52081
	Std.	0,06721	0,04601	0,01065	0,05213	0,02177	0,04208	0,03663

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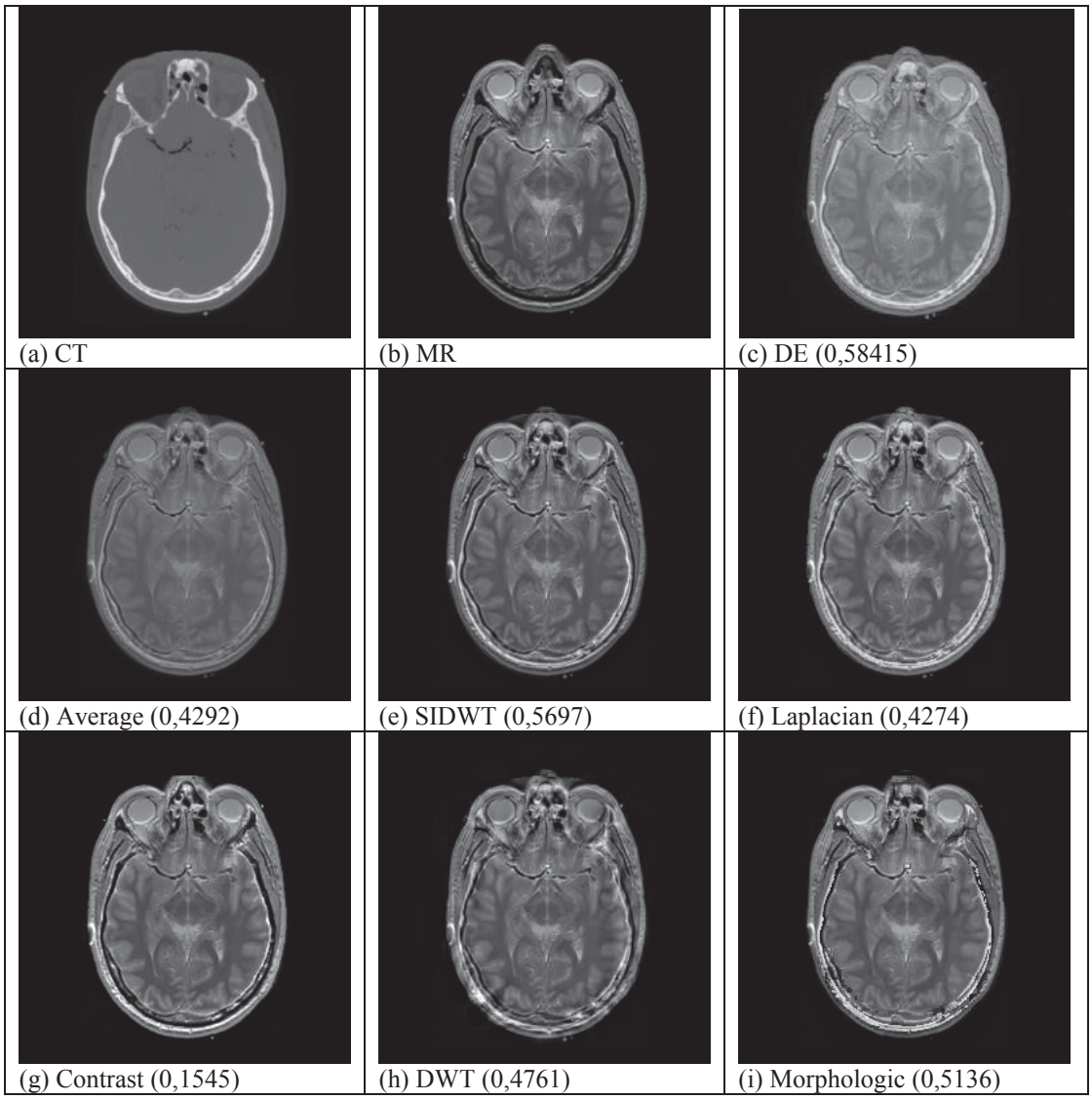

Figure 9. Fusion results of CT and MR source images with different fusion algorithms

Table 2. Fusion results of proposed scheme under different DE parameters

F / CR	Ct2pd	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**	**2**
0,4	Avg.	0,58323	0,58306	0,58332	0,58004	0,58184	0,57516	0,50684
	Std.	0,00013	0,00171	0,00060	0,00086	0,00171	0,00392	0,03938
0,5	Avg.	0,58195	0,58295	0,58377	0,58112	0,58012	0,58006	0,44802
	Std.	0,00259	0,00301	0,00011	0,0021	0,00167	0,00311	0,10646
0,6	Avg.	0,58290	0,58354	0,58092	0,58574	0,57923	0,57233	0,46283
	Std.	0,00023	0,00089	0,00255	0,00298	0,00194	0,02944	0,07010
0,7	Avg.	0,58301	0,58411	0,56916	0,57819	0,56916	0,55909	0,45462
	Std.	0,00015	7,5E-05	0,02528	0,00023	0,02528	0,02436	0,08726
0,8	Avg.	0,58224	0,58399	0,58222	0,57496	0,57538	0,56183	0,43051
	Std.	0,00011	0,00020	0,00203	0,00192	0,00263	0,03580	0,06518
0,9	Avg.	0,58373	0,58395	0,56885	0,57514	0,56381	0,52363	0,42727
	Std.	0,00024	7E-05	0,02503	0,00018	0,03539	0,05963	0,04611

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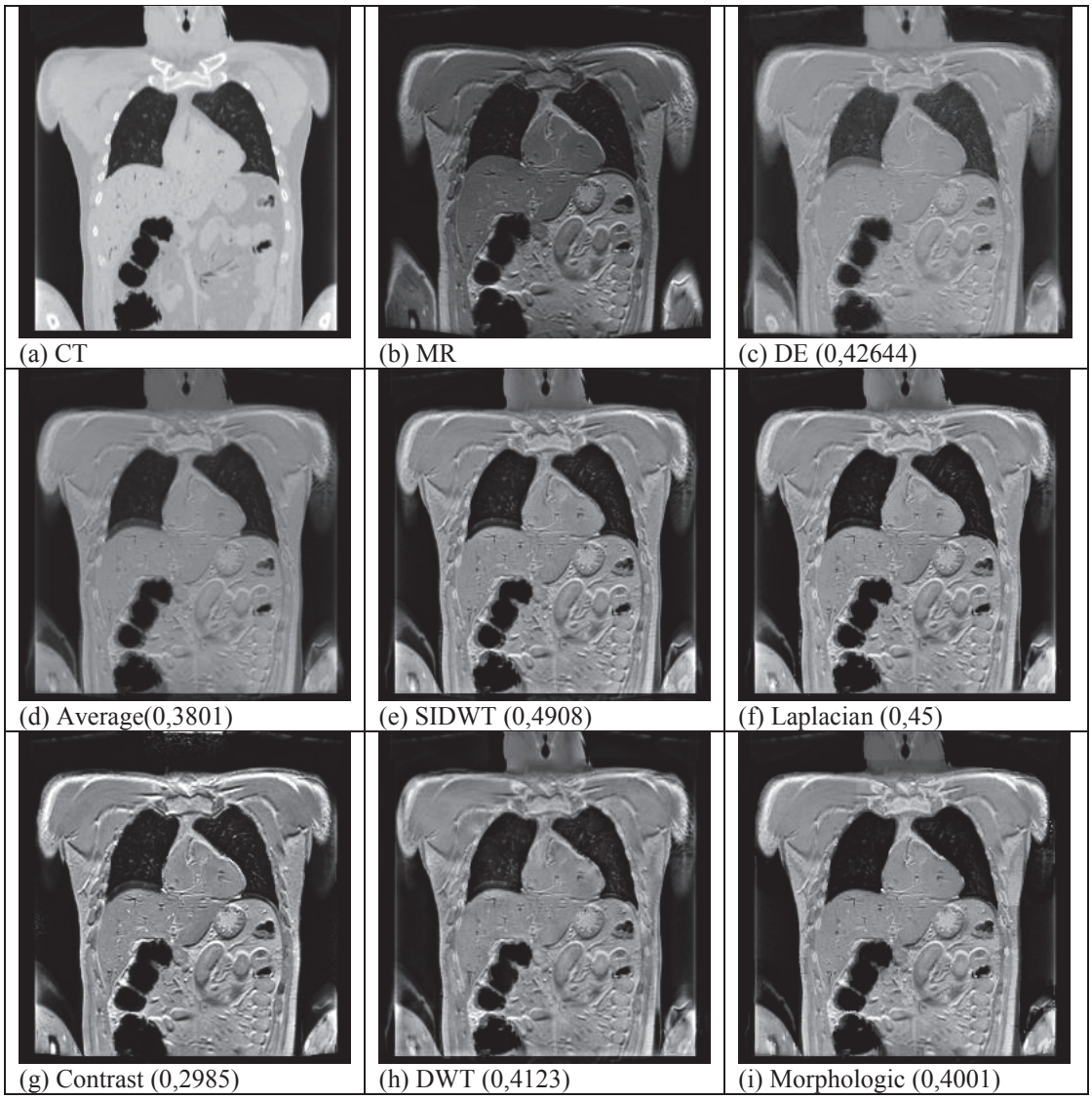

Figure 10. Fusion results of another set of CT and MR source images with different fusion algorithms

Table 3. Fusion results of proposed scheme under different DE parameters

F / CR	Ct10pd1	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**	**2**
0,4	Avg.	0,39067	0,41412	0,40705	0,41275	0,39197	0,39129	0,37257
	Std.	0,04751	0,02038	0,02106	0,02853	0,02392	0,00317	0,05236
0,5	Avg.	0,41209	0,41125	0,40951	0,42483	0,42168	0,40216	0,38216
	Std.	0,02080	0,01881	0,01894	0,00145	0,00553	0,00254	0,07438
0,6	Avg.	0,39798	0,41111	0,40187	0,38882	0,41148	0,41529	0,37523
	Std.	0,01527	0,01869	0,02133	0,00069	0,01966	0,02609	0,02719
0,7	Avg.	0,42426	0,41349	0,38926	0,39809	0,38648	0,39377	0,36712
	Std.	0,00405	0,02008	0,00030	0,01518	0,00217	0,00238	0,02894
0,8	Avg.	0,41053	-0,4042	0,38967	0,42252	0,37354	0,38097	0,37003
	Std.	0,01937	0,02070	0,00052	0,00599	0,01886	0,00867	0,00966
0,9	Avg.	0,41186	0,38891	0,39891	0,40521	0,42568	0,41244	0,38174
	Std.	0,01993	0,00061	0,02132	0,01803	0,00074	0,00443	0,00871

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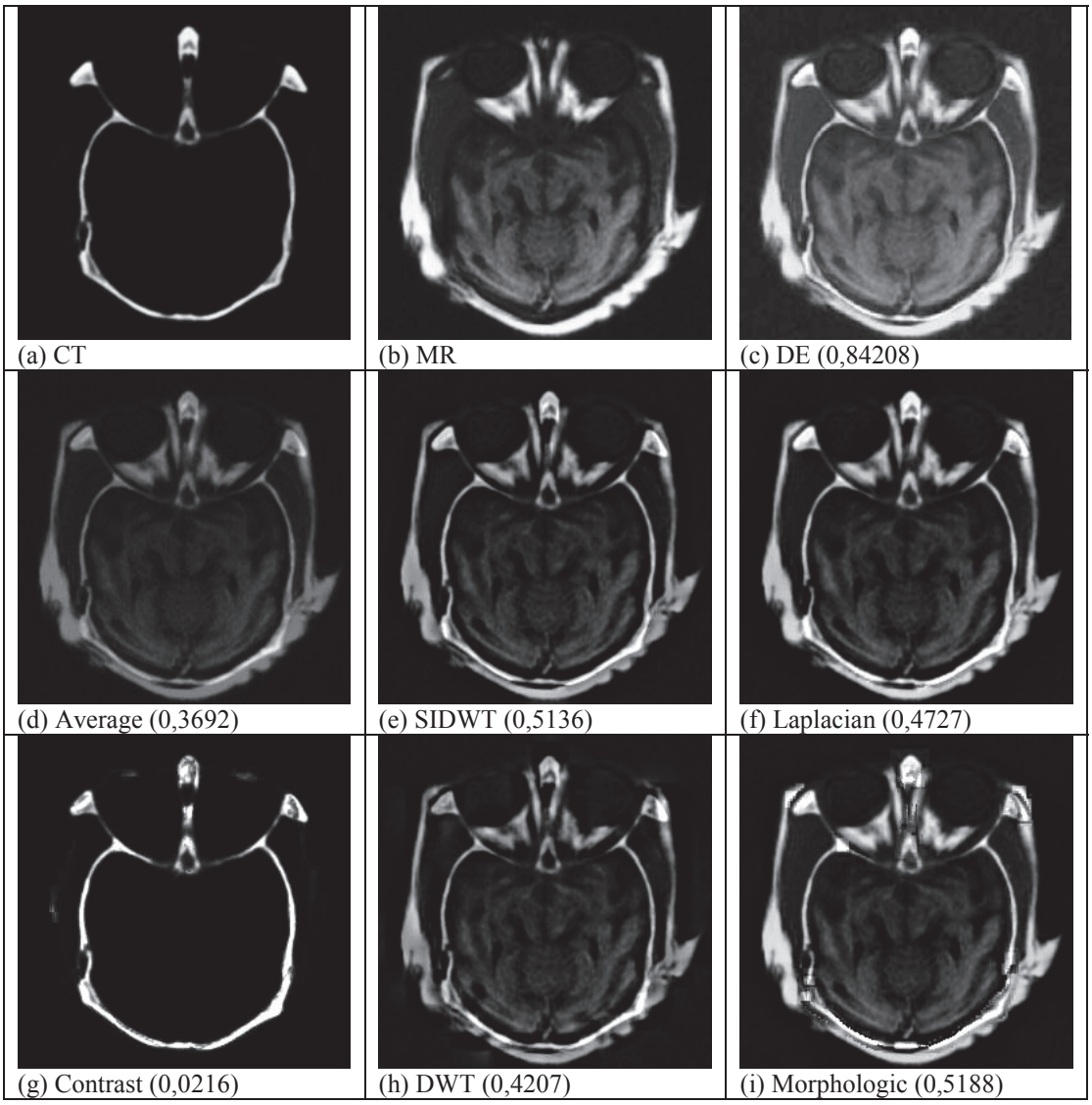

Figure 11. Fusion results of another set of CT and MR source images with different fusion algorithms

Table 4. Fusion results of proposed scheme under different DE parameters

F / CR	meda	0,5	0,6	0,7	0,8	0,9	1	2
0,4	Avg.	0,81812	0,82016	0,82924	0,83306	0,82492	0,80539	0,70442
	Std.	0,01826	0,02030	0,00312	0,00297	0,05644	0,01237	0,04333
0,5	Avg.	0,82996	0,83569	0,83953	0,84126	0,83114	0,81006	0,64925
	Std.	0,01018	0,01074	0,00261	0,01846	0,01674	0,00976	0,06742
0,6	Avg.	-0,8234	0,83497	0,83524	-0,8378	0,83658	0,81771	0,69245
	Std.	0,02245	0,00987	0,01107	0,00404	0,00245	0,00609	0,07491
0,7	Avg.	0,79519	0,83272	0,83258	0,83902	0,83620	0,7923	0,56006
	Std.	0,04012	0,01286	0,01565	0,00238	0,00088	0,05317	0,07016
0,8	Avg.	0,72934	0,81815	0,82924	0,82699	0,83073	0,80793	0,58701
	Std.	0,05526	0,04937	0,01826	0,02093	0,00874	0,00196	0,07016
0,9	Avg.	0,41186	0,38891	0,39891	0,40521	0,42568	0,41244	0,38174
	Std.	0,01993	0,00061	0,02132	0,01803	0,00074	0,00443	0,00871

Conclusion

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This paper proposes a new DE and DWT based image fusion method. DE was employed to optimize the fitness function that evaluates the effect of parameters using infusion process and selects optimum parameters. All transform domain fusion methods proposed in literature fuse images in similar ways. The first step is transforming source images, second step is select appropriate transform domain coefficients and last step is applying inverse transform on selected coefficients and acquire fused image. Mostly maximum or average of corresponding coefficients is selected during fusion process. But in some regions selecting maximum is more appropriate and in other regions selecting minimum or average is more appropriate. In order to solve this selection problem proposed method employed DE and parameter based fusion technique. Better results was taken with this optimized fusion scheme than classical transform domain based fusion schemes.

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MESLEK YÜKSEKOKULU ÖĞRENCİLERİNİN SAYISAL BECERİLERİ ÜZERİNE: SINAVLI-SINAVSIZ GEÇİŞ KARŞILAŞTIRMASI

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Özet: Bu çalışmada, meslek yüksekokullarına sınavlı-sınavsız geçiş sistemiyle yerleşen öğrencilerin temel matematik ve sayısal becerilerinin demografik değişkenlere bağlı olarak değişimleri araştırılmaktadır. Çalışmanın verileri, 2016 -2017 Eğitim Öğretim Yılında, Kocaeli meslek yüksekokulunda inşaat, bilgisayar teknolojileri, kimya ve kimyasal işleme teknolojileri, yönetim ve organizasyon ve muhasebe ve vergi bölümlerinin birinci sınıfında okuyan 218 öğrenciden elde edilmiştir. Verilerin toplanması aşamasında, öğrencilerin matematik ve sayısal becerilerini belirlemek için Leylek ve Gürlen, (2015) tarafından geliştirilen, geçerlilik ve güvenirlik düzeyleri yüksek olan bir matematik başarı testi ve kişisel bilgi formu kullanılmıştır. Toplanan verilerin istatistiksel analizleri SPSS programında, frekans tablosu, t-testi ve varyans analizi hesaplamaları kullanılarak elde edilmiştir. Araştırmanın bulgularına göre; sınavlı-sınavsız geçiş ve mezun olunan lise türü ile temel matematik becerileri arasında istatistiksel olarak anlamlı farklılıklar olduğunu göstermiştir. Ailenin eğitim seviyesi ve gelir düzeyi değişkenlerine göre temel matematik ve sayısal becerileri arasında anlamlı bir farklılık olmadığı görülmüştür. **Anahtar Kelimeler**: meslek yüksekokulu, sınavlı-sınavsız geçiş sistemi, matematik ve sayısal beceriler

ON THE NUMERİCAL SKILLS OF VOCATIONAL SCHOL STUDENTS; COMPARISON OF ENROLLED WITH AND WITHOUT EXAMINATION SYSTEM

Abstract: In this study, it is investigated basic mathematical and numerical skills of students enrolled in vocational schools with and without examination system in terms of some demographic variables. The sample of the study consists of 218 first grade students from construction, computer, chemistry, business and accounting departments in Kocaeli university, Kocaeli vocational school. Data has been collected by achievement in mathematics test and the personal information survey designed by Leylek and Gürlen, (2015) to determine students' numerical skills. Using of statistical package for the social sciences (SPSS), Frequency tables, t-test and variance analyses have been operated on the data. According to do findings of the research, there are differences between basic numerical and skills according to enrolled with and without examination system, the type of high school graduated. There are not differences in basic numerical skills according to parents' education level and family income level. **Keywords**: vocational school, enrolled with and without examination system, mathematical and numerical skills

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GİRİŞ

Yeniçağımızda, çok hızlı bir değişim ve dönüşümün olduğu, bilginin üretilmesi, kullanılması ve aktarılmasına yönelik her alanda (sosyal, siyasal, ekonomik vb.) değişmelerin yaşandığı, artık herkes tarafından görülebilen ve kabul edilen bir durumdur. Bu hareketlilik, eğitimin en alt biriminden en üst düzeyine kadar her alanında birçok değişimi ve yenilenmeyi zorunlu hale getirmiştir. Bilgi toplumuna ulaşmadaki süreçte bilgi tabanlı değişim hareketleri bireylerin eğitimden beklentilerini de değiştirmiştir. Farklı alanlarda belli düzeyde bilgiye sahip olan insan modelinden ziyade bir alanda derinlemesine uzman, teknolojik gelişmelere hakim insan profili ideal olan olarak karşımıza çıkmaktadır. Türkiye deki eğitim modeline göre mesleki eğitimin başlangıcı olarak meslek liseleri olduğu görülmektedir. Bunun devamında ara veya teknik eleman olarak tanımlanan mesleki alanlarda uzmanlaşmaya gidilen okullar olarak meslek yüksekokulları gelmektedir.

Türkiye de mesleki eğitimin ortaya çıkışı ve gelişim süreci: Bu konuda yapılan araştırmalar ülkemizdeki mesleki eğitimi başlangıcının 1950'ler olduğunu göstermektedir (Çağlar & Türel, 2005; Alkan, Suiçmez, Aydınkal & Şahin, 2014). Meslek yüksekokulları ise, 1975-1976 öğretim yılında Milli Eğitim Bakanlığı Yayın Yüksek Öğretim Kurumu (YAY-KUR) Örgün Yüksek Öğretim Dairesi'ne bağlı olarak eğitime geçmiştir. 1992 yılında, 21 bir üniversitenin kurulması ile yükseköğretim alanında yeni bir döneme girilmiş bu durum meslek yüksekokullarının gelişimini ve etkinliğini hızlandırmıştır (Kelecioğlu, 2006).

Elmacı, Poyraz ve Çalık'ın (1999) çalışmalarında, yükseköğretimdeki meslek yüksekokullarında kalite güvence sisteminin oluşturulmasına ve geliştirilmesine yönelik önerileri, meslek yüksekokullarına olan ilgiye ve bu okulların tercih edilmesinde önemli ölçüde artışa sebep olmuştur.

Bundan sonraki süreçte, üniversite kaynaklarının meslek yüksekokullarına yetersiz oranda aktarılması, üniversite yönetimleri tarafından ikinci veya üçüncü planda görülme ve öğrencilerin hazır bulunuşluk düzeylerindeki eksiklikler, meslek yüksekokullarının hem eğitim öğretim kalitesini hem de bu okullara olan ilgiyi olumsuz yönde etkilemiştir. Meslek yüksekokullarına yerleştirme 2002 yılına kadar ÖSS puanı ile gerçekleştirilmiştir (ÖSYM, 2002). Ancak, 10.07.2001 tarihli ve 24458 nolu Resmi Gazete 'de yayınlanan 4702 sayılı kanun ile yürürlüğe giren meslek liselerinden meslek yüksekokullarına sınavsız geçiş uygulamasıyla 2002 yılında mesleki ve teknik ortaöğretimden meslek yüksekokullarına geçiş için ÖSS'ye girme zorunluluğu kaldırılmıştır (ÖSYM, 2002). Meslek yüksekokullarına yerleştirilmede adaylar, ortaöğretim başarı puanı sırasına göre (sınavsız geçiş) yerleştirilmeye her hangi bir meslek okuluna yerleştirilmeye başlanmıştır (Kelecioğlu, 2006).

Sınavsız geçiş hakkına rağmen, bu okullardaki kontenjanların dolmaması ve benzeri sorular nedeniyle, 2004 Öğrenci Seçme ve Yerleştirme Sistemi (ÖSYS) Yüksek Öğretim Programları ve Kontenjanları Kılavuzu'nda Bir düzenleme ile, ''…Sınavsız geçiş hakkı bulunmayan lise mezunları ile kendi alanları dışında tercih yapmak isteyen meslek lisesi mezunları Y-ÖSS puanları (sınavsız geçiş hakkı bulunan adayların, kendi alanlarında yerleştirilmeleri tamamlandıktan sonra boş kalan kontenjanlara) ile yerleştirilecektir.'' hükmü getirilmiştir (Leylek & Gürlen, 2015). Bu değişikliğin bir sonucu olarak 2004-2005 eğitim-öğretim yılında meslek yüksekokulları, sınavsız geçişle ve ÖSS (YGS) puanı ile öğrenci alır duruma gelmiştir. En son yapılan değişiklikle, meslek yüksekokullarına sınavsız girmenin kaldırılması resmi gazete aracılığıyla duyurulmuş ve kararın 2017-2018 eğitim-öğretim yılından itibaren uygulamaya konulacağı ifade edilmiştir.

Meslek yüksekokulları ile ilgili yaşanan sorunlar, sınavsız geçişin değerlendirilmesi, bu okullardaki eğitimin ve verimliliğin artırılması ve daha birçok konu üzerinde geçmişten günümüze araştırma çalışmaları, çalıştaylar ve farklı bilimsel etkinlikler yapılmıştır. (Elmacı, Poyraz & Çalık, 1999; Ulusuy, 1999: Filiz & Özel, 2003; Başaran ve diğerleri, 2010; Karagül, K., Karagül N. & Doğan, 2011; Leylek & Gürlen, 2015). Bu araştırmanın amacı meslek yüksekokullarına sınavlı-sınavsız sistemiyle yerleşen öğrencilerin temel matematik becerilerinde anlamlı düzeyde farklılaşma olup olmadığının incelenmesi ve demografik değişkenlere göre değişkenliği araştırılmaktadır.

YÖNTEM

Bu araştırmada, nicel araştırma yöntemlerinden betimsel tarama modeli türlerinden ilişkisel tarama modeli ile veriler toplanmış ve değerlendirilmiştir. İlişkisel tarama modelleri, ''iki ve daha çok sayıdaki değişken arasında birlikte değişim varlığını ve/veya derecesini belirlemeyi amaçlayan araştırma modelleridir. Bu tür bir düzenlemede, aralarında ilişki aranacak değişkenler ayrı ayrı sembolleştirilir. Ancak bu sembolleştirme (değerler verme, ölçme), ilişkisel bir çözümlemeye olanak verecek şekilde yapılmak zorundadır.'' (Karasar, 2005).
Araştırmanın evrenini, 2016-2017 öğretim yılında Kocaeli Üniversitesi, Kocaeli Meslek Yüksekokulu inşaat, bilgisayar teknolojileri, kimya ve kimyasal işleme teknolojileri, yönetim ve organizasyon ve muhasebe ve vergi bölümlerinde öğrenim gören 218 birinci sınıf öğrencisi oluşturmaktadır.

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Tablo 1: Öğrencilerin Bölümlere göre dağılımı

Bölüm	N	%
İnşaat	37	17,0
Bilgisayar teknolojileri	40	18,4
Kimya ve kimyasal işleme teknolojileri	44	20,1
Yönetim ve organizasyon	46	21,2
Muhasebe ve vergi	51	23,3
Toplam	218	100

Verilerin toplanması aşamasında öğrencilerin temel matematik ve sayısal becerilerini belirlemek için Leylek ve Gürlen, (2015) tarafından geliştirilen Matematik Başarı Testi (MBT) kullanılmıştır. 35 maddeden oluşan testin kapsam geçerliliği uzman görüşü alınarak ve güvenirliği ise KR-20 katsayısı 0,92 bulunarak elde edilmiştir (Leylek ve Gürlen, 2015). Ayrıca öğrencilerin demografik özelliklerini belirlemek için Kişisel Bilgi Formu (KBF) kullanılmıştır.

Verilerin analizinde; öğrencilerin meslek yüksekokullarına sınavlı-sınavsız yerleşme durumları ile temel matematik becerileri arasında anlamlı fark olup olmadığını tespit etmek için MBT den aldıkları puanlarla t-testi uygulanmıştır. İkinci aşamada MBT başarısının, demografik değişkenlere göre farklılaşıp farklılaşmadığını belirlemek amacıyla ANOVA testi uygulanmıştır. Analizler 0.05 anlamlılık düzeyinde test edilmiştir ($p<0.05$).

BULGULAR

Çalışma örneklemimizi oluşturan verilerin demografik dağılımları aşağıdaki gibidir (Tablo 2).

Tablo 2: Öğrencilerin demografik dağılımları

		f	%
Cinsiyet	Kız	92	42,2
	Erkek	126	57,8
Okul Türü	Meslek Lisesi	104	47,7
	Genel Lise	74	34,0
	Anadolu Lisesi	23	10,5
	Diğer Lise Türü	17	0,8
Meslek Yüksekokuluna Yerleşme Sistemi	Sınavlı	130	59,6
	Sınavsız	88	40,4
Toplam		218	100

Meslek yüksekokullarına sınavlı-sınavsız yerleştirmeyle gelen öğrencilerin temel sayısal becerilerinde anlamlı bir farklılık olup olmadığını belirlemek amacıyla gerçekleştirilen t-testi sonuçları aşağıdaki gibidir (Tablo 3).

Tablo 3: Öğrenci MBT Puanlarının t-Testi Sonuçları

		N	$\bar{X}$	S.S	Sd	t	p
MBT puanı	Sınavsız Geçiş	88	10,05	5,21	216	-11.13	,000
	Sınavlı Geçiş	130	19,47	7,49			

Tablo 3'e göre meslek yüksekokullarına sınavlı-sınavsız sistemiyle yerleşen öğrencilerin MBT puanı farklılık göstermektedir ($p<0,05$). Bu durumda, sınavla yerleşen öğrencilerin, sınavsız yerleşen öğrencilere göre temel sayısal becerilerinde daha başarılı olduğu söylenebilir.

Öğrencilerin mezun oldukları lise türü değişkeni ile temel matematik becerileri arasında anlamlı bir farklılık olup olmadığını belirlemek amacıyla gerçekleştirilen tek yönlü varyans analizi (ANOVA) sonuçları Tablo 4 'te sunulmuştur.

Tablo 4: Öğrencilerin MBT Puanlarının Lise Türüne Göre ANOVA Sonuçları

Varyansın kaynağı	K.T	S.d	K.O	F	p	Fark
Gruplar Arası	4400,177	3	1468,241	20,56	,000	Meslek Liseleri ile diğer okullar arasında
Grup İçi	19327,152	215	71,538			
Toplam	23496,046	218				

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Tablo 4' e göre öğrencilerin MBT puanlarında, mezun olunan lise türüne göre anlamlı bir fark olduğu görülmektedir, (F=20,56, p<0,05). Lise türü arası farkların hangi gruplar arasında olduğunu bulmak amacıyla yapılan testin (Tukey testi) sonuçlarına göre, Genel lise, Anadolu lisesi ve diğer liselerden mezun olan öğrenciler, Meslek Lisesi mezunu öğrencilerden daha başarılı olduğu bulgusuna ulaşılmıştır.

SONUÇLAR

Meslek yüksekokullarına sınavlı-sınavsız geçiş sistemiyle yerleşen öğrencilerin temel sayısal becerilerinde istatistiksel olarak anlamlı farklılıklar olduğu sonucuna varılmıştır. Sınavla yerleşen öğrencilerin temel sayısal becerileri; sınavsız yerleşen öğrencilerden önemli ölçüde illerde olduğu net bir şekilde belirlenmiştir. Öğrencilerin mezun oldukları lise türünün sayısal becerileri üzerinde anlamlı farklılıklar oluşturduğu sonucuna ulaşılmıştır. Fen ve matematik ağırlıklı teknik eleman yetiştiren meslek yüksekokullarında temel sayısal becerileri yüksek olan öğrencilerin fen ve matematik derslerinde daha başarılı olduğu sonucuna varılabilir.

Bu sonuçlardan hareketle, meslek yüksekokuluna öğrenci seçme sistemi üzerinde tekrar çalışmalar yapılması gerektiği ve sayısal bilgi, beceri düzeyi belirli bir düzeyde olan öğrencilerin meslek yüksekokullarına kabul edilmesi gerektiği söylenebilir.

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METAL MALZEMELERIN DOĞAL FREKANSININ SICAKLIĞA BAĞLI OLARAK DEĞIŞIMININ İNCELENMESI

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Makinalarda ve özellikle konstrüksiyonlarda zaman zaman kontrol dışı titreşimlere rastlanır. Bu tireşimler kimi zaman sadece kullanıcıda rahatsızlığa neden olur iken bazen de bir makinanın arızalanması veya bir konstrüksiyonun çökmesine kadar giden ciddi sonuçlar doğurabilir. Bir cismin elastisite modülüne, geometrisine ve kütlesine bağlı olan titreşim frekansına doğal frekans denir. Eğer cisim bu frekansta uyarılırsa artan genlikle ve sürekli olarak titreşeceği rezonans durumuna girmesine sebep olunabilir.

Temelde cismin elestisite modülüne, geometrisine ve kütlesine bağlı olan doğal frekans, bu özelliklerden herhangi birinin değişimi ile tahmin edilemeyen noktalara kayabilmektedir. Bu özellikleri değiştirme gücüne sahip olan fiziksel özelliklerden sıcaklığın doğal frekans değişimine etkisi bu sebeple oldukça kritik bir öneme sahiptir.

Bu çalışmada metal malzemelerin doğal frekansı strain gauge ile ölçülen değerlerin labview görsel programlama dilinde analizi yapılmıştır. Yapılan deney düzeneğinde farklı metal malzemelerin farklı sıcaklıklardaki doğal frekansları ölçülmüş ve normal sıcaklıktaki doğal frekanslarla karşılaştırılarak malzemelerin sıcaklığa bağlı olarak doğal frekens değişimleri incelenmiştir.

Keywords: Doğal frekans, strain gauge, labview

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NOISE LEVEL IN A DISTRICT OF BURSA

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Abstract: Noise is generally defined as unwanted sound and comes from the activities of people. It has significant affects on public health, such as physical, psychological, psychological and performance-related effects. Noise pollution is one of the major environmental problems such as water, air and soil pollution. It causes hearing loss, communication and sleep interference, physiological responses, and annoyance. Therefore, modeling of noise in cities is of great importance and demonstrates the health risk areas. One of the significant places which may be affected from the noise are residential areas. The recommended maximum noise level near residential areas in Turkey is 68 dBA. Especially traffic load around the residental areas is the significant reason for noise pollution.

The aim of this study is to determine noise level in a district in Bursa, which is one of the big cities of Turkey. It has been determined 6 points that are sensitive to noise near traffic roads around this district. The measurements have been conducted in the morning, noon and evening time on days when the weather is sunny, cloudy or partly cloudy. The measurements are between 93 dB(A) and 60 dB(A) and the results indicate that noise level upper than 68 dB around the district in Bursa city affects the people impressively.

Keywords: Bursa, district, noise pollution.

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NOVEL POLY(E-CAPROLACTONE) MACROMONOMERS BEARING 2-[(4-FLUOROBENZYL)THIO]ETOXY AND 3-[(4-FLUOROBENZYL)THIO]PROPYLOXY UNITS:SYNTHESIS AND CHARACTERIZATION

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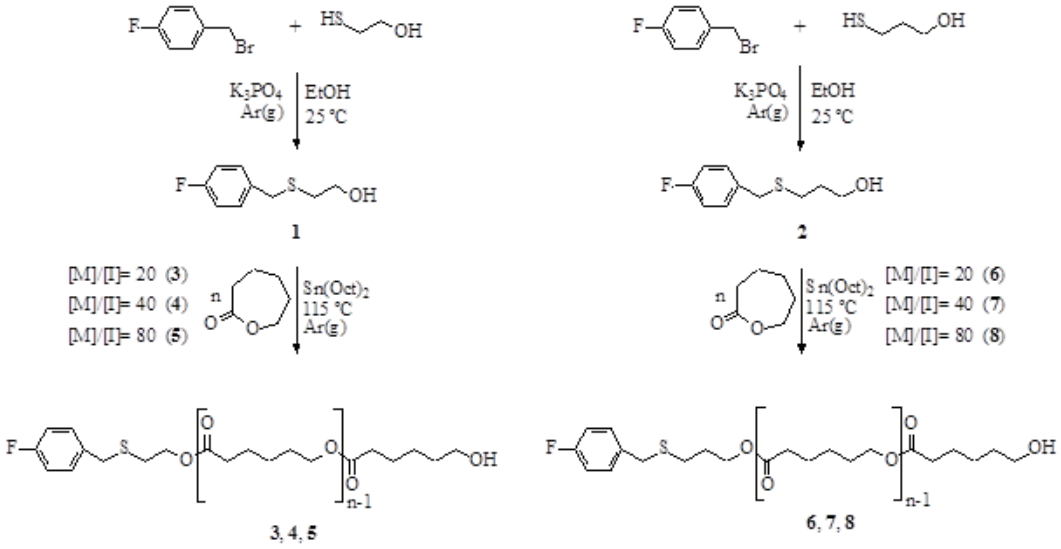
Abstract: Ring-opening polymerization (ROP) can be performed both in a controlled and living manner, depending on the monomer and initiator/catalyst system [1].Aliphatic polyesters, synthesized via (ROP) of lactones and lactides, are of significant interest owing to good mechanical properties, hydrolyzability and biocompatibility [2,3]. To address pharmacological, biomedical, environmental and agricultural concerns, the issue of sustainability and ever-limited petroleum resources, aliphatic polyesters such as polyglycolide, polylactides (PLA), poly(ε-caprolactone) (PCL) have received considerable interests in polymer science [3].

In this work, a series of poly(ε-caprolactone)swith different arm length were synthesized through ring-opening polymerization of ε-caprolactone with 2-[(4-fluorobenzyl)thio]ethanol **(1)** [4] and 3-[(4-fluorobenzyl)thio]propan-1-ol**(2)** as the initiators, $Sn(Oct)_2$ as a catalyst under inert atmosphere in bulk at 115 °C. The route followed during synthesis of initiators and polymers is given in Scheme 1. The synthesized initiators and polymers were characterized by FT-IR and NMR spectral data and GPC, DSC techniques.



Scheme 1. Synthesis of initiators (**1**,**2**) and PCL(**3-8**) macromonomers

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NUMERICAL INVESTIGATION OF MACHINING CHARACTERISTICS OF HASTELLOY-X

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Abstract: Nickel-based alloys provide high corrosion resistance and high-temperature strength but these alloys possess poor machinability. Hastelloy-X is one of the nickel-based alloys. There are many studies about finite element modeling of nickel-based alloys but studies of Hastelloy- X are limited. In the present work, machining characteristics of Hastelloy-X were investigated and a numerical model was developed for the turning operation of Hastelloy-X. Cutting speed of 40 m/min and feed rate 0.1 mm/rev were taken into consideration in the operations and the results were evaluated considering process outputs such as cutting forces, cutting temperature and effective stresses The proposed model is applicable for the turning operation of Hastelloy-X.

Keywords: Hastelloy-X, turning operation, DEFORM-2D

Introduction

Modern product designs and manufacturing technologies are changing day by day. In this context, there are many innovative methods used in manufacturing and many methods applied in improving manufacturing processes. Some of the developed methods (3d printing, etc.) work differently according to the traditional manufacturing methods. The use of nickel alloys is important with the development of aviation and the energy sector. For this reason, its machining needs to be investigated thoroughly.

Nickel-based alloys are extensively used because of their advantages in the spacecraft engines and gas turbine components These alloys have some important benefits: being heat-resistant, retaining their high mechanical and chemical properties at elevated temperatures, having high melting temperatures, enhanced corrosion resistance as well as resistance to thermal fatigue, thermal shock, creep, and erosion (Akıncıoğlu et al., 2016; Ulutan and Özel, 2010). However, these alloys have some problems in machining because they have an austenitic matrix and similar with stainless steels, work hardening is rapidly seen during machining. Also, increase in tool flank wear, cratering and notching are observed at elevated temperatures. (Choudhury and El-Baradie, 1998).

According to literature studies, machining of Hastelloy was not sufficiently investigated. Furthermore, previous studies focus on the statistical models based on experimental results. Hastelloy is a candidate material to be investigated through numerical studies in order to improve the machining operations and reduce the experimental expenses. In the present work, a numerical model was developed for the turning operation of Hastelloy-X. The verification of the numerical model was performed comparing the maximum insert cutting temperatures with the experimental results. In addition to these outputs, effective stresses and cutting forces were discussed.

Materials and Methods

In this work, 2D finite element model for orthogonal cutting is developed in DEFORM-2D program. In this context, Langrange finite element formulation is used by continuous and adaptive meshing method. Dry cutting conditions are used in the tests. 2-dimensional simulation studies in machining are preferred because of their simplicity and solution time comparing to 3D simulation studies. Hastelloy-X is used as material. The workpiece is assumed as plastic. The tool is assumed rigid in developed model. In the simulations, ultrasonic vibration is applied at 20 kHz and 20 microns in the cutting direction. The feed rate is taken as 0.1 mm/rev. Cutting speed is selected as 40 m / min. Mesh convergence is obtained. 2500 elements for Hastelloy-X and 1500 elements for tungsten carbide tool are determined and results are not changed above the number of these elements. With the remeshing operation, the number of mesh is increased in the cutting region at the time of machining, thereby facilitating the convergence of the solution. In the simulations, X is the cutting direction and Y is the feed direction (Figure 1).

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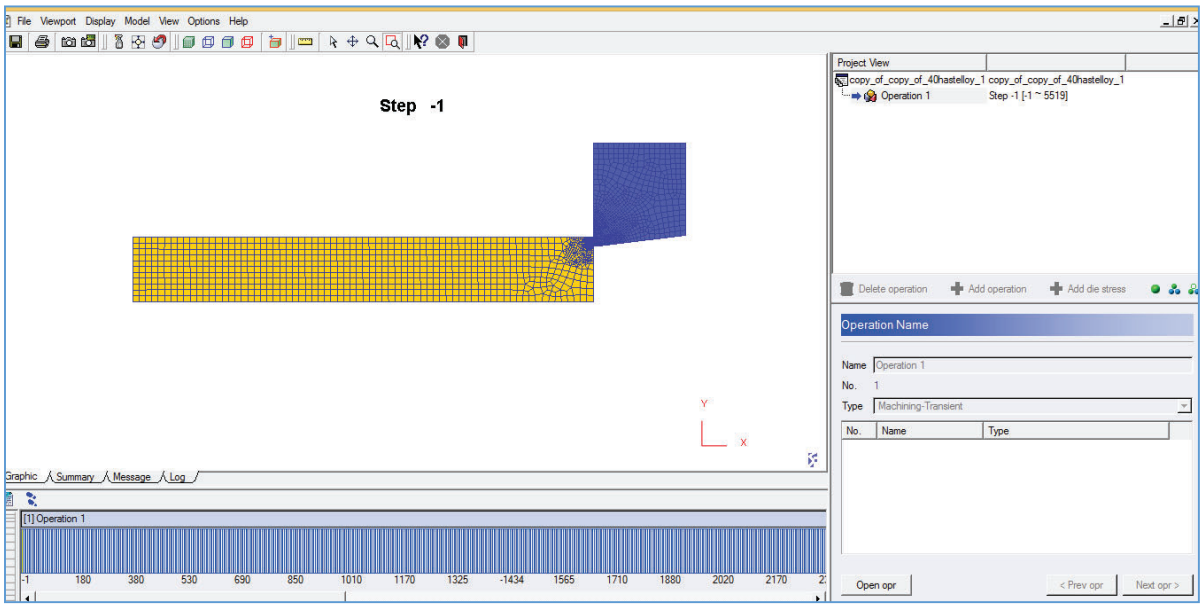

Figure 1. A snapshot from DEFORM-2D

The initial temperature of the workpiece is set as 20 ° C. The Johnson Cook (JC) material model is used to model the workpiece. In high strain situations, JC model produces reasonable results. This model shows the precision of the strain rate in the material. Equations for this model are given in Eq. 1-2. Table 1 shows the coefficients of this model.

$$\sigma=\left(A+B\varepsilon^{n}\right)\left(1+C\ln\left(\frac{\dot{\varepsilon}}{\dot{\varepsilon}_0}\right)\right)\left(1-T^{*}\right)^{m} \quad (1)$$

$$T^{*}=\frac{\left(T-T_{room}\right)}{\left(T_{melt}-T_{room}\right)} \quad (2)$$

$\frac{\dot{\varepsilon}}{\dot{\varepsilon}_0}$: strain rate / reference strain rate
n : strain rate sensitivity for the material
T_{room}: Room temperature
T_{melt}: Melting temperature of workpiece
A, B, C, m : Material constants

Table 1. Johnson Cook coefficients for materials used in simulations

	A(MPa)	B(MPa)	C	n	m	$\dot{\varepsilon}_0$
Hastelloy-X	380	1200	0,012	0,55	2,5	0,001

Johnson Cook material models are based on many tests and coefficients are determined by curve fitting techniques. Split Hopkinson compression tests are performed at different strain rates and temperatures in order to determine the model coefficients. The coefficients used in this study were given in Table 1. These values were reported in literature by Abotula et al. 2011.The material of the cutting tool is WC + TiAlN coating and cutting tool has a rake angle of 0° and a clearance angle of 7°. The tool tip hone radius is 0,02 mm.

Different damage models and fracture criteria have been defined in the literature in order to predict of chip shapes and cutting forces. Cockcroft & Latham fracture criterion is selected in this study. Thus, the morphology of serrated

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chips could be observed. Similar approach was used before the study performed in the literature (Çakır et al., 2015).

Friction model and coefficients are determined by using different studies in the literature (Özel and Ulutan, 2012). The friction zones determined during the machining of Hastelloy-X are given in Fig 2. The friction zone is divided into two sections. The part of the tool hone radius is taken as shear friction zone and the value is 0,9. The second region is defined on the top of this region to the portion where the chips are rubbing the cutting tool. This region is determined as coulomb friction and the value is taken as 0,7.

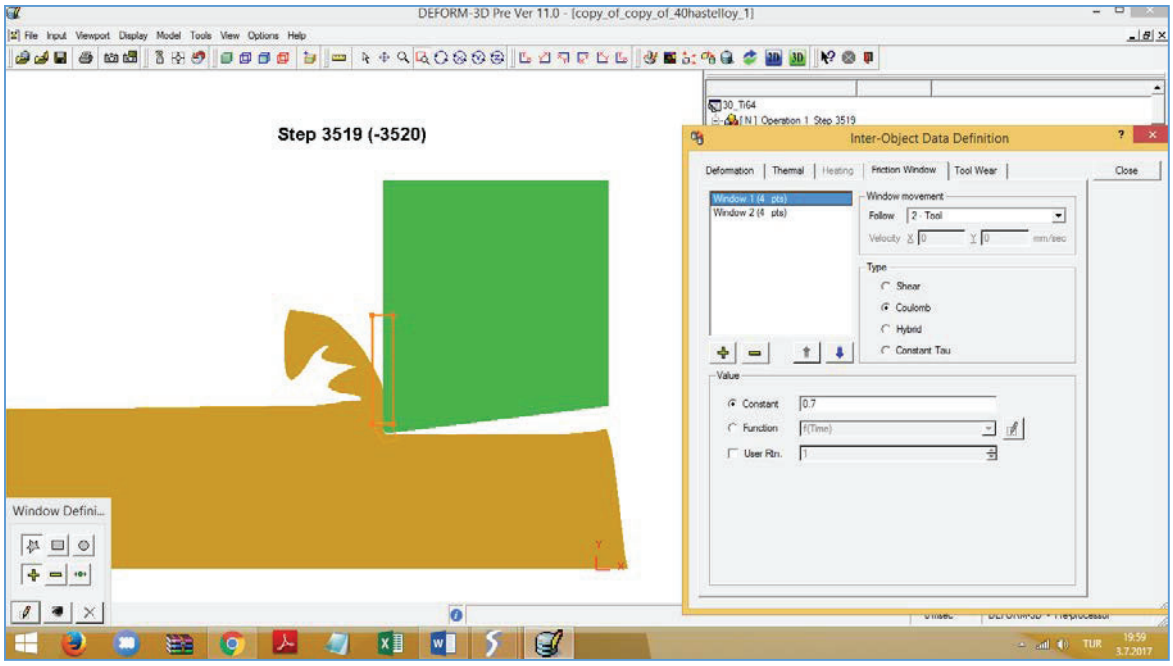

Figure 2. Friction zones determined during the machining of Hastelloy-X

Material properties for Hastelloy-X were given at Table 2. These properties have been determined with literature studies and in the producers catalogs as follows (Aghaie and Golaizi, 2008; Abotula et al., 2014);

Table 2. Mechanical and thermal properties of Hastelloy-X used in simulations

	Hastelloy-X
Modulus of Elasticity (MPa)	25^0C-205000 200^0C-198000 400^0C-187000 600^0C-173000 800^0C-157000
Thermal expansion ($mm.mm^{-1}.^oC^{-1}$)	20^0C-1,3e-5 200^0C-1,35e-5 400^0C-1,41e-5 500^0C-1,43e-5
Thermal conductivity ($W.m^{-1}.\ ^oC^{-1}$)	25^0C-9,2 200^0C-14,1 600^0C-21,9 800^0C-24,7
Emissivity coefficient	0,85
Poisson's ratio	0,32

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Results and Discussion

Mean cutting forces, maximum cutting insert temperatures and maximum effective stress values are investigated in the numerical study.

Maximum cutting insert temperatures

Numerical results have been compared to experimental study to verify the developed numerical model. Maximum insert temperatures at the cutting edge measured during machining of Hastelloy-X alloy is given in Table 3. Results of experimental study and numerical results are compared. It can be said that the developed numerical model can predict cutting insert temperature within a range of 20% error. In this context, it is observed that the numerical model satisfies the experimental results.

Maximum insert cutting temperatures

	Experimental (°C)	Simulation (°C)
Conventional turning	208,2	167,73

Mean cutting forces

Numerically determined mean cutting forces for Hastelloy-X are given in Figure 3. The force in the X direction is about 110 N and the force in the Y direction is about 30 N.

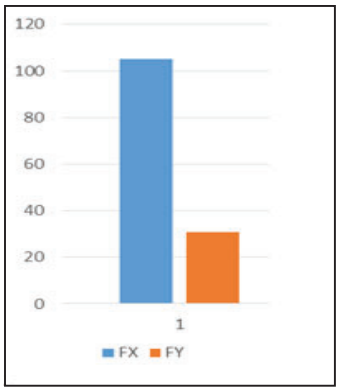

Figure 3. Cutting forces (N) for Hastelloy-X

Effective stresses

Effective stress distributions in turning of Hastelloy-X is shown in Figure 4. In conventional turning, the maximum effective stress is nearly 1600 MPa.

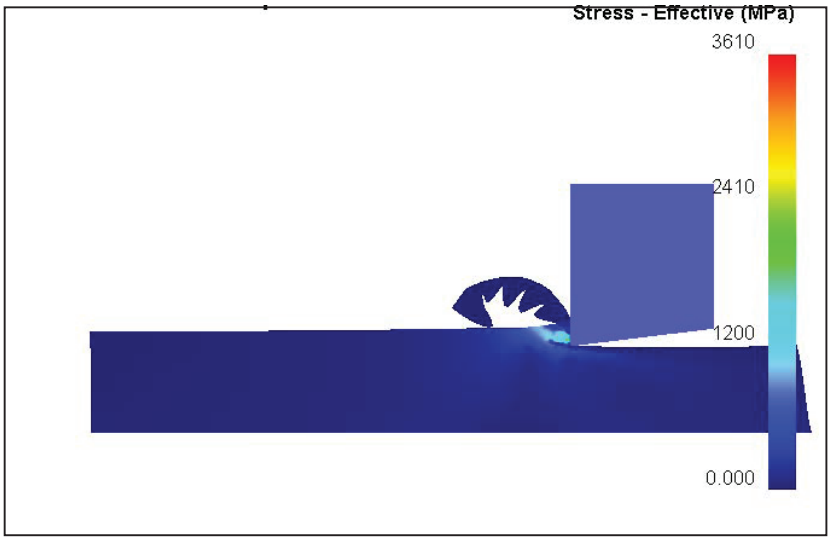

Figure 4. Effective stress distribution in turning of Hastelloy-X

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Conclusion

In this study, machining of Hastelloy-X is modelled using finite element method. Mean resultant cutting forces in the simulations is nearly 110 N. Maximum effective stresses is approximately 1600 MPa. Maximum insert temperatures is 167 ^{0}C which exhibit good agreements with the experimental results.

Acknowledgements

This work was financially supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK Project #215M382) and the Research Fund of Eskişehir Osmangazi University (ESOGU BAP Project #2016-1086). The authors M.A.Sofuoğlu and S.Gürgen acknowledge the support of TÜBİTAK under Program 2228 and 2211 respectively.

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NUMERICAL STUDY OF THE EFFECT OF PARTICLES SIZE AND VOLUME FRACTION OF AL2O3\ WATER NANOFLUID IN LAMINAR CONVECTIVE HEAT TRANSFER IN HORIZONTAL CIRCULAR TUBE

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The problems of sedimentation, increased pressure drop, fouling and erosion of the flow channel, which are caused by addition of milli or micro sized solid particles in a base fluid are resolved by nanofluids. Nanofluids are used in a heat transfer enhancement, which is a significant issue in the research and industry fields. Nanoparticles increase the thermal conductivity of the base fluid manifold which in turn increases the heat transfer. These heat transfer, very common in industrial and technological world (engine coolant, lubricating oils, heat transfer fluids for solar panels and heat exchangers,…).This paper included thermal behavior for fully developed laminar flow regime in forced convection heat transfer of Al2O3 nanoparticles dispersed in water, flowing through a horizontal circular tube under constant heat flux boundary condition at walls. In this investigation, the effects of parameters, such as nanoparticles diameter, concentration, and Reynolds number on the enhancement of nanofluids heat transfer have been considered in order to study the behaviour of the system in terms of Nusselt number, heat transfer coefficient and temperature fields. Moreover a comparison with data present in the literature is carried out. A correlation of the Nusselt number with Re and dnp, has been established.

Keywords: Al_2O_3, Circular tube, Effect of particles size, Heat transfer, Laminar flow, Nanofluid, Numerical study

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OKUL ÖNCESİ ÇOCUKLAR İÇİN GÖRSEL PROGRAMLAMA ÖĞRENİMİ: CODE.ORG

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Abstract: Kodlama, kişilere yaratıcı düşünme becerilerini geliştirme, gerçek yaşam sorunlarına farklı yönlerden bakabilme ve sistematik biçimde çözüm üretebilme, yeni fikirler keşfetme, mantıklı öğrenme ve işbirliği içinde çalışma konularında yardımcı olmaktadır. Çocuklarımızın okul öncesi dönemde bu özelliklere sahip olmaya başlamaları ilerleyen yıllarında daha başarılı olmalarını sağlamaktadır. Küçük yaşlarda programlama öğrenmenin önemini anlayan programcılar, çocuklara programlamayı sevdirecek, basit ve sade bloklarla kodlama yapabildikleri çeşitli araç ve diller geliştirilmiştir. Bu çalışmamızda herhangi bir kurulum gerektirmeden çevrimiçi çalışabileceğimiz, içerisinde her yaş gurubuna özel modüllerin yer aldığı, basit blokları sürükleyerek kodlama yapılabilen code.org portalını inceleyeceğiz.

Keywords: programlama, okul öncesi, code.org, bloklarla kodlama

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ÖRGÜTSEL ETİK VE GÜVENİN TAKIM PERFORMANSINA ETKİSİ: OTOMOTİV SEKTÖRÜ ÇALIŞANLARINA YÖNELİK BİR ARAŞTIRMA

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Özet: Çalışan davranışları örgüt içinde hâkim olan etik anlayış ve çalışanlar arasındaki güven ilişkisi gibi birçok örgütsel faktörden etkilenebilmektedir. Örgütlerin etik kurallar çerçevesinde yönetilmesi ve örgüt içinde karşılıklı güvenin oluşması bireysel performans başta olmak üzere takım performansı ve örgütsel performansa olumlu katkıda bulunacaktır. Buradan hareketle bu çalışmada örgütsel etik ve güvenin takım performansına etkisini ortaya koymak amaçlanmıştır. Araştırma verileri, bir otomobil firmasının Ankara bölgesi satış ve servis merkezlerinde çalışan 136 kişiden elde edilmiştir. Yapılan analizlere göre örgütsel etik ile takım içi güven arasında pozitif yönde anlamlı bir ilişki, yine örgütsel etik ile takım performansı arasında pozitif yönde anlamlı bir ilişki olduğu tespit edilmiştir. Ayrıca regresyon analizi sonucunda örgütsel etik ve güvenin takım performansı üzerinde anlamlı bir etkisinin olduğu görülmektedir. Buna göre örgütsel etik ve güvenin takım performansının önemli bir kısmını açıklamaktadır.

Anahtar Kelimeler: Örgütsel Etik, Takım İçi Güven, Takım Performansı

Giriş

Çalışanlar örgütlerinden, yöneticilerinden ve çalışma arkadaşlarından etik kurallara uymalarını ve birçok yönden güven vermelerini beklerler. Bu beklentinin olumlu sonuçlanması çalışanların işyerindeki tutum ve davranışlarının örgüt lehine gerçekleşmesine ve dolayısıyla da performans artışına neden olacaktır. Bir başka ifadeyle, örgütlerinin etiğe uygun bir şekilde yönetildiğini algılayan ve örgüt içinde yer alan tüm taraflar (yönetici-çalışan-çalışma arkadaşları) arasındaki karşılıklı güven ilişkisinin iyi bir düzeyde olduğunu hisseden çalışanların performansları da yüksek olacaktır. Bu nedenlerle çalışmada örgütsel etik ve takım içi güvenin takım performansı üzerindeki etkisinin ortaya konulması amaçlanmıştır. Çalışmada öncelikle örgütsel etik, takım içi güven ve takım performansı kavramsal olarak ele alınmış, daha sonra ilgili literatüre dayanarak hipotezler geliştirilerek, etik ve özellikle de takımla ilgili ampirik çalışmalar için oldukça uygun olan otomotiv sektörü çalışanları örnekleminde araştırma hipotezleri test edilmiştir.

Literatür

Örgütsel Etik

Etik kavramı belirli durumlar kapsamında ahlaki açıdan uygun davranışa ve doğruluğa rehberlik eden kurallar, standartlar, kodlar veya ilkeler bütününü ifade eder (Lewis, 1985: 381). Örgütsel etik ise bir organizasyon yapısı içinde zararlı davranışlardan kaçınmak ve adil, güvenilir, dürüst ve saygılı bir ortam sağlayan davranışları geliştirmek üzere insan davranışına ilişkin standartlar ve ilkelerle ilgilidir. Örgütsel etik, etik iklim, güven düzeyi, ahlak bilinci ve ortak menfaati teşvik eden paylaşılan bir dizi değerin grubun egemen kültürünü oluşturmasını sağlayan davranış yollarını kapsayan geniş ve dinamik bir kavramdır (Letendre, 2015:2083). Örgütsel etik ile ilgili literatür incelendiğinde; Koh ve El'Fred (2001) örgütsel etiğin iş doyumunu etkilediği ve bunun da olumlu iş tutumlarını/davranışlarını ve örgütsel sonuçları teşvik ettiği, ayrıca, üst yönetimin örgütsel etik üzerinde önemli etkiye sahip olduğuna dair bulgular elde etmiştir. Elango vd., (2010)'in çalışmasında yüksek seviyedeki örgütsel etik algısının etik niyetle pozitif bir ilişki içinde olduğu görülmüştür. Valentine ve Fleischman (2004)'in araştırması ise, biçimsel etik eğitimi olan örgütlerde çalışanların, bu tür eğitim almayan çalışanlara göre daha olumlu örgütsel etik algısına sahip olduklarını göstermiştir.

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Takım İçi Güven

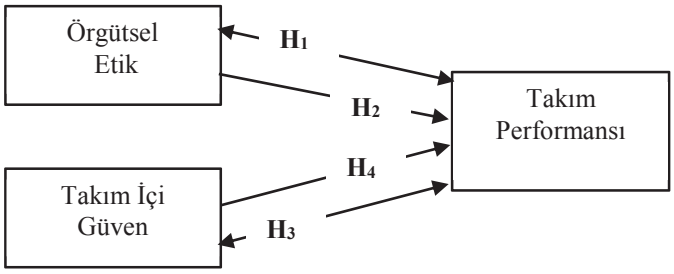
Güven, bir tarafın, diğer tarafın denetimini yapma veya izleme becerisine bakmaksızın, diğerinin güvenen için önemli olan belirli bir işlemi gerçekleştireceği beklentisine dayanarak diğer tarafın eylemlerine karşı savunmasız olma isteğidir (Mayer vd., 1995:712). Takım içi güven ise takım üyelerinin diğer takım arkadaşlarına karşı sahip oldukları ortak güven algılamalarıdır. Güvene ilişkin algılar, bireysel seviyede bulunur; ancak, takım düzeyinde güvenin anlamı, bu bireysel düzey algılamaların ortak niteliklerine dayanmaktadır (De Jong ve Elfring, 2010:536). Örgütsel davranış alanında güven ile ilgili çalışmalar incelendiğinde; güvenin örgütsel özdeşleşme ve örgütsel bağlılığı artırdığı (DeConinck, 2011) ve işten ayrılma niyetini (Aryee vd., 2002), tükenmişliği (Simmons vd., 2009) ve stresi (Costa vd., 2001) azalttığına dair bulgular elde edilmiştir. Bununla birlikte güvenin görev performansı ve örgütsel vatandaşlık davranışı üzerinde anlamlı bir etkisinin olduğu (Colquitt vd., 2007), güven ile etik iklim (Mulki vd., 2006), takım yaratıcılığı ve takımın işbirliği kültürü (Barczak vd., 2010) arasında pozitif yönde ve anlamlı bir ilişki olduğu görülmektedir.

Takım Performansı

Bireysel anlamda performans bir amaca veya hedefe ulaşma konusunda gösterilen verimlilik ve etkinlik derecesidir (Tutar ve Altınöz, 2010:201). İş performansı, bir kişinin standart bir süre boyunca yürüttüğü belirli davranışsal çalışmaların örgütüne kattığı toplam beklenen değer olarak tanımlanır (Motowildo, 2003:39). Takım performansı ise "bir takımın üretim çıktısının, bu çıktıyı inceleyenlerin performans standartlarını ne derece karşıladığı veya aştığı" olarak tanımlanır (Hackman, 1987:323). Bir başka ifadeyle takım performansı, bir takımın amaçlarını veya misyonunu ne ölçüde yerine getirdiğini belirtir (Devine ve Philips, 2001:512). Literatür incelendiğinde; takım performansı ile takım güveni, takım bütünlüğü ve takım şeffaflığı (Palanski vd., 2011), takım üyelerinin dönüşümcü liderlik algısı (Braun vd., 2013), takımlarda bilgi paylaşımı (Lee vd., 2010), takım güçlendirmesi (Kirkman vd., 2004), takım iklimi (Pirola-Merlo vd., 2002) arasında pozitif yönde ve anlamlı bir ilişki olduğu, görev çatışması ve ilişki çatışması (De Dreu ve Weingart, 2003) arasında negatif yönde ve anlamlı bir ilişki olduğu görülmektedir.

Yöntem

Araştırmanın amacı örgütsel etik ve takım içi güvenin takım performansı üzerindeki etkisini otomotiv sektörü çalışanları örnekleminde ele almaktır. Bu doğrultuda çalışmada araştırma hipotezlerinin de yer aldığı ve teorik çerçeveye uygun olarak değişkenler arasındaki ilişkileri ortaya koymak üzere bir model oluşturulmuştur (Şekil 1).



Şekil 1: Araştırma Modeli

***H1**: Örgütsel etik ile takım performansı arasında anlamlı bir ilişki vardır.*
***H2**: Örgütsel etiğin takım performansı üzerinde anlamlı bir etkisi vardır.*
***H3**: Takım içi güven ile takım performansı arasında anlamlı bir ilişki vardır.*
***H4**: Takım içi güvenin takım performansı üzerinde anlamlı bir etkisi vardır.*

Araştırma bir otomobil firmasının Ankara bölgesi satış ve servis merkezlerinde çalışanlara yönelik olarak 2017 yılı Nisan-Mayıs döneminde gerçekleştirilmiştir. Bu dönemde firmanın satış ve servis merkezlerinde çalışan sayısı toplam 195'dir. Çalışanların bir kısmı, anket formunu doldurmayı reddetmişlerdir ve toplamda 136 kullanılabilir anket formu elde edilmiştir. Bu kapsamda seçilen örneklem, evrenin yaklaşık % 70'ini temsil etmektedir.

Araştırmada katılımcıların örgütsel etiğe ilişkin algılarını ölçmek için Hunt, Wood ve Chonko (1989) tarafından geliştirilen 5 maddelik Örgütsel Etik Ölçeği kullanılmıştır. Ölçekte yer alan ifadelerden bazıları şöyledir; "Yöneticilerin sık sık etik dışı davranışlar sergilediğini düşünürüm." ve "Eğer şirket yöneticilerimden birisi, kişisel kazançla sonuçlanacak bir etik dışı davranış gösterirse, hemen uyarılır.". Ölçekten alınan yüksek puanlar örgütsel etik algısının yüksek olduğunu göstermektedir.

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Takım içi güven algısını ölçmek için De Jong ve Elfring (2010) tarafından geliştirilen 5 maddelik Takım İçi Güven Ölçeği kullanılmıştır. Ölçekte yer alan ifadelerden bazıları şöyledir; "İşimle ilgili konularda takım arkadaşlarımın beni bilgilendireceklerinden eminim." ve "İşimde güçlük çektiğimde takım arkadaşlarımdan yardım alacağımı bilirim.". Ölçekten alınan yüksek puanlar takım içi güven algısının yüksek olduğunu göstermektedir.

Takım performansı algısını ölçmek için De Jong ve Elfring (2010) tarafından geliştirilen 3 maddelik Takım Performansı Ölçeği kullanılmıştır. Ölçekte yer alan ifadelerden bazıları şöyledir; "Takımın üretim miktarı hakkındaki genel değerlendirmeniz." ve "Takımın etkinliği hakkındaki genel değerlendirmeniz.". Ölçekten alınan yüksek puanlar takım performansı algısının yüksek olduğunu göstermektedir.

Her üç ölçek 5'li Likert tipinde hazırlanmıştır ve her madde 1 ile 5 arasında (1=Hiç katılmıyorum ve 5=Tamamen Katılıyorum) derecelendirilmiştir. Ölçeklerin dilimize uyarlanmasında ölçeklerdeki ifadeler İngilizce ve Türkçe'yi bilen iki İngilizce dil uzmanı ve sosyal bilimler alanında uzman iki kişi tarafından Türkçe'ye çevrilmiştir. Çevirilerin ortak noktaları dikkate alınarak ortaya çıkan Türkçe taslak başka bir dil uzmanı tarafından tekrar İngilizceye çevrilmiştir. Sonuçta ölçeklerin orijinali ve Türkçe'den çevirisiyle uyumlu bulunan ifadeler araştırmada kullanılmıştır.

Bulgular ve Tartışma

Araştırma sonucunda elde edilen veriler SPSS 23 programında değerlendirilmiştir. Demografik özelliklere ilişkin veriler, frekans analizi ve yüzdesel değerler ile açıklanmıştır. Ölçekler için Cronbach's Alfa güvenilirlik analizi yapılmıştır. Hipotezlerin testi için korelasyon ve regresyon analizi yapılmıştır.

Tablo 1: Katılımcıların Demografik Özellikleri

Cinsiyet	Frekans	Yüzde (%)	Medeni Durum	Frekans	Yüzde (%)
Kadın	18	13,2	Evli	86	63,2
Erkek	118	86,8	Bekâr	50	36,8
Toplam	136	100	Toplam	136	100
Yaş	Frekans	Yüzde (%)	Birim	Frekans	Yüzde (%)
20-30 Yaş Arası	69	50,7	Servis	97	71,3
31-40 Yaş Arası	56	41,2	Satış	39	28,7
41-50 Yaş Arası	10	7,4	Toplam	136	100
51 ve Üzeri	1	0,7			
Toplam	136	100			
Hizmet Süresi	Frekans	Yüzde (%)	Eğitim Durumu	Frekans	Yüzde (%)
1-5 Yıl Arası	89	65,4	İlkokul	12	8,8
6-10 Yıl Arası	25	18,4	Ortaokul	13	9,6
11-15 Yıl Arası	16	11,8	Lise	65	47,8
16-20 Yıl Arası	1	0,7	Yüksekokul	22	16,2
21-25 Yıl Arası	2	1,5	Üniversite	21	15,4
26-30 Yıl Arası	3	2,2	Yüksek Lisans	3	2,2
Toplam	136	100	Toplam	136	100

Araştırmaya 18 kadın ve 118 erkek katılmıştır, bunların % 63,2'si evli, %36,8'i bekârdır. Katılımcıların %50,7'si 20-30, %41,2'si 31-40, %7,4'ü 41-50, %0,7'si 51 yaş ve üzerindedir. Katılımcılardan 97'si servis, 39'u satış biriminde çalışmaktadır. Hizmet süresi bakımından katılımcıların %65,4'ü 1-5 yıl, %18,4'ü 6-10 yıl, %11,8'i 11-15 yıl, %0,7'si 16-20 yıl, %1,5'i 21-25 yıl ve %2,2'si 26-30 yıl arasındadır. Katılımcıların %8,8'i ilkokul, %9,6'sı ortaokul, %47,8'i lise, %16,2'si yüksekokul, %15,4'ü üniversite ve %2,2'si yüksek lisans mezunudur.

Tablo 2: Değişkenlerin Ortalama, Standart Sapma, Güvenilirlik ve Korelasyon Değerleri

	Ortalama	Standart Sapma	1	2	3
Örgütsel Etik	3,9485	,79405	[0,796]		
Takım İçi Güven	4,0235	,88412	,323**	[0,861]	
Takım Performansı	4,1667	,79401	,429**	,480**	[0,886]

**Korelasyon 0.01 düzeyinde anlamlı (iki yönlü), [Parantez içindeki değerler Cronbach Alfa güvenilirlik katsayısıdır.]

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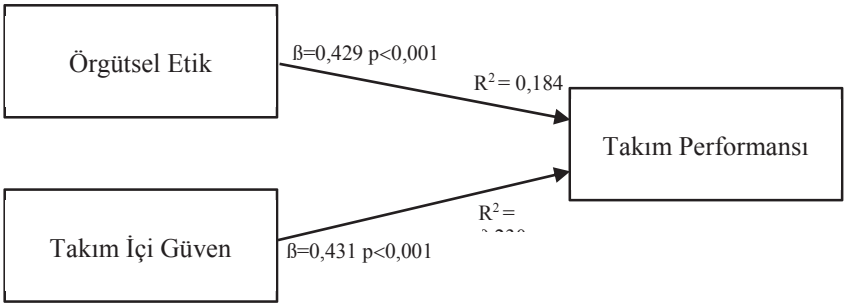
Araştırmaya katılanların ölçeklerden aldıkları değerler, örgütsel etik (3,95), takım içi güven (4,02) ve takım performansı (4.16) düzeylerinin ortalamanın üzerinde olduğunu göstermektedir. Buna göre katılımcıların örgütlerini etik anlamda iyi bir konumda gördükleri, takım arkadaşlarına yeterince güven duydukları ve takımlarının performansının kabul edilebilir bir seviyede gördükleri ifade edilebilir.

Araştırmada kullanılan ölçeklerin güvenilirlik değerleri şöyledir; örgütsel etik ölçeği 0.796, takım içi güven ölçeği 0.861 ve takım performansı ölçeği 0.886'dır. Bu değerler ölçeklerin güvenilirlik katsayılarının kabul edilebilir olduğunu göstermektedir.

Değişkenler arası ilişkilerin yönü ve derecesini belirlemek için korelasyon analizi yapılmıştır. Analiz sonucunda örgütsel etik ile takım performansı arasında pozitif yönde anlamlı bir ilişki ($r=0.429$, $p>0.01$) olduğu görülmektedir. Buna göre Hipotez 1 (H_1: Örgütsel etik ile takım performansı arasında anlamlı bir ilişki vardır.) kabul edilmiştir. Aynı zamanda takım içi güven ile takım performansı arasında pozitif yönde anlamlı bir ilişki ($r=0.480$, $p>0.01$) olduğu görülmektedir. Dolayısıyla Hipotez 3 (H_3: Takım içi güven ile takım performansı arasında anlamlı bir ilişki vardır.) kabul edilmiştir.



Şekil 1: Regresyon Modeli

Örgütsel etik ve takım içi güvenin takım performansı üzerindeki etkisini belirlemek için regresyon analizi yapılmıştır. Analiz sonucuna göre; örgütsel etiğin takım performansı üzerinde anlamlı bir etkisinin olduğu (ß=0,429;p<0,001) ve %18,4 oranında açıklayıcı olduğu (R^2= 0,184) görülmektedir. Buna göre Hipotez 2 (H_2: Örgütsel etiğin takım performansı üzerinde anlamlı bir etkisi vardır.) kabul edilmiştir. Öte yandan takım içi güvenin takım performansı üzerinde anlamlı bir etkisinin olduğu (ß=0,431;p<0,001) ve %23 oranında açıklayıcı olduğuna (R^2= 0,230) dair bulgular elde edilmiştir. Dolayısıyla Hipotez 4 (H_4: Takım içi güvenin takım performansı üzerinde anlamlı bir etkisi vardır.) kabul edilmiştir.

Sonuç

Örgütsel etik ve takım içi güvenin takım performansı üzerindeki etkisinin otomotiv sektörü çalışanları örnekleminde incelendiği bu araştırma sonucunda geliştirilen hipotezlerin tamamı kabul edilmiştir. Yapılan analizler örgütsel etik ve takım içi güven ile takım performansı arasında pozitif yönde anlamlı bir ilişki olduğunu göstermiştir. Araştırma bulguları katılımcıların örgütlerini etik kurallara uyan bir örgüt olarak gördüklerini, takım arkadaşlarını güvenilir bulduklarını ve takımlarının performansının iyi olarak değerlendirdiklerini göstermektedir. Ayrıca regresyon analizi sonucuna göre; örgütsel etiğin ve takım içi güveninin ayrı ayrı takım performansı üzerinde anlamlı bir etkisinin olduğunu göstermektedir. Buna göre örgütsel etik ve takım içi güvenin takım performansı üzerinde önemli bir belirleyici olduğu ve çalışanların örgütsel etiğe ve takım içi güvene ilişkin algı düzeylerindeki artışın takım performansını da artıracağı ifade edilebilir. Sonuç olarak örgütlerin başarılı olabilmesi için çalışanlarının üstün performans göstermeleri gerekmektedir. Dolayısıyla çalışanlarından üstün performans beklentisi içinde olan örgütlerin, çalışanlarını yönlendirmedeki davranış tarzlarının ahlaki normlara bağlı, adil ve eşitlikçi olması, yani etiğe uygun olması kaçınılmazdır. Aksi takdirde etiğe uygun olmayan bir örgütsel yaklaşım tarzıyla çalışanlardan üstün performans beklenemez. Örgütler bu anlamda çalışanları için, uygun davranışa ve doğruluğa rehberlik eden kurallar, standartlar, kodlar ve ilkeler geliştirmelidir. Bu kurallar, standartlar, kodlar ve ilkelerin çalışanlarca içselleştirilmesini sağlayacak örgütsel yapının oluşturulması yöneticiler için bir zorunluluk haline gelmiştir. Bu noktada örgütlere ve yöneticilerine etik kurallara uygun bir iş yapma anlayışını benimsemeleri ve bunu da çalışanları başta olmak üzere tüm paydaşlarına hissettirmeleri tavsiye edilmektedir. Gelecek çalışmalar için araştırmacılara örgütsel etik kapsamında incelenebilecek etik karar verme, etik iklim, etik liderlik gibi değişkenler ile örgütsel davranış yazınında çalışan tutum ve davranışlarını konu edinen diğer değişkenlerle birlikte ele almaları önerilmektedir.

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PARTICULATE MATTER EMISSIONS FROM LAYING HENS HOUSES IN SUMMER SEASON

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Poultry production is an important source for air pollutants emission from animal agriculture. The numbers of poultry (layer and broiler) in Turkey increase from 312 million hens to 329 million hens between 2016 and 2015. Therefore air quality monitoring in poultry houses should be done to determine pollutant level of atmosphere. In this study, three laying hens operations in Bursa region of Turkey were monitored for PM emission in summer season measurement period. Three broiler houses with natural ventilation systems reared laying hens in cages until 70 weeks and capacity of Layer1, 2 and 3 is 12000, 12000 and 11000 layers. The PM concentrations and indoor climatic conditions, such as temperature, humidity and air velocity were measured continuously for four days in the beginning, middle and end of each month in summer season in selected laying hens houses using Testo 435-2 multiparameter. Measurements were conducted simultaneously in all monitored Laying hens houses and PM concentrations were sampled at the ventilation exhausts in each house. Thermo PDR 1500 was used for PM concentration measurement. The PM concentrations inside houses were compared with health limit thresholds established in the USA and Europe. Also, the seasonal emission rates of PM were calculated and reported along with herd characteristics, house conditions, and weather. At the end of the study, indoor temperature, relative humidity, air velocity and ventilation rate were ranged between 22 and 35 °C, 36 and 71 %, 0.01 and 1.07 m/s, 0.04 and 17.6 m^3/ h. hen, respectively. PM emissions rates were calculated 4.18 mg/h for Layer1, 2.32 mg/h for Layer2 and 21.2 mg/h for Layer3. The results of this study provide useful knowledge about PM emissions for laying hens producer.

Keywords: Laying hens, Particulate Matter, Emissions, Air Quality, Poultry

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PHYSICS' TEACHERS CONCEPTION ABOUT THE DEVELOPMENT OF THE MATTER CONCEPT DURING HISTORY

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Abstract: In this article, we use a qualitative research method to reconstruct and analyze the representations of college physics teachers from Quebec in Canada on the concept of matter. We do this based on clinical interviews. This study shows that college teachers construct false representations since they often rely on naive epistemology.

INTRODUCTION

Many studies have focused on students' conceptual representation (from high school to university) on core concepts of physics (Hewson, 1982; Bagheri-Crosson and Venturini, 2006; Métioui and Levasseur, 2011). This research demonstrates that despite multi-year education many students have conceptual difficulties in solving non-canonical problems and moreover rely on false theories similar to the ones developed during history such as the theory of impetus in the case of the study of movement (Viennot, 2014). The present research follows this perspective and identifies the representations that college physics teachers from Quebec in Canada harbor on the concept of matter. It should be noted that theories on this concept constitute essential elements of knowledge in science curricula (from high school to university). In the first part, we will present a historical outline defining the conceptions that scientists make on the subject, from Greek antiquity until today, which will enable us to construct our protocol of interviews that we will use in the second part. Finally, we will describe the population studied and the general conclusions of our study.

HISTORICAL OVERVIEW OF THE CONCEPT OF MATTER

The history of science shows us that knowledge of the concept of matter was not scientific from the beginning. People were confronted with the idea of the matter by asking the question: where do the things that we see around us come from? For example, the Greeks have devised explanatory schemes based on the existence of particles of atoms that are eternal, stable and cannot break. For the philosophers, Leucippus and Democritus, we can translate all that exists from emptiness and moving atoms. Taking the ideas of his predecessors, Epicurus postulated that things are composed of fundamental "atoms" that unite or separate themselves, obeying natural laws (Thuillier, 1981).

The idea of elementary corpuscles rests on different theories. For example, Descartes (1596-1650) did not think that the elementary corpuscles were eternal. On the other hand, Newton (1643-1727) supposes them to be stable while admitting the action at a distance between masses, which has never been accepted by the Cartesians who considered actions between bodies were the result of collisions between them. But against this mechanistic trend, some scientists oppose an energy vision.

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For the physicist Boscovich (1711-1787), atoms were not small balls, but rather mathematical points as centers of forces, a theoretical approach to the notion of the atom. For him, the prime elements of matter were entirely indivisible, and they were scattered in an immense void.

According to Thuillier (1981), the ideas of Boscovich were taken up again in the nineteenth century and this would have oriented the scientists towards the notion of energy instead of the notion of matter in the classical sense.

We already know from the discoveries of physicists Thomson, Rutherford, Bohr and others that an atom contains electrons located around a nucleus, itself composed of protons and neutrons. Similarly, it is known that the electron is bound to the nucleus by electromagnetic forces. On the other hand, in the nucleus, protons and neutrons are linked by a strong interaction force.

This historical reminder was intended to indicate the main stages in the development of the concept of matter. The richness of the models, as well as their conceptual and technical complexity, have not been entirely elucidated, but we can already think to a research whose results will allow the analysis of the discourse of physics teachers.

THE CONSTRUCTION OF THE INTERVIEW PROTOCOL

To uncover the representations of the teachers, we opted for a form of interview where we could interrogate the subjects directly. We present here the two questions selected for the interviews, as well as the reasons for these choices: (1) What matter is for you? And (2) Is there an ultimate constituent of matter?

According to the considerations of the first part, we can conclude, with the development of modern physics, that the concept of matter deviates more and more from the discourse maintained by scientists of the precedent era. This deviation has reached the point where scientists no longer speak of matter in the classical sense, but rather consider in term of the concept of energy since the advent of relativistic mechanics and quantum mechanics.

Our aim is to verify whether teachers are aware of the vague and ambiguous nature of this notion, contrary to the concept of energy that predicts accurate information about a given system (Wolter et al., 2002).

In quantum mechanics, the concept of energy gives information about the possibility of having an interaction between the states of a given system thanks to the equation “H. ψ = E. ψ”. Similarly, within the framework of classical mechanics, this concept makes it possible to know the possibility of having “work” done on a given system using the equation T + V = E (energy) where T is the kinetic energy of the system and V is its potential.

However, these concepts are not in logical continuity, in the sense of the historians of science Kuhn (1972) and Bachelard (1981), because, in classically mechanics, energy is defined along a trajectory, unlike Quantum mechanics where it describes a problem with eigenvalues.

As for the second question about the existence of an ultimate constituent of matter, we wanted to know if teachers were aware that scientists are no longer looking for an ultimate component that would be the basis of our material universe. On this subject, note that with the development of particle physics we know that matter is composed of two types of particles: leptons and quarks. Four types of fundamental interactions cause these elementary particles to interact.

The gravitational and electromagnetic forces at the macroscopic scale are well known; on the other hand, weak interactions and strong interactions are only observed at the nuclear level. This set of particles and interactions could, in principle, account for the entire hierarchy of the structures of matter, from atomic nuclei to stars and galaxies.

Note that nowadays, researchers are trying to find a single class of particles instead of the two ones above. Moreover, they also think that a single force could account for all the interactions between the elementary particles.

METHOD AND POPULATION

To identify the representations made by the teachers about matter, we conducted ten semi-directive interviews, each lasting about twenty minutes, on the above questions. The teachers' comments have been reproduced verbatim.

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Each teacher has been identified with the symbol C_i (the ith teacher). Below is an analysis of the interviews conducted with ten teachers who participated in this research on a voluntary basis, nine of whom held a bachelor's degree (physics, chemistry, mechanical engineering and electrical engineering) and one held a master's degree in Physics (M.Sc.).

INTERPRETATION OF THE DATA OBTAINED IN THE TEACHERS' SPEECHES IN RELATION TO THE FIRST QUESTION

Concerning question 1, most teachers consider matter as a juxtaposition of atoms. It would be a concrete concept that can be apprehended by appealing to the senses. For example, subjects C_7 and C_8 have used "sensory" representations to define the matter. Here are the terms in which C_8 clarified his point of view about this concept:

"That is what makes the solid object on which one sits [...]. For me, matter is what one perceives daily, and that is what makes one exist [...] matter, that's it. It's solid; I touch it. For me, it's real." (C_7)

"That's all that surrounds us. Whether it is solid or gas or liquid, that is what I would call matter. That is what one can touch, that one can feel." (C_8)

Thus, this teacher has a naive conception of matter and grants a great confidence to his senses. In our view, this is a realistic approach that differs from the modern approach.

Subjects C_6 and C_{10} have specified in their answers that matter is made up of atoms. Thus, for these persons, the matter would be an assemblage of atoms. Here is how they clarified this idea:

"We can define matter from the atom, as we can define it from our environment. So, we can start from matter, so it's what surrounds us, to try to define what is the constituent of matter or even to go, to do the reverse. To say the matter is a collection of atoms which constitutes what surrounds us." (C_6)

"Matter and a set consisting of this raw material, in fact, which is the atom." (C_{10})

These two teachers have a naive representation, as they spontaneously trust the evidence of the first experience. It is the same for the teacher (C_3) who considers the matter as:

"All these particles (proton, ion, ...) there that form a rigid whole, a set if one wants [...]. A particle is a part of the matter." (C_3)

The explanations given by these teachers (C_3, C_6, and C_{10}) lead us to think that for them, the matter seems to be reduced to a set of combinations of atoms and that it is composed of fundamental particles, small elementary bodies. Moreover, none has insisted on the vagueness of the notion of matter.

However, two of the ten teachers interviewed (C_2 and C_9) attempted to define matter by referring to the energy concept but failed to provide a coherent explanation and asserted in their answers their difficulty in identifying the epistemological premises that underlie the concept of energy since they specify:

"It is energy ... it is what underlies all the transformations, all the revolutions, all the chemical physics reactions, all to, and then it is, of course, at the origin of life too ... but what it is, I do not know ... I think I prefer to say that I am not sure exactly." (C_2)
"It can be an assembly of these particles of atoms. If I consider it as a wave, I will say that it is energy, while being aware that energy is a notion that we understand very badly." (C_9)

For subjects C_2 and C_9, energy is a notion that is not well understood. In our view, on the contrary, it is a concept whose postulates are clearly established, as much in quantum mechanics as in classical mechanics. Indeed, in classical mechanics, one defines the energy of a physical system in motion as the scalar product of the resulting force exerted on the latter and its displacement. In quantum mechanics, energy is the solution of the equation with eigenvalues: $H.\psi = E.\psi$.

The answer given by the subject C_1 does not differ from those provided by the teachers C_3, C_6, and C_{10}. The latter, however, called for a quantitative assessment of the matter. For him, matter is a "quantity of the substance; this substance can be composed of several core elements." Moreover, the explanations given by the subject C_3 resembles those of the subject C_1, since according to him:

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"Matter is a set of fundamental constituents arranged in different ways which cause the paper I have in front of me to be paper [...]. The matter is ultimately an assortment of primary constituents called protons, neutrons, and electrons, which are arranged in different ways in order and quantity, so that carbon, nickel is obtained." (C_5)

For this teacher, the matter seems reduced to a set of small elements since for him, the particles "are fundamental constituents which, from these elements, we reconstitute all the matter that we have around us." In our opinion, C_5 emphasizes the concept of a particle and does not seem to have grasped its high level of abstraction.

Finally, the subject C_4 explicates in his speech that everything that exists, in reality, is explained from the emptiness and the atoms. Indeed, in his words:

"Matter is all that surrounds us [...]. Matter for me essentially is made up of void. But within this void, there are grains [...]. The material consists of this grain, called the atom." (C_4)

The above definition approaches the materialist thesis of the Greek thinkers Leucippus and Democritus that the origin of all things can be explained by primordial material elements (emptiness and atoms).

INTERPRETATION OF THE DATA CONTAINED IN TEACHERS' SPEECHES IN RELATION TO THE SECOND QUESTION

Regarding the question of the existence of an ultimate constituent of matter, none of the ten teachers interviewed stated in his speech that researchers are no longer looking for a final constituent of matter, as has been the case for several generations and that the actual research done in particle physics aims to understand the different types of interactions that govern the particles.

Subjects C_1, C_2, and C_{10} were not able to answer because they do not have a clear opinion on this issue. Moreover, teachers, C_4 and C_8 seem to assert in their speeches that the atom is the ultimate constituent of matter. For example, C_4 specifies that the atom is the fundamental element of matter:

"There is not one (the constituent of matter), there exists that whole which is at the basis of everything. We cannot say that the electron is the ultimate basis of matter, I cannot say that the proton is either. It is because I believe that in the matter, they are always encountered in the presence ... ultimately the ultimate basis is the atom which is the essential foundation." (C_4)

In our view, the explanations given by this person about the matter and the existence of its ultimate constituent resemble those provided by the Greeks. Indeed, for him, matter is an assemblage of atoms, that is to say, of fundamental particles which are infinitely small.

The subject C_8 has specified in his speech that he prefers to speak not of the ultimate constituent, but of ultimate unity. Below is how C_8 explain his idea:

"The atom is a whole with what's in it like electrons, protons, all that. We cannot say that the electron is ultimate or that the proton is ultimate, the whole makes the atom. So far, ultimately, I would say the principal unit, it is the atom." (C_8)

According to these remarks, C_8 seems to reason again at the level of the principal unit of matter which exists in the material world, a reasoning that no longer accords with the developments of modern science.

The answers given by C_5 and C_7 do not deviate implicitly from the answers given by C_4 and C8, namely a substantiate conception of matter. For example, C5 states that "possibly a fundamental constituent of matter will be found."

For him, particles are essential constituents of matter that "they are primary parts which, from these elements, we reconstitute all the matter that we have around us."

Moreover, C_7 does not seem to be aware of the preoccupations of particle physics, because "if in the universe one meets the atom of hydrogen, one also meets the free electrons and the protons and the nuclei. The universe is done the same way, I teach astronomy, astrophysics and then I do not see any problems more that." In this representation, C_7 seems to concretize the concepts of the electron, proton, etc.

The teachers C_6 and C_9 referred to the notion of quark to interpret their answers:

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"The current studies on the quark suggest that everything would build from that. Namely, we will find something else, smaller? Well, it is even imaginable. Easily believable." (C6)

"If we rely on the historical evolution of knowledge, we may presume that when we have isolated the three quarks, we will decompose them into other parts." (C_9)

The above comments lead us to believe that teachers C_6 and C_9 attach great importance to the problem of decomposition and show confidence in the existence of matter at the subatomic level.

CONCLUSION

From the preceding considerations, one can conclude that physics teachers have retained relatively naive representations about matter. Indeed, we have clarified that the explanations they provided follow the perspective of a philosophy of visual and sensorial inspiration. For most of them, matter consists of an assembly of particles. A result from a process of decomposition of matter. With such representations, one can understand why none of the respondents consider that the concept of matter becomes more and more abstract in the discourse of physicists, to the point where physicists prefer the idea of energy.

The results of this research on teachers' representations show that there is a need to rethink teacher training, if not to integrate into their training elements of history and epistemology of sciences (Niaz, 2002; Métioui et al., 2016). However, it is important to emphasize that it is at this condition that they will have the opportunity to reflect on their knowledge, to ask questions that lead to an awareness of the postulates that guide the construction of knowledge and generate conceptual change possibilities (Posner et al., 1982; Zhou, 2010).

For example, how can we induce an epistemological change in the teacher that will allow him to reflect on the epistemological breaks in the development of the concept of matter? Given the complexity of this question, we will just enumerate some answers to show that our research could allow the development of a strategy to facilitate teachers' assimilation of the concept of matter.

The first step is to make teachers think about the importance of the social dimension of science. A reflection begun in this direction will allow them to consider science as a human activity where the search for reality and truth occupies only a small place (Abd-El-Khalick and Lederman, 2000; Adúriz-Bravo, 2007).

The second step is to analyze the successive models developed during the development of theories on the composition of matter. In this stage, teachers will be asked to clarify the epistemological premises that underlie the different doctrines developed on the subject, while confronting them with their conceptions. According to this path, theories on the matter no longer appear to the teachers as the result of a serie of continuous improvements whose aim is the search for the ultimate constituent of matter.

Finally, it should be emphasized that such a teaching strategy will make it possible to see the conceptual difficulties encountered, for example, by scientists Thomson, Bohr and Rutherford, to name just a few, to develop their atomic models (Niaz et al., 2002; Métioui and Trudel, 2015).

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REAL TIME SOLID WASTE MONITORING USING CLOUD AND SENSORS TECHNOLOGIES

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Abstract: The rise of urbanization and increase of human population correspond to the amount of solid waste produced. Inappropriate solid waste management poses risk to the environment as well as to the healthy living of people. Outmoded way of solid waste management is a cumbersome and complex process, which utilizes more valued human effort, time and cost and is not well matched with advancement in technologies. In this work, a smart bin solution is shown with a three-layered architecture for IoT real time solid waste monitoring. The lower layer is installed with sensors for measuring waste levels in smart bins; the middle layer is comprised with both Wi-Fi and GSM technologies for data transmission to a central system. A cloud service for receiving and storing data from the sensors is on the upper layer. In order to collect waste, the corresponding cleaning service is notified whenever a smart bin level threshold is reached. Ultrasonic ranger sensor and laser distance sensors were implemented and tested. A web based system to store user's information necessary for monitoring was also developed. The technologies used in the proposed system can solve the problem associated with solid waste monitoring and management and thus provides green environment.

Keywords: Solid waste, Ultrasonic ranger sensor, Laser distance sensor, Cloud service, Smart bin, Real time solid waste monitoring.

Introduction

Solid waste refers to all non-liquid wastes which are produced from different sources such as households, commercials, institutions, parking and industries. Solid waste management is the most important service provided by every city government and serves as a prerequisite for the wellbeing of its residents. Inappropriate solid waste management poses risk to the environment as well as to the healthy living of the people. Rise of urbanization, increase of human population corresponds the social economic activities which are proportional to the amount of solid waste produced. Currently, world cities generate about 1.3 billion tonnes of solid waste per year. This volume is expected to increase to 2.2 billion tonnes by 2025. Waste generation rates will be more than double over the next twenty years in lower income countries (Hoornweg & Bhada, 2012). Solid waste management is advanced in developed countries and less so in growing economies. For instance, over the last two decades, European countries have increasingly shifted their focus with regard to municipal waste from disposal methods to prevention and recycling (States *et al*., 2016).
On the contrary (Mwesigye *et al*., 2009), waste management in growing economies is not coping with the growth of urban areas thus leading to poor waste management. Most of Municipal waste management efforts by local authorities are severely affected by low capacity to collect and transport waste. The authorities need more tools (e.g. a moving vehicle) and personnel, and better mechanisms to sustain municipal waste management operations (Zurbrugg & Eawag, 2003; Mwesigye *et al*., 2009). Although a direct solution would be to increase expensive and improve the infrastructure, efficiency of the existing capacity can be improved to mitigate the impact of poor municipal waste management to the environment through the application of Information and Communication Technology (ICT).

In recent past, several research activities were actively involved with Internet of Things (IoT), for instance in smart home applications an implementation of IoT for environmental condition monitoring in homes was done by Kelly *et al*.,(2013). also in resolving transportation issues a novel modular and multilayered vehicular data cloud platform based on cloud computing and IoT technologies was developed (He, Yan, & Xu, 2014), where by a novel software architecture for the vehicular data clouds in the IoT environment which has the capabilities to integrate numerous devices available within vehicles and devices in the road infrastructure was proposed. Likewise in health systems a health industrial internet of Things (IIoT) enabled monitoring framework (Hossain & Muhammad, 2015) developed, where electrocardiogram (ECG) and other healthcare data are collected by mobile devices and sensors and securely sent to the cloud for seamless access by healthcare professionals, to mention but a few.

Unquestionably there also several efforts invested in solid waste management with IoT, in general, smart waste monitoring system consists of sensors and transmission medium, collecting different types of data regarding the waste detection level found inside a smart bin.

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An automatic smart waste management system (Bashir & Banday, 2013) designed and implemented, the overall system of waste detection divided into four subsystems; viz smart trash system, smart vehicle system, local base station and smart monitoring and controlling hut, two load sensor and IR proximity sensor entangled, RF transmitter used to send the detection of waste to local base station where the RF receiver is placed, the local base station decodes the trash bin location and accordingly sends a signal to the smart monitoring and controlling hut which sends signal to Smart vehicular system about the location of the trash bin.

Smart Garbage Management System (Bhor & Morajkar, 2015), according to author four IR sensors embedded on a dustbin for waste level detection, GSM 900 modem used to send waste level data collected by Microcontroller, to the control station whereas monitoring of the distributed dustbin is been done, the same GSM module is connected to the computer and used to send the message to the contractor for cleaning the dustbin in additional a graphical user interface using MATLAB software was developed.

According to Hassan (2016) a smart city service for real time waste monitoring and collection was designed and developed, The system consists smart bins, each bin installed with Arduino Uno, ultrasonic sensor and Radio Frequency (RF) transmitter on the top of the container. When the container is full of waste, it sends signal to the control center which will have the level of waste in the containers and through GSM/GPRS, a message (SMS) will send to the mobile phone of the truck driver of which waste bin is full and need to be empty.

Furthermore, a Wireless sensor network prototype for solid waste bin monitoring with energy efficient sensing algorithm (Mamun *et al.,* 2013b), researchers proposed a three tier architecture system whereas sensor resides on the lower tier formed with wireless sensor networks, with ZigBee-PRO and GSM/GPRS embraced in middle tier. The gateways which is the middle tier are acting as a bridge between the sensor nodes in the lower tier and the servers in the upper tier. It receives ZigBee data from the sensor nodes and transmit the data to the servers through GSM/GPRS, the system provides real time bin information with a developed web application to monitor the output.

Nonetheless, Intelligent system for valorizing solid urban waste, the developed iEcoSys system (Intelligent Ecologic System) encouraging waste recycling and separation (Reis *et al.,* 2014), according to the author RFID technology, ZigBee technology and XBee modules together with Arduino Microcontroller were involved. The flow of information in the iEcoSys system begins with the citizen who acquires iBags, which allows him to be identified at the act of depositing waste. the system insists on GAYT (Get As You Throw) citizens are credited with the amount receivable for the recycled waste.

To date, only few studies detailed on solutions which have a consideration on communication technologies constraints found within an area. In this study both Wi-Fi and GSM technologies prototypes implemented and can used as indoor/outdoor based solution, become more convenient to users depending on type of communication technology accessible while using contemporary technology and thus giving users a wide range of choices to use. The table below provides the literature summary of different technologies, methods and some important features for real time monitoring such as map and alerts in solving the problem of solid waste management.

Table 1: A summary of systems that used different communication technologies and methods to monitor and manage solid waste over the last years.

S/n	Authors	Communication Technologies	Location Map	Real Time Monitoring	Notification (Alert)
1.	Hassan (2016)	GSM/GPRS, RF(Tx/Rx)	**NO**	**YES**	**YES**
2.	Mamun *et al.,* (2016)	GSM/GPRS, ZigBee	**NO**	**YES**	**YES**
3.	Bhor & Morajkar (2015)	GSM/GPRS	**NO**	**YES**	**YES**
4.	Reis *et al.,* (2014)	ZigBee, FID	**NO**	**YES**	**YES**
5.	Bashir & Banday (2013)	RFID	**NO**	**YES**	**YES**
6.	Mamun, et al., (2013a)	RFID, ZigBee	**NO**	**NO**	**NO**
7	Catania & Ventura (2014)	ZigBee, Wi-Fi, GSM/GPRS	**NO**	**YES**	**NO**
8	Chowdhury & Chowdhury (2007)	RFID, Wi-Fi	**NO**	**YES**	**NO**

The realm of this paper is to design and develop an IoT based and real time solid waste monitoring prototypes. The developed system intends to reduce valued human resources effort, time and cost as well as to protect the environment and health living of the people. Modern technologies such as cloud system, Wi-Fi, GSM as well as ultrasonic ranger sensor and laser distance sensor are implemented. Offering a substantial way to optimize solid waste management increasing collection throughput and improve its sustainability.

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The rest of the paper is organized as follows; materials and tools used in the study with the architectural designs of the system. Followed by practical implementation together with results and discussion of the developed system prototypes. Lastly, is the conclusion of the presented study.

Methods and tools

Proposed real time solid waste monitoring system architectures.

IoT real time solid waste monitoring can revolutionize today's solid waste management activities by enhancing smart waste management and building quality service for citizens. Figure 1 is the general architecture, it gives the overview of the designed solution for real time waste monitoring based on IoT. The general architecture portrays the interaction and communication among the distributed smart bins at different citizen's buildings (home, church, mosque, hospital, school e.t.c) after been registered into a web database of cleaning service central system where waste monitoring is done, also including a seamless transmission of waste data and storage to the cloud platform via internet service. Central system administrator browses and retrieves the processed information for waste monitoring and collection through the developed web platform.

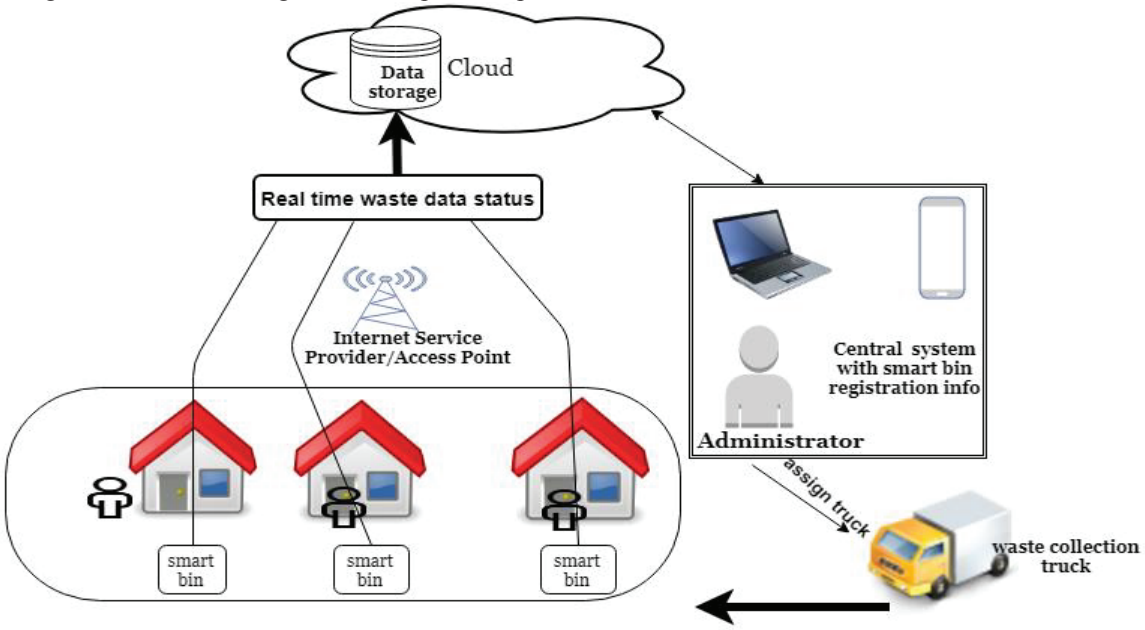

Figure 1. General architecture solution for real time waste monitoring and collection.

Figure 2, shows a smart bin prototypes solution's block diagram with a three-layered architecture for IoT real time solid waste monitoring, which are Lower layer, Middle layer and Upper layer.

The lower layer, is installed with Ultrasonic ranger srf05 sensors for measuring waste levels in smart bins, and 500mAh 3.7 V Lipoly batteries power supply source connected to microcontroller.

The middle layer, consists of the gateway which act as the bridge between the lower and upper layer, both Wi-Fi and GSM technologies integrated with the microcontrollers were applied in this layer, where by Adafruit Feather M0 Wi-Fi w/ATWINC1500 with a Wi-Fi module and 32u4 FONA SIM 800L with a GSM module were used for transmission of the detected solid waste data to the cleaning service central system cloud storage.

The upper layer, comprised with a cloud open source platform for the Internet of Things "Thingger.io" which is used for receiving, updating, storing and analyzing incoming data from the imbedded smart bin's sensor via the gateway after establishing connection with the server. The developed web based interface is also installed in the upper layer linked with the Thingeri.io, with role based restrictions for administrator to monitor the incoming sensor data in real time. During monitoring an administrator is been notified wherever the smart bin level threshold is achieved, administrator can visualize the location of the smart bin from the map and assign a driver to collect waste.

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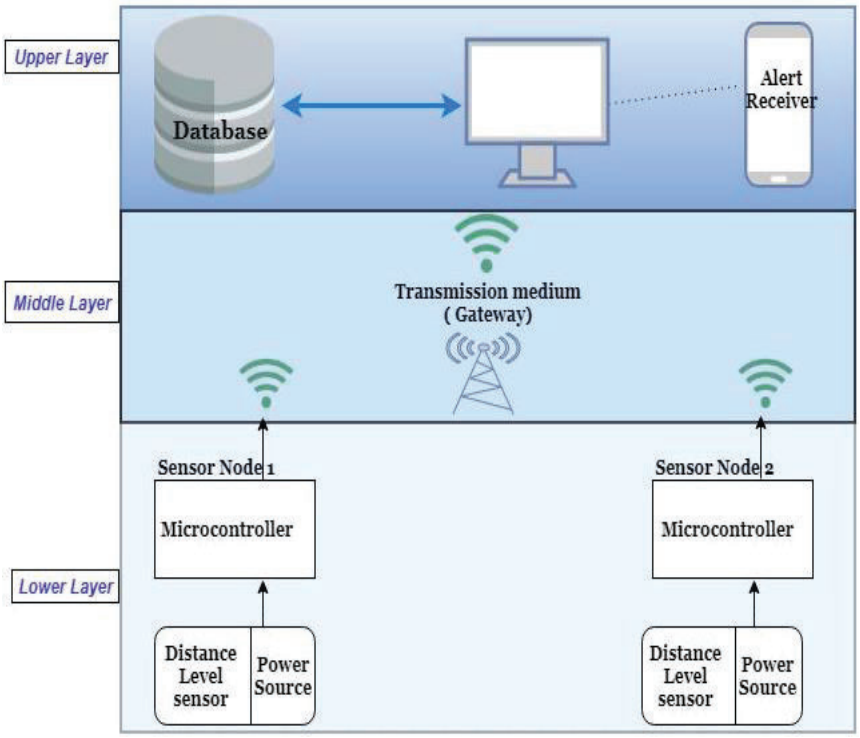

Figure 2. Block diagram of the smart waste monitoring and collection system

The flow chart diagram Figure 3 describes the architectural building blocks and logical decision involved from the detection of solid waste obstacle as soon as someone throws waste into a bin to waste collection process. The diagrams provide an impression on how the developed system prototypes will achieve real time monitoring and collection of solid waste. It also describes the working principles of the designed system block diagram and general architecture Figure 1 and Figure 2 for Internet of Things and Wireless sensor network in achieving real time solid waste monitoring.

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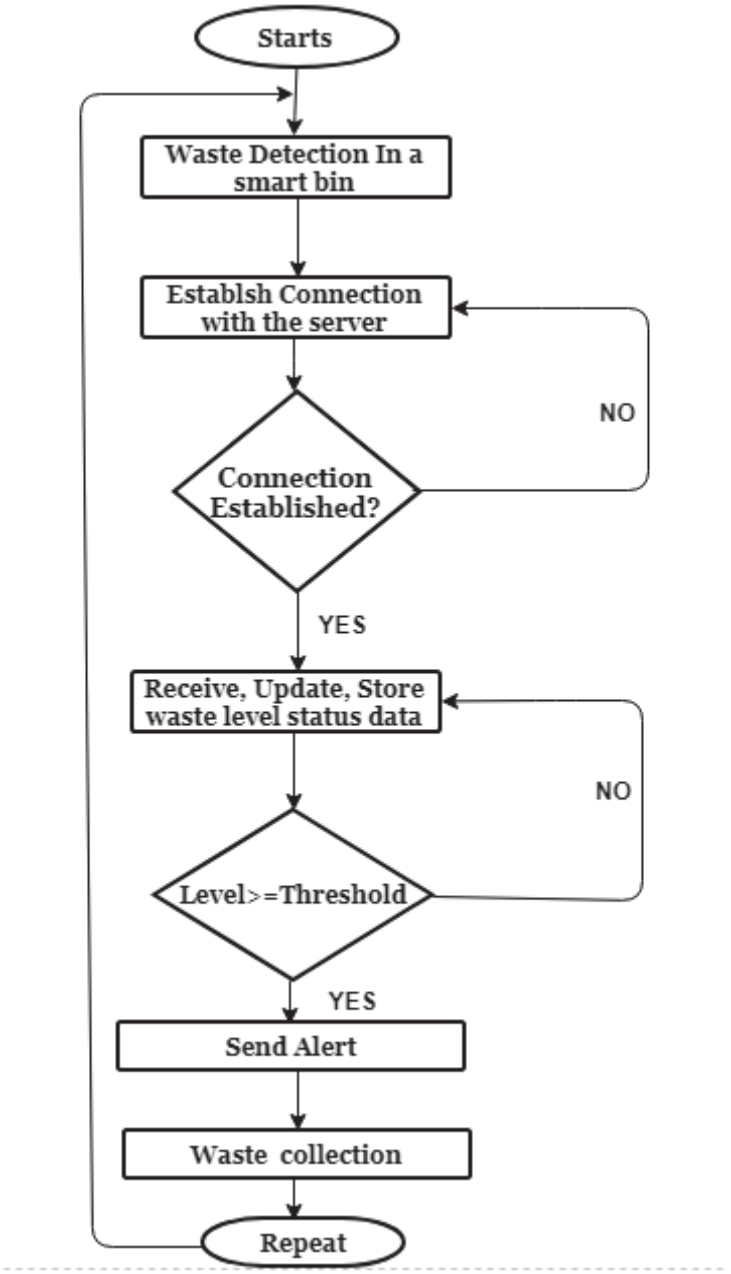

Figure 3. Flow chart diagram of the smart waste monitoring and collection system

Practical implementation of the developed prototype

The practical implementation of the developed system consists of monitoring processes from the sensors measurements and communication of the system prototype which is the heart of the whole structure of system, it shows how the designed system working and communicate with the hardware devices for the successful real-time monitoring. It consists of Microcontroller units; the Adafruit Feather M0 Wi-Fi w/ATWINC1500, 32u4 FONA SIM 800L GSM, Ultrasonic ranger srf05 sensors, 500mAh 3.7 V Lipoly batteries and LED backpack. A sketch (source codes) in C/ C++ with specific standard library written in Arduino IDE compiled and uploaded into the feather boards via Universal Serial Bus (USB) and thus became the brain of the boards, by controlling and coordinating all the hardware components defined operations systematically. The detected solid waste data and time of detection are transmitted to a cloud storage Thinger.io for monitoring purposes. Figure 4 and Figure 5 shows the hardware components of solid waste monitoring system prototype.

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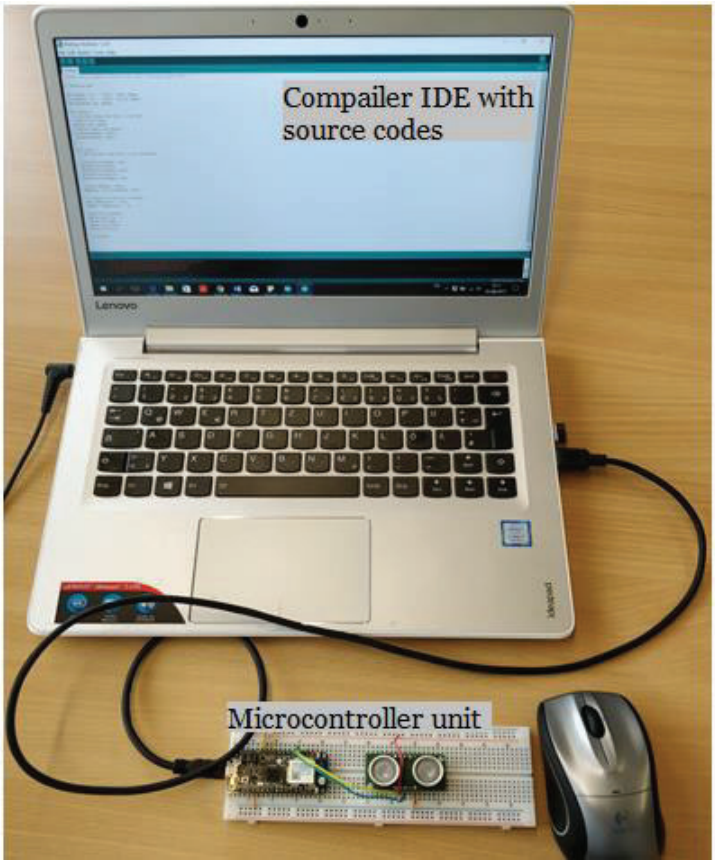

Figure 4. Communication with PC

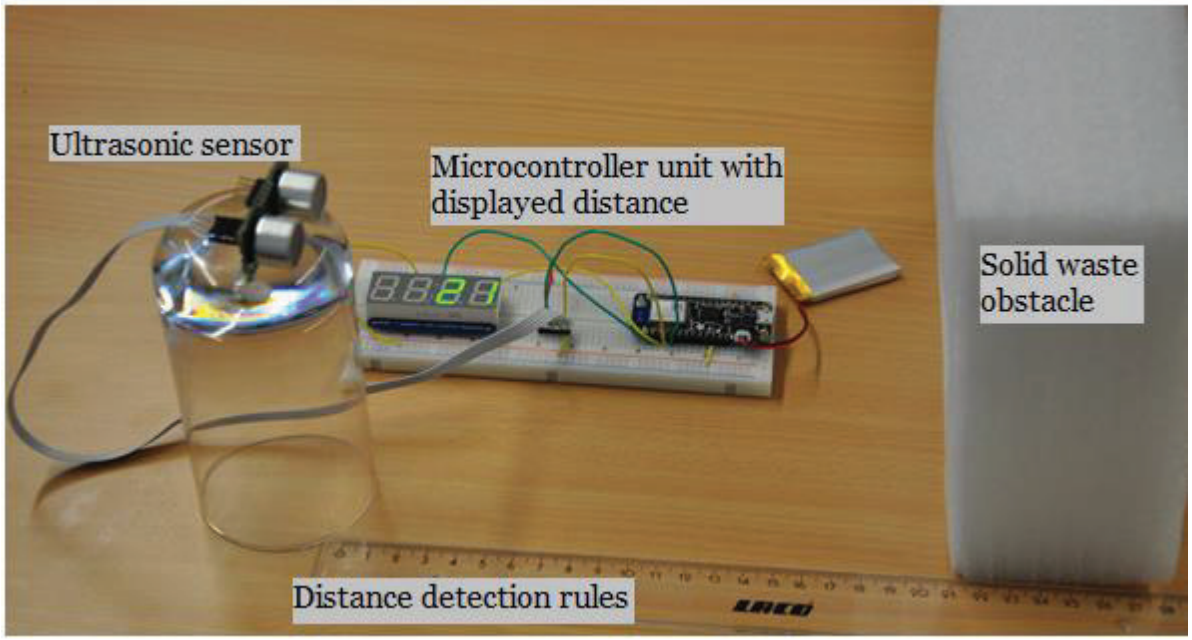

Figure 5. A working sensor prototype

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Results Discussion

In this section results obtained from the implementation of the developed prototypes are discussed. Number of test cases were run with different materials at different distance measurements from the sensor. With the successful internet connection between the sensor and cloud storage via the gateway. Real time solid waste sensor data in

centimetres unit of measure, were transmitted at the specified programming time interval and plotted for visualisation. When the smart bin threshold is reached the visualisation remained constant means no more solid waste level was detected as shown in Figure 6, until waste collection service is completely done. A location map Figure 8 was given, depicting the actual location where the smart bin is installed during the monitoring, this is important for the planning of route during waste collection.

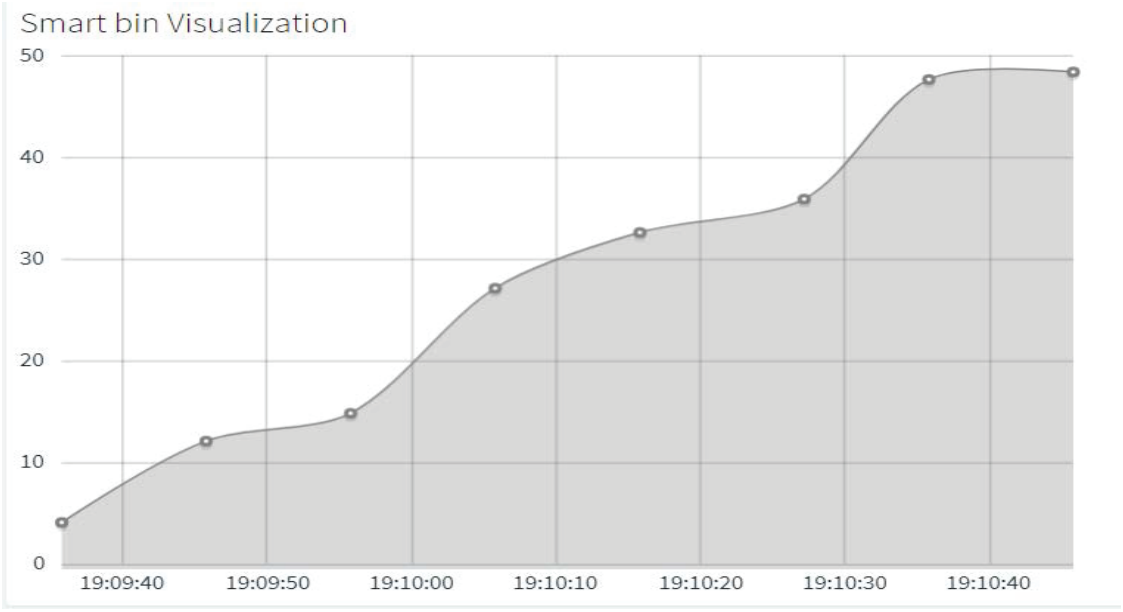

Figure 6. Real time solid waste distance level detection

An alert, both SMS and email were sent to the corresponding cleaning service administrator whenever the smart bin threshold is archived to take an action of assigning truck to go and collect waste. Figure 7 shows the SMS notification sent to the Android Mobile Phone during running of the tests. The SMS consists with the International Mobile Equipment Identity (IMEI) of the GSM module from the microntroller's board for the identification of the smart bin.

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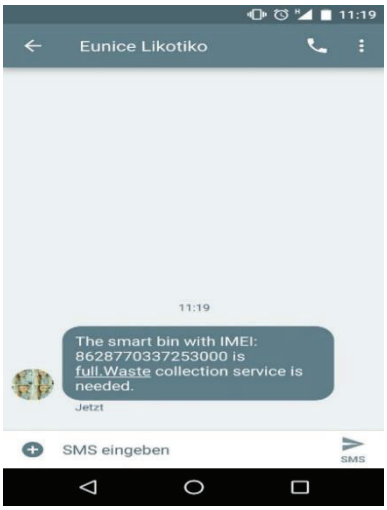

Figure 7. SMS notification

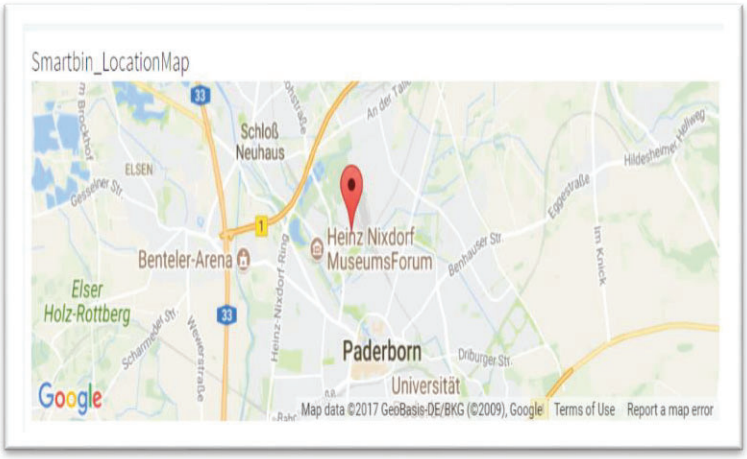

Figure 8. Sensor node location in a map

The developed web based interface Figure 9 was linked with the cloud platform Thinger.io for administrator to browse and retrieve monitoring information. The web also provided the interface for smart bin registration and storage of necessary information regarding smart bin such as *owner's category*, *Bin_id, first name, last name, location, email,* and *phone number*. The device IMEI from the GSM module and MAC ID from Wi-Fi module are unique and thus were used as *Bin_id* in the database for the administrator to identify the registered information of the smart bin during assignment of truck for waste collection.



Figure 9. Central system web based platform for smart bin

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Ultrasonic ranger srf05 and VL53L0X Time of Flight distance sensor were also tested for the detection of different materials. The study selected materials in a consideration that were common known materials in generation of solid waste, such materials were; Paper, Glass, Polyurethane, Grasses (organic), Bubble wrap, Plastic, Nylon, and Aluminium foil, see Table 2. Both sensors detected the specified material at a time, difference of the sensor performance was observed. VL53L0X ToF sensor was extra sharp and very quickly to detect the even gesture of the material with it thin light source when light bounce back to the sensor in a fraction of second. Even though the sensor was not able to detect an obstacle far beyond 120 centimetres. On the other hand, Ultrasonic ranger srf05 detected material from a far up to 400 centimetres which is two-time maximum distance detection of the VL53L0X ToF sensor with high linearity from the obstacle distance. The triggered sensor sound wave took up to 25ms to make output level detection. The presented results are being useful for the selection of the right sensor for the development of the similar application.

Table 2: Sensors testing table

	Material	Results
1.	**Paper**	**Detected**
2.	**Glass**	**Detected**
3.	**Polyurethane**	**Detected**
4.	**Grasses (organic)**	**Detected**
5.	**Bubble wrap**	**Detected**
6.	**Plastic**	**Detected**
7.	**Nylon**	**Detected**
8.	**Aluminium foil**	**Detected**

Conclusion

In this work, an innovative three-layer architecture of real time solid waste bin monitoring system based on IoT has been designed and implemented. The system uses wireless sensor network and different communication technologies to monitor the solid waste bin status in real time. A notification is sent wherever the condition is reached and a smart bin location is shown on a map. The developed solution system can be used to reduce valued human resources like human effort, time and cost and improve the sustainability of the solid waste operations and obtaining green environment. Moreover, the study suggested some areas for extension such as waste collection route optimization, power optimization and actual implementation of the proposed architecture and prototypes.

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RHEOLOGICAL CHARACTERIZATION OF AQUEOUS SOLUTIONS OF HEC

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The rheological properties of aqueous hydroxyethyl cellulose (HEC) solutions at different concentrations were studied in a rotational mode with an imposed stress rheometer; the effect of the temperature has been invested. The investigation focused on a range wide enough concentration from 0.2% w/w to 1% w/w, and for temperatures ranging from 10 °C up to 80 °C. We analyzed both the shear rate, temperature and concentration dependencies of flow behavior reported from experimentally obtained data.

The results obtained suggest that the apparent viscosity is strongly influenced by the concentration of aqueous solutions of the HEC which shows a marked non-Newtonian shear-thinning behavior for the different temperatures considered. The HECsolutions exhibit a rheofluidifying behavior, the consistency index (k) and the apparent viscosity increase with increasing polymer concentration. Several rheological models, such the model of the power law, Williamson, Cross and Carreau were used to fit the rheograms based on the correlation coefficient (R^2) and the BIV. These models are all applicable and have an equivalent ability to describe the shear flow behavior of concentrated solution. Rheological parameters such as consistency index, flow index, derived from these models were then subjected to further analyses.The influence of temperature is consistent with the Arrhenius model

Keywords: hydroxyethyl cellulose, rheology, power law, temperature.

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ROBUST FEATURE SELECTION AND CLASSIFICATION USING HEURISTIC ALGORITHMS BASED ON CORRELATION FEATURE GROUPS

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Abstract: The complexity of multidimensionality is one of the frequently encountered problems in the high-dimensional data space. The fact that multidimensionality in the data space increases and reaches great numbers brings about the problem that the number of non-informative ones among the features associated with the target class increases along with the data set complexity. The fact that all features included in the high-dimensional data space are not distinctive or do not contain critical information generally leads to difficulties at the learning stage. At this point, the importance of feature selection emerges. Feature selection is a problem of minimum subset selection from the original feature set for the best accuracy estimation. The neglected subject in the feature selection is ensuring that the inconsistency problem of the selected feature sets is brought to a solution. Studies carried out in recent years have focused on obtaining feature groups with which the group to which each feature belongs is associated with a class label rather than standard feature selection methods in which a single feature set is obtained. Within the scope of this study, each feature group obtained by group-based learning was presented as a solution candidate to heuristic methods. This paper proposes a novel feature selection method to Artificial Immune Recognition System (AIRS) variations in order to find robust gene sets from high dimensional microarray data. The unique feature of this feature selection method is that utilizes correlation based feature groups in order to increase the reliable classifying accuracy from optimal feature groups. We test the performance of the proposed local feature selection method for AIRS variations on high dimensional microarray data sets. We compare proposed LFSAIRS variations which are LFSAIRS1, LFSAIRS2, Parallel LFSAIRS1, and Parallel LFSAIRS2 with the Standard Genetic Algorithm (SGA), Sequential Forward Selection (SFS) and Sequential Backward Elimination (BES) approaches. Results of the robustness were evaluated by the Jaccard test and classification accuracy was evaluated using k-NN, SVM, Naïve Bayes and Random Forest classifiers. Results show that the proposed methods capable of finding robust gene subsets with high classification accuracy.
Keywords: Machine Learning, Local Feature Selection, Heuristic Approaches, Classification

Introduction

Gene expression microarray data sets due to the have characteristics such as high-dimensionality and small sample dimension their classification becomes hard. The fact that multidimensionality in the data space increases and reaches great numbers brings about the problem that the number of non-informative ones among the features associated with the target class increases along with the data set complexity. Many feature selection algorithms were developed for the purpose of reducing the dimensionality of this kind of data and improving the accuracy of classifiers. Feature selection is a problem of minimum subset selection from the original feature set for the best accuracy estimation.

Feature selection algorithms encountered inconsistency problem in many cases. One reason for the encountered inconsistency situation is the selection of the minimum feature set composed of features that give the best classifier accuracy, which is the classical purpose of feature selection algorithms. Furthermore, features having a high correlation with each other in the feature set defined by the feature selection algorithm can select different features in cases where the parameters of the feature selection algorithm are set differently. For the same feature selection algorithm, minor variations within the train data can also result in the selection of different feature subsets every time. Another reason for inconsistency encountered in feature selection algorithms is the small number of samples in the high-dimensional data space. The main observation here is that the groups formed by the associated features are generally present in high-dimensional data and these groups are resistant to the

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variations of training samples. Furthermore, sub-sampling of training data and the determination of stable feature groups also make convergence possible to the structure of the original feature groups. Another observation is that each feature group is improved by being optimized with heuristic algorithms and learning is performed at the group level. Within the scope of this study, the feature groups formed by the correlation-based strategy within the feature selection framework were taken as a basis. An attempt to develop the correlation feature groups defined using high-dimensional data with the meta-dynamics of the local feature selection method to Artificial Immune Recognition System (AIRS) variations (LFSAIRS1, LFSAIRS2, Parallel LFSAIRS1, and Parallel LFSAIRS2) and the Standard Genetic Algorithms (SGA) was made. Then robust feature selection framework compared with Sequential forward selection and backward elimination methods.

Creating correlation based feature groups from high-dimensional data is mentioned in the second part of the paper, the methods used in the study are mentioned in the third part, the novel local feature selection method to Artificial Immune Recognition System (AIRS) is mentioned in the fourth part, the data set is mentioned in the fifth part, stability performance measurements is mentioned in the sixth part and the performance measurements of the optimal feature sub-groups obtained are mentioned in the seventh part.

Creating Correlation Based Feature Groups from High-Dimensional Data

Feature groups are an effective method to reduce the complexity of multidimensionality. At the same time, factors such as the use of feature groups in learning with high-dimensional data, reducing the complexity of the model, increasing the constancy of selected features, and the decrease of the variability of the estimator is also very effective. Studies carried out in recent years have focused on obtaining feature groups with which the group to which each feature belongs is associated with a class label rather than standard feature selection methods in which a single feature set is obtained. The fact that relational features have a very high correlation in high-dimensional data sets makes it possible to use feature groups by being taken as a basis. Thus, obtaining stable feature groups resistant to the sample number variation is ensured (Loscalzo et al., 2009). The fact that feature groups are obtained from data sets with characteristics such as small sample size and high dimensionality leads to obtaining unstable results or results that are not completely optimal. Therefore, the first step is to produce a set of feature groups by targeting the convergence to the original feature groups with the frames formed to obtain feature groups. The second step is to perform the feature selection process based on the set of feature groups produced. The idea of converging to original feature groups by creating a set of feature groups is based on the principles of group-based learning method.

In this study, relational feature groups were obtained by the CFG (Correlation Based Feature Group) algorithm. The CFG is a filter-based feature selection method that sorts the feature subset by the correlation-based intuitive function. The CFG algorithm examines the usefulness of subset of attributes based on a heuristic evaluation function. In choosing a correlation-based feature, each attribute is taken into account in the correlation between the attributes, as well as the predictive predicting of the class label. The value of the heuristic evaluation function used in the evaluation of the attributes is determined by equation 1. The intuitive usability of a subset of S attributes with k attributes is represented by $meritS$, the mean attribute-class correlation is presented by rcf for ($f \epsilon S$), and the correlation between the mean attributes is presented by rff parameters.

$$meritS = \frac{k*rcf}{\sqrt{k+(k-1)*rff}} \qquad (1)$$

Each of the feature groups represents a solution candidate, and the presence of the related feature in a feature group was encoded with 1 while the absence of it was encoded with 0.

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Methods

A. Artificial Immune Recognition Systems

Artificial Immune Recognition system is a novel immune inspired supervised learning algorithm and consist of biological immune systems metaphors. Artificial Immune Recognition Systems consist of the stages of initialization, memory cell recognition, resource competition and the selection of memory cells.

At the initialization stage, the data set is normalized to the range of [0,1]. After normalization, the affinity threshold is calculated by equation (2). At the next stage, antigens are presented to the storage pool with antigen training. At the memory cell recognition stage, a stimulation value is assigned to these cells by stimulating the recognition cells in the memory pool. Affinity is calculated by equation (3), the stimulation values are calculated by equation (4) and (5). The recognition cell with the highest stimulation value is calculated by equation (6) then M_{cmatch} cell is cloned and mutated. The number of clones is calculated by equation (7),

$$affinity\ threshold = \sum_{i=1}^{n}\sum_{j=i+1}^{n}\left(\frac{affinity(\text{agi,agj})}{n(n+1)/2}\right) \quad (2)$$

$$affinity(\text{agi, agj}) = 1 - \text{Euclidean distance(agi, agj)} \quad (3)$$

$$stimulation = 1 - \text{affinity} \quad (4)$$

$$stimulation(\text{mc, ag}) = \begin{cases} \text{affinity(mc, ag)} & \text{if mc. class} = \text{ag. class} \\ 1 - \text{affinity} & \text{otherwise} \end{cases} \quad (5)$$

$$\boldsymbol{Mcmatch = argmax(stimulation(mc, ag))} \quad (6)$$

$$\boldsymbol{numClones = stimulation * clonalRate} \quad (7)$$

At the resource competition stage, when mutated clones are added to the ARB (artificial recognition spheres, antibody) pool, competition begins for the time source. According to the stimulation value, limited resource assignment to the ARB pool is made according to the stimulation value. ARBs without enough resources are removed from the system. When the stop criterion is achieved, the process ends, and the ARB with the highest stimulation value is selected as the candidate memory cell. At the selection of memory cells stage dynamically and evolving developed Memory cell pool in the algorithm is used for the classification process.

The basic steps of the AIRS1 algorithm, the first version of artificial immune recognition systems, and the AIRS2 algorithm, the second version, are same. The main difference between them is that the ARB pool is used as a permanent resource in the AIRS1 algorithm, it is used as a temporary resource in the AIRS2 algorithm. In the case of being used as a permanent resource, ARBs remaining from previous steps cause the algorithm to spend more time by being involved in the competition for limited resources. Therefore, the complexity of the AIRS2 algorithm is less. While AIRS1 uses the mutation parameter that can be defined by the user, AIRS2 uses the concept of somatic hyper mutation where the mutation ratio of a clone is proportional to the affinity (Torres et al, 2016). While the classes of clones may change after the mutation process in the AIRS1 algorithm, classes are not allowed to change in the AIRS2 algorithm.

Parallel-AIRS1 and Parallel-AIRS2 versions demonstrate the distributed nature of the immune systems and their parallel processing qualities. At first, each part of the training data set is assigned to np number of processes. Thus, it is ensured that np number of the memory pool is created by running the AIRS algorithm on each process. As a result, the memory pools obtained are merged (Vijendra & Laxman , 2013).

In this study, the affinity threshold value, clonal ratio, mutation ratio, np, total source, stimulating value, hypermutation ratio, run number and iteration number parameters of the Artificial Immune Recognition Algorithms took the values of 0.1, 10, 0.15,2, 150, 0.9, 2.0, 30 and 50, respectively. The fitness function of each solution candidate was calculated according to accuracy of the KNN classifier.

B. Standard Genetic Algorithms

Standard Genetic Algorithms (SGAs) are adaptive heuristic search algorithms based on natural selection and evolutionary ideas. It is based on Darwin's principle of "survival of the fittest" and firstly proposed by John Holland, his colleagues and their students at the University of Michigan.

In genetic algorithm the initial population is generated first. Every individual in the population represents a solution candidate. Each representing a possible solution to a given problem. The evaluation of each candidate solution is performed according to the fitness function determined for the problem. Each individual goodness is represented by its fitness. Individuals in the population should be selected to form a new population.

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Individuals in a population compete for resources and mates. To ensure the formation of a new generation following the crossover and mutation operators of the two selected individuals. Genes from "survival" individuals propagate throughout the population.
In this study, the regular crossing of the crossing methods and tournament selection of the selection methods were used. While the population size of the genetic algorithm parameter takes the value of 100, chromosome length varies according to the dynamic size of the feature group. The mutation ratio, number of tournaments, number of runs and number of iterations of the algorithm took the values of 0.8, 2, 30 and 50, respectively. The fitness function of each solution candidate was calculated according to accuracy of the KNN classifier.

C. Sequential Forward Selection and Backward Elimination

Sequential forward and backward selection techniques are simple and effective methods for selecting an attribute. While these methods create a set of attributes, they perform an extraction or addition of an attribute from the attribute subset according to the method selected at each step. The selection criterion here is the performance ratio of the classifier algorithm. According to the performance status of the specified classifier algorithm, the discriminative attributes are determined at each step. For both approaches, KNN classifier was used. In this study, run number and iteration number parameters of the Sequential forward and backward selection techniques took the values of 30 and 50, respectively.

Local Feature Selection Method to Artificial Immune Recognition System

D. LFSAIRS steps:

6. The initial set of feature group sets are created based on CFG algorithm.
7. Do for each Antigen (Ag) until training process is completed:
    - 7.1. Calculating fitness value of the each feature set is calculated by taking into account only best matching cell
    - 7.2. Until termination do :
    - 7.3. The highest fitness value of the feature set is selected as a best feature set
    - 7.4. Generation of l clones of the best feature set
    - 7.5. Mutation of the each clone
    - 7.6. Calculating fitness of the each clone by taking into account only best candidate cell
    - 7.7. Set the highest fitness value of the feature set as a candidate optimum feature subset
    - 7.8. If best candidate cell is sufficient calculate the optimum subset then go step 3. else go 2.3
8. After memory cell replacement stage, set the optimum subset of attributes as the subset of the new attribute. If training process is completed go to Step 4, else go to step 2.
9. Selection of the best optimized feature set
10. Classification of the best optimized feature sets based on test set

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E. LFSAIRS Flowchart:

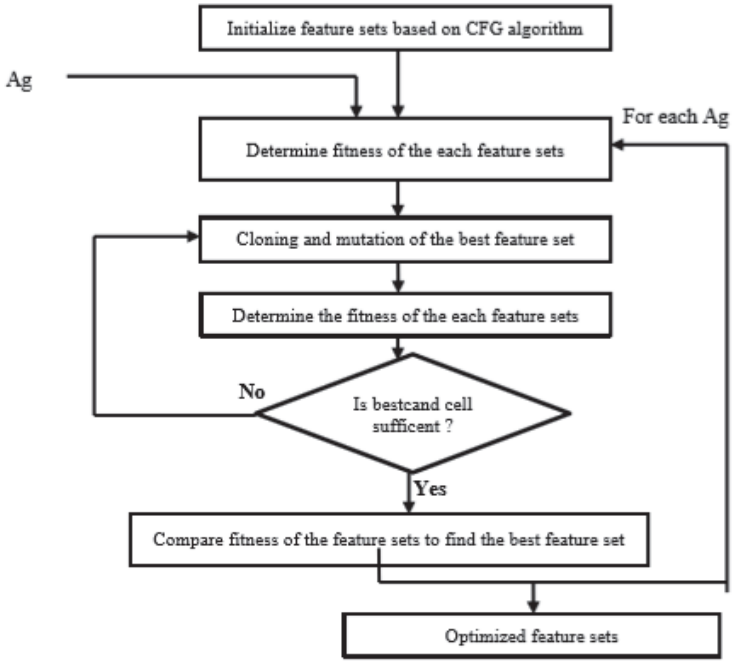

Figure 1. LFSAIRS local feature selection

Data Sets

The most common six microarray data sets were used in this study. Table 1 includes information on the genes, samples and class numbers contained in the data sets used in this study (Loscalzo et al, 2008).

Table 1: Microarray Data set

Dataset	Gene	Sample	Class
Colon	2000	62	2
Lungstd	5000	181	2
Prostate	6034	102	2
SRBCT	2308	63	4
Lymphoma	4026	62	3
Leukemia	7129	72	2

Experimentally obtained performance values were obtained by dividing the data sets as 70% training and 30% test set. A number of bootstrap data sets were obtained from the training data set in order to ensure the resistance of training samples against variations. Then, *n* number of feature groups was selected by separately running the CFG algorithm on *t* number of bootstrap data sets. We set the *t* and *n* parameters respectively to 10 and 10 for all algorithms within the scope of this paper. The number of features contained in the feature groups obtained as a result of the CFG algorithm varies dynamically specific to each data set. Learning was performed at the group level by improving the feature groups presented to the LFSAIRS1, LFSAIRS2, Parallel-LFSAIRS1, Parallel-LFSAIRS2 and Standard Genetic Algorithm like a single cell. While stability results were evaluated by the Jaccard test, their classifying accuracy was evaluated using k-NN, SVM, Naïve Bayes and Random Forest classifiers. WEKA was used to obtain classifying accuracies. For all algorithms the classifying accuracy of the most optimal solution candidate obtained at the end of each run was obtained using the test data set with 10 cross validations. The performance values added to the results were calculated by taking the average of the number of runs.

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Stability Performance Measurements

The stability of feature selection approaches is obtained by measuring the similarity between feature sets. In this study, the Jaccard index was calculated using the formula given in equation (8). Parameter *m* was used to specify the number of feature sets while expressing two feature sets used for *Si* and *Sj* similarity measurement.

$$Jaccard_{Index}=IJ(Si,Sj)=| Si \cap Sj | / | Si \cup Sj | \quad (8)$$

The stability estimation was calculated using the Jaccard test formula specified in equation (9). The fact that the obtained result was high means that the stability of the relevant feature set was also high.

$$\sum(S)=\frac{2}{m(m-1)}\sum_{i=1}^{m-1}\sum_{j=i+1}^{m} IJ(Si,Sj) \quad (9)$$

Performance Results and Discussion

Within the scope of this study, it was focused on the problem of stability encountered in feature selection algorithms. As a solution to this problem, stable feature groups were obtained by combining group-level learning with the meta-dynamics of heuristic approaches.

Table 2: Average Classification accuracy of Algorithms with CFG based on k-NN and SVM

	k-NN					*SVM*				
Data set	*LFSAIRS2 %*	*LFSPAIRS2 %*	*LFSAIRS1 %*	*LFSPAIRS1 %*	*SGA %*	*LFSAIRS2 %*	*LFSPAIRS2 %*	*LFSAIRS1 %*	*LFSPAIRS1 %*	*SGA %*
Colon	80	81.1	75.8	78.8	80	82.1	85.6	83.7	83.4	81.4
Lungstd	**91.6**	**86.8**	**87.2**	**86.9**	**89.1**	**91.6**	**93**	**94.1**	**92.3**	**93.3**
Prostate	53	58.5	59	59.7	54.2	48.2	45.4	48	47.8	50
SRBCT	**86.5**	**85.3**	**86.1**	**83**	**84**	**88.4**	**89.7**	**87.6**	**87.7**	**88.1**
Lymphoma	76.9	76.5	76.1	77.6	73	88.4	86	83.4	82.8	80
Leukemia	**84.6**	**84.6**	**82.2**	**83**	**82**	**83.3**	**86.1**	**85.3**	**86**	**82.6**

Table 3: Average Classification accuracy of Algorithms with CFG based on NB and RF

	Naïve Bayes					*Random Forest*				
Data set	*LFSAIRS2 %*	*LFSPAIRS2 %*	*LFSAIRS1%*	*LFSPAIRS1 %*	*SGA %*	*LFSAIRS2 %*	*LFSPAIRS2 %*	*LFSAIRS1%*	*LFSPAIRS1 %*	*SGA %*
Colon	74.6	75	74.7	70.3	70.7	69.2	71.1	72	68.4	68.4
Lungstd	**97.2**	**95.9**	**95.8**	**95.8**	**95**	**88.8**	**89.7**	**90.2**	**89.4**	**90**
Prostate	52.3	51.1	51.4	54.7	55.2	65.3	65	63.3	62.8	61.9
SRBCT	37.6	36.1	38.4	38.8	36.1	38.4	41.9	41.5	42.3	38.4
Lymphoma	**76.9**	**76.9**	**76.9**	**78**	**76.9**	**78.4**	**77.6**	**78.4**	**78**	**76.1**
Leukemia	**86.6**	**86.6**	**86.6**	**86.6**	**86.6**	**84.6**	**86**	**84**	**84.6**	**84.6**

Table 4: Average Classification accuracy of Sequential Forward Feature Selection (SFS), Backward Elimination Feature Selection (BES) based on SVM, NB, RF and k-NN

	SFS				*BES*			
Dataset	*k-NN*	*SVM*	*NB*	*RF*	*k-NN*	*SVM*	*NB*	*RF*
Colon	71.5	70.7	59.2	76.9	76.9	78.8	76.9	71.1
Lungstd	98	93.3	95.8	95	**98.1**	94	94.5	95
Prostate	72.3	75.2	75.7	64.7	74.5	78.2	76.1	74.5
SRBCT	86.9	60	61.5	57.6	84.6	82	**41**	46.1
Lymphoma	92.3	76.9	76.9	81.5	84.6	80.7	76.9	76.9
Leukemia	86.6	86.6	80.6	80.6	83.7	82.8	80.6	83.1

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Table 5: Stability Results of Algorithms Based CFG and SFS, BES

Dataset	*LFSAIRS2*	*LFSPAIRS2*	*LFSAIRS1*	*LFSPAIRS1*	*SGA*	*SFS*	*BES*
Colon	0.8	**0.9**	0.85	**0.9**	0.8	0.51	0.5
Lungstd	0.8	**0.9**	0.81	**0.9**	0.8	0.54	0.55
Prostate	0.71	**0.9**	0.83	**0.92**	0.8	0.6	0.51
SRBCT	0.8	**0.9**	0.8	**0.9**	0.8	0.67	0.63
Lymphoma	0.89	**0.9**	0.8	**0.91**	0.83	**0.72**	0.69
Leukemia	0.81	0.89	0.79	**0.9**	0.85	0.71	**0.7**

Table 6: Average Selected Feature size Results of Algorithms Based CFG and SFS, BES

Dataset	*μ LFSAIRS2*	*μLFSPAIRS2*	*μ LFSAIRS1*	*μ LFSPAIRS1*	*μ SGA*	*μ SFS*	*μ BES*
Colon	48.5	49.9	47.4	48.9	40.4	4.8	43.75
Lungstd	54.7	61.8	57.5	60	45	6.0	48
Prostate	52	62	62.3	61.1	41.8	8.4	44.2
SRBCT	69.3	68	68.6	66.7	44.9	9.2	47
Lymphoma	99.6	99.1	95.9	95.3	62	4.4	63
Leukemia	123.6	124.8	123.1	**125.1**	61.6	**4.0**	64.1

According to the average classification accuracy results shown in Table 2 and Table 3, it was observed that the algorithms achieved highest classifying accuracy result respectively in the Lungstd, SRBCT and Leukemia data sets for KNN and SVM classifiers and It was observed that the algorithms achieved highest classifying accuracy result respectively in the Lungstd, Leukemia, Lymphoma data sets for Naïve Bayes and Random Forest classifiers. It was observed that the highest classifier performance achieved by the LFSAIRS2 algorithm on Lungstd data set by 97.2% based on Naïve Bayes classifier and the lowest classifier performance showed by LFSPAIRS2 and SGA algorithms on SRBCT data set by 36.1 % based on Naïve Bayes classifier.

In Table 4 including the average classification accuracy results of Sequential Forward Selection and Sequential Backward Elimination approaches applied on six microarray data sets. It was observed that the algorithms achieved highest classifier performance by the Sequential Backward Elimination approach on Lungstd data set by 98.1% based on K-NN classifier and the lowest classifier performance showed by the Sequential Backward Elimination approach on SRBCT data set by 41 % based on Naïve Bayes classifier.

Table 5 shows the stability results of the algorithms. The results showed respectively LFSPAIRS1 and LFSPAIRS2 algorithms gave the highest stability results and BES and SFS algorithms gave the lowest stability results. While it was observed that the LFSPAIRS2 algorithm generally gave close results by 90% stability on data sets except Leukemia. LFSPAIRS1 algorithm generally gave close stability results by 90% on data sets. LFSPAIRS1 algorithm respectively gave highest stability results on Prostate and Lymphoma. It was observed that the SFS algorithm achieved the highest stability performance by 0.72 on Lymphoma data set and the lowest stability performance by 0.51 on Colon data set. It was observed that the BES algorithm achieved the highest stability performance by 0.7 on Leukemia data set and the lowest stability performance by 0.5 on Colon data set.

In Table 6, we present the average selected of feature size of the algorithms. The comparison results showed that the feature reduction capacity of the SFS algorithm was better compared to the other algorithms. It was observed that the feature reduction capacity of the SGA algorithm was better compared to the artificial immune recognition algorithm versions and BES approach. It was observed that the highest average feature size showed by the LFSPAIRS1 algorithm on Leukemia by 125.1 and the lowest average feature size achieved by the SFS algorithm on Leukemia by 4.0.

Conclusion

In high-dimensional data space, the feature subsets obtained by the feature selection algorithms cannot be stable despite having good classifier performances. The lack of stability means that the feature subsets that field experts will use in their studies will decrease the reliability of the experiment. In this study we proposed a robust feature selection framework with a novel local feature selection technique. Within the scope of this study, each feature group obtained by group-based learning was presented as a solution candidate to heuristic methods except sequential forward selection and backward elimination algorithms. When the performance results obtained were examined, it was concluded that feature groups obtained at the correlation base increased their robustness by being improved with the meta-dynamics of heuristic approaches like a single cell. The classifier and stability results obtained were compared with six commonly used microarray data sets.

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RÜZGÂR VERİLERİNİN ÖLÇÜMÜ VE ENERJİ POTANSİYELİNİN BELİRLENMESİ

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Özet: Rüzgar enerjisi, rüzgarı meydana getiren hava akımının sahip olduğu kinetic enerjidir. Bu kinetic enerji rüzgâr türbini yardımı ile elektrik enerjisine dönüştürülerek kullanılabilir. . Elektrik enerjisi üretimi için kullanılacak rüzgâr türbin tipinin ve konuşlandırılacağı yerin belirlenmesi önem arz etmektedir. Bu amaç ile kullanılacak bölgenin rüzgâr enerji potansiyelinin belirlenmesi gerekmektedir. Bunun için bölgede uygun olabilecek yerde rüzgâr verilerinin ölçülmesi gerekmektedir. Ölçülen bu rüzgâr verileri kullanılarak, bölgenin rüzgâr enerjisi potansiyel analizi yapılır. Bu çalışmada; rüzgâr verilerinin ölçümü ve enerji potansiyelinin belirlenmesi araştırılmıştır. Bu amaç ile Sakarya-Esentepe bölgesinde kurulu bulunan rüzgâr ölçüm istasyonundan elde edilen rüzgâr hızı ve yönü verileri kullanılarak istatistiksel analiz yapılmıştır. Rüzgâr verilerinin istatistiksel analizinde Weibull dağılımı kullanılmıştır. Analiz sunucunda; ortalama rüzgâr hızı, hâkim rüzgâr esme yönü ile ortalama güç yoğunluğu değerleri hesaplanarak bulunmuştur. Ayrıca, Weibull dağılımı kullanılarak yapılan analiz sonuçları ile gözlemlenen değerler karşılaştırılmıştır.
Anahtar Kelimeler: Rüzgar enerjisi, Rüzgar verileri, Rüzgâr güç yoğunluğu, Weibull dağılımı,

Giriş

Dünyada artan oranlarda ihtiyaç duyulan enerji talebinin; her dönemde yeterince, temiz, verimli, güvenilir, sürekli ve ekonomik koşullarda sağlanabilmesi temel hedefler arasında olmalıdır. Artan insan nüfusu, sanayi üretiminin çeşitlenerek artması ve teknolojideki hızlı gelişmeler, ülkelerin enerjiye olan taleplerini her geçen gün artırmaktadır. Bu durum, ülkeleri yeni enerji kaynakları konusunda araştırmalara yönlendirmiştir. Son yıllarda; artan enerji ihtiyacının karşılanmasında, fosil enerji kaynaklarındaki gerek rezerv azalışı ve gerekse üretim ve kullanımında ortaya çıkan çevre kirliliği, tüm dünyada temiz ve yenilenebilir enerji kaynaklarına doğru bir yönelme gözlemlenmektedir.

Yenilenebilir enerji kaynaklarından biri olan rüzgâr enerjisi, rüzgârı meydana getiren hava akımının sahip olduğu kinetik enerjidir. Bu enerjinin bir bölümü yararlı olan mekanik veya elektrik enerjisine dönüştürülebilir. Rüzgâr enerjisi, çok eski tarihlerden beri insanlar tarafından yel değirmenlerinde ve su pompalama işlemlerinde kullanılmıştır. Günümüzde ise modern rüzgâr türbinleri yardımı ile rüzgâr enerjisi elektrik enerjisine dönüştürülerek kullanılmaktadır (Oral vd., 2007, Özgür, 2006).

Rüzgâr enerji santralinin projelendirilmesi ve ekonomisi, temel olarak seçilen santral sahasında üretebilecek enerji miktarına bağlıdır. Bu enerji miktarının tespiti için; enerji üretim bölgelerinde yapılan rüzgâr ölçümlerinden elde edilen verilerin istatistiksel olarak analiz edilmesi gerekmektedir. Bu analiz sonucunda, bölgenin yıllık ortalama rüzgâr hızı, hakim rüzgâr yönü, ortalama güç yoğunluğu gibi büyüklükler belirlenerek, bölgede kurulabilecek rüzgâr enerji santrali için bilimsel alt yapı oluşturulmuş olunur.

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Bu çalışmada; enerji üretim amaçlı yapılan rüzgâr ölçümleri için kurulan ölçüm istasyonu ile ilgili bilgiler verilmiştir. Rüzgâr enerjisi potansiyelinin belirlenmesinde kullanılan Weibull dağılımı incelenmiştir. Örnek bir uygulama olarak, Sakarya Üniversitesi yakınında Esentepe yöresinde kurulan rüzgâr ölçüm istasyonundan elde edilen rüzgâr verileri yardımıyla istatistiksel analiz yapılarak bölgenin rüzgâr enerjisi potansiyeli belirlenmiştir.

Rüzgâr Verilerinin Ölçümü

Bir bölgenin rüzgâr enerjisi potansiyelinin belirlenmesi için rüzgâr hız ve yön değerlerinin periyodik olarak ölçülmesi gerekir. Enerji amaçlı ölçümlerin yapılabilmesi için standartlara uygun rüzgâr ölçüm istasyonunun kurulması gerekmektedir. Rüzgâr ölçüm istasyonu, bir ölçüm direği üzerine yerleştirilmiş ölçüm cihazlarından oluşmaktadır. Rüzgâr ölçüm istasyonlarında sağlıklı bir ölçüm yapılabilmesi için; rüzgâr hızı, rüzgâr yönü, sıcaklık, nem ve basınç gibi meteorolojik değişkenlerin ölçülmesi gerekmektedir. Rüzgâr enerji santral sahasının topoğrafik durumuna göre, sahayı en iyi temsil edecek bir ya da daha fazla ölçüm noktası belirlenir ve bu ölçüm direkleri bu noktalara konuşlandırılır. Ölçüm direkleri santral sahasındaki hâkim rüzgâr yönüne dik olacak şekilde yerleştirilir. Ölçüm direğinin yüksekliği en az rüzgâr türbininin kule yüksekliğinin 2/3 katı kadar yapılır. Ayrıca ölçüm yapılacak arazinin topoğrafik koşullarına göre ölçüm yüksekliği değişmektedir (Oral vd., 2007, Özgür, 2006, Durak vd., 2008)

Rüzgâr ölçüm istasyonunun kurulacağı yerlerin belirlenmesi çok öneme sahiptir. Seçim yapılacak alanda rüzgâr akımını kesecek bir engelin bulunmaması gerekmektedir. Tepe arkalarında yer seçimi tercih edilmemelidir. Aksi taktirde oluşacak türbülans nedeniyle ölçülecek rüzgâr hızı gerçek değerinden çok fazla uzaklaşabilmektedir. Ölçüm istasyonunun kurulacağı yerlerde rüzgâr akışının daima laminer olması, ölçüm sonuçlarını daha gerçekçi yapacaktır. Yer seçimi yapılırken deneyimli uzmanların görüşünün alınması yapılacak hatayı önleyecektir. Ayrıca rüzgâr ölçüm istasyonunun kurulacağı noktalara ait 1/25.000 ölçekli harita üzerinde UTM (Universal Transfer Mercator) ve coğrafi koordinatları ile deniz seviyesinden olan yükseltisi, uzman elemanlar tarafından tespit edilmelidir (Oral, 2010).

Rüzgâr ölçüm istasyonlarından alınan veriler data logger'a iletilerek depolanır. Depolanan veriler bilgisayar ortamına aktarılıp değerlendirilir. Ölçüm sistemi; anemometre ve yön sensörleri, ölçüm değerlerini her 10 saniyede bir okuyarak sonuçları 10 dakikalık ortalamalar olarak data logger'a kaydetmektedir.

Rüzgâr İstatistiği

Rüzgâr verilerinin istatistiksel analizlerinde, Weibull dağılımı bir çok çalışmada kullanılmıştır. Weibull dağılımı; rüzgâr enerjisi potansiyelinin araştırılmasında tercih edilen dağılım metodudur (Çelik, 2003, Bansal vd., 2002, Persaud vd.,, 1999, Lun vd., 2000, Seguro vd., 2000, Ulgen vd., 2002, Gökçek vd., 2007). Rüzgâr verilerinin analizi yoluyla elde edilen Weibull parametreleri kullanılarak herhangi bir rüzgâr hızının frekansı konusunda hassas bir tahminde bulunmak mümkün olabilmektedir. Weibull yoğunluk fonksiyonu; rüzgârın herhangi bir hızda esme sıklığını gösteren fonksiyondur. Weibull yoğunluk fonksiyonunun elde edilebilmesi için şekil ve ölçek parametrelerinin bilinmesi gerekir.

Rüzgâr hızı için, iki parametreli Weibull olasılık yoğunluk fonksiyonunun genel ifadesi,

$$f(v)=\frac{k}{c}\left(\frac{v}{c}\right)^{k-1}\exp\left[-\left(\frac{v}{c}\right)^{k}\right] \quad (1)$$

biçimindedir [7]. Burada $f(v)$, v rüzgâr hızındaki Weibull yoğunluk fonksiyonunu, k boyutsuz şekil parametresini ve c ise ölçek parametresini ifade etmektedir. Ortalama rüzgâr hızı v_m, aşağıdaki eşitlikten hesaplanabilir (Mayhoub vd., 1997).

$$v_m=\int_0^{\infty} v f(v)dv=c\Gamma\left(1+\frac{1}{k}\right) \quad (2)$$

Burada Γ(.), gama fonksiyonu aşağıdaki eşitlik ile ifade edilebilir (Johnson, 2001).

$$\Gamma(y)=\int_0^{\infty} e^{-x}x^{y-1}dx \quad (3)$$

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Weibull dağılımı parametrelerinin belirlenmesinde çeşitli yöntemler kullanılmaktadır. Grafik metodu, en yüksek olabilirlik metodu en çok kullanılan yöntemlerdendir (Seguro, 2000). Bu çalışmada grafik metodu kullanılmıştır. Grafik metodunun temel ilkesi, rüzgâr hızı verilerini temsil eden doğru ile gözlenen rüzgâr hızı verileri arasındaki dikey farkları minimum yapmaya dayanır KArsli vd., 2003).

Rüzgâr hareket halinde bir hava akımı olduğundan kinetik enerjiye sahiptir. Rüzgârdan elde edilebilecek güç,

$$p(v)=\frac{1}{2}\rho A v^3 \tag{4}$$

eşitliği ile ifade edilebilir (Johnson, 2001). Burada *P(v)*, v hızındaki rüzgârın sahip olduğu gücü, *A* süpürme alanını ve ρ ise havanın yoğunluğunu ifade etmektedir. Weibull dağılımı için ortalama rüzgâr gücü yoğunluğu P_m aşağıda verilen eşitlik ile ifade edilebilir metodudur (Çelik, 2003, Bansal vd., 2002, Persaud vd.,, 1999, Lun vd., 2000, Seguro vd., 2000, Ulgen vd., 2002, Gökçek vd., 2007, Mayhoub vd., 1997, Johnson, 2001, Karsli vd., 2003, Gökçek vd., 2007).

$$P_m=\int_0^\infty p(v)f(v)dv=\frac{1}{2}\rho c^3\Gamma\left[1+\frac{3}{k}\right] \tag{5}$$

Analiz ve Uygulama

Bu çalışmaya örnek olması bakımından, Sakarya–Esentepe bölgesinde kurulan rüzgâr ölçüm istasyonundan elde edilen rüzgâr hızı ve yönü değerleri, rüzgâr analizde kullanılmıştır. Bu istasyonda 10 ve 30 metrelerde rüzgâr hızı, 30 metrede rüzgâr yönü ile 3 metrede çevre sıcaklığı değerlerinin ölçümü periyodik olarak yapılmaktadır. Bu analiz çalışmasında rüzgâr hızı dağılımının belirlenmesinde, iki parametreli Weibull dağılımı kullanılmıştır. Analizde, rüzgâr ölçüm istasyonundan elde edilen 2007 yılı Eylül, Ekim, Kasım aylarını içeren rüzgâr verileri kullanılmıştır. Weibull dağılımının şekil ve ölçek parametrelerinin belirlenmesi, grafik yöntemi kullanılarak yapılmıştır. Rüzgâr verilerinin analizinde kullanılmak üzere MATLAB programı geliştirilmiştir. Ayrıca rüzgâr verilerinin analizinde, grafiklerin oluşturulmasında WindPRO yazılımı kullanılmıştır. Bölgenin istatistiksel rüzgâr enerjisi analizi yapılmış olup, Weibull parametreleri, rüzgâr hız dağılım frekansı, ortalama rüzgâr hızı ile güç yoğunluğu değerleri bulunmuştur.

Tablo 1'de 3 aylık bir zaman periyodunu kapsayan, aylık ortalama rüzgâr hızı, Weibull parametreleri ile ortalama güç yoğunluğu değerleri verilmiştir. Tablo 1'de görüldüğü gibi aylık ortalama rüzgâr hızının gerçek değerlerinin, 3.56 ile 4.47 *m/s* arasında değiştiği, en yüksek ortalama rüzgâr hızının Kasım ayında, en düşük ortalama rüzgâr hızının ise Ekim ayında olduğu ve tüm aylar için ortalama rüzgâr hızının gerçek değerinin 4.07 *m/s* olduğu belirlenmiştir. Aynı tabloda Weibull dağılımına göre aylık ortalama rüzgâr hızının 3.62 ile 4.56 *m/s* arasında değiştiği, en yüksek ortalama rüzgâr hızının Kasım ayında, en düşük ortalama rüzgâr hızının ise Ekim ayında gerçekleştiği ve tüm aylar için ortalama rüzgâr hızının 4.12 *m/s* olduğu belirlenmiştir. Tabloda görülebileceği gibi, tüm aylar boyunca ortalama Weibull (*k*) şekil parametresinin 1.85 ve (*c*) ölçek parametresini ise 4.64 m/s olduğu bulunmuştur.

Aylık ortalama güç yoğunluğunun değerleri Tablo 1'de verilmiştir. Tablo 1'de gösterildiği gibi aylık ortalama güç yoğunluğunun en büyük gerçek değeri 116.10 W/m^2 olup Kasım ayında, en küçük değeri ise Ekim ayında 58.79 W/m^2 olarak gerçekleşmiştir. Benzer şekilde aylık ortalama güç yoğunluğunun Weibull dağılımına göre en büyük değeri Kasım ayında 114.50 W/m^2 olarak, en küçük değeri ise Ekim ayında 57.88 W/m^2 olduğu görülmüştür. Tüm aylar boyunca ortalama güç yoğunluğunun gerçek değeri 88.93 W/m^2, Weibull değeri ise 87.90 W/m^2 olarak bulunmuştur.

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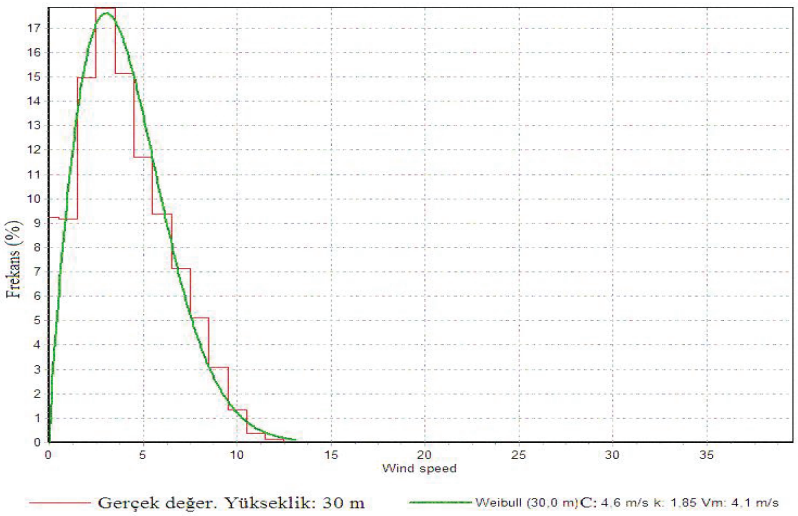
Tablo 1: Ortalama rüzgâr hızı, Weibull parametreleri ile ortalama güç yoğunluğu (30 *m* için)

	Weibull dağılımı				Gerçek değerler	
Aylar	V_m (m/s)	k	c (m/s)	P_m (W/m^2)	V_m (m/s)	P_m (W/m^2)
Eylül	4.29	1.98	4.84	91.55	4.21	93.15
Ekim	3.62	1.92	4.08	57.88	3.56	58.79
Kasım	4.56	1.89	5.13	114.50	4.47	116.10
Ortalama	4.12	1.85	4.64	87.90	4.07	88.93



Şekil 1. Rüzgâr hızı frekans dağılımı

Tablo 2: Sektörel ortalama rüzgâr hızı, Weibull parametreleri ve frekans

Sektör	c (*m/s*)	V_m (*m/s*)	k	Frekans (%)
0-N	5.10	4.52	2.20	21.68
1-NNE	4.14	3.72	1.55	18.23
2-ENE	5.50	4.87	2.09	19.54
3-E	4.45	3.95	1.92	7.40
4-ESE	4.42	3.95	1.66	6.04
5-SSE	3.85	3.42	1.96	4.24
6-S	3.77	3.35	1.88	2.66
7-SSW	3.69	3.27	1.93	2.36
8-WSW	4.44	3.97	1.68	3.72
9-W	5.20	4.60	2.26	2.57
10-WNW	3.79	3.40	1.58	3.63
11-NNW	3.94	3.49	2.10	7.95
Ortalama	4.64	4.12	1.85	100

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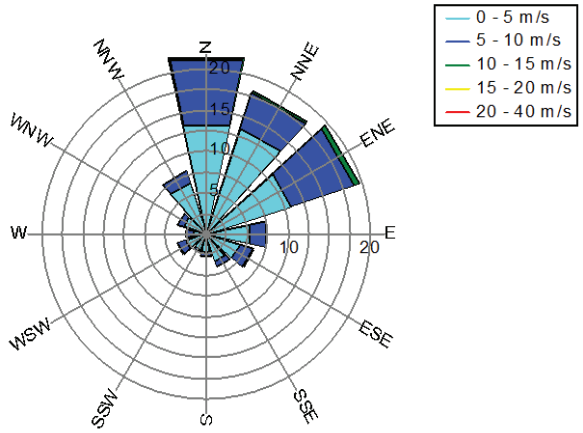
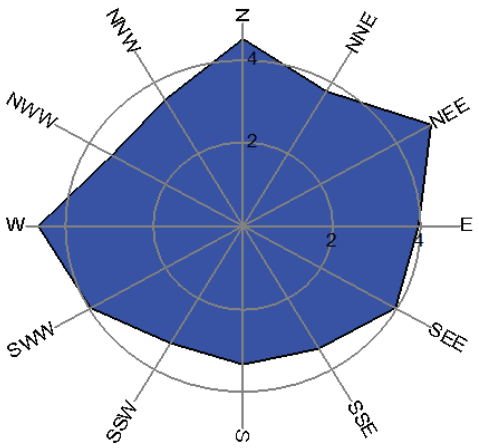
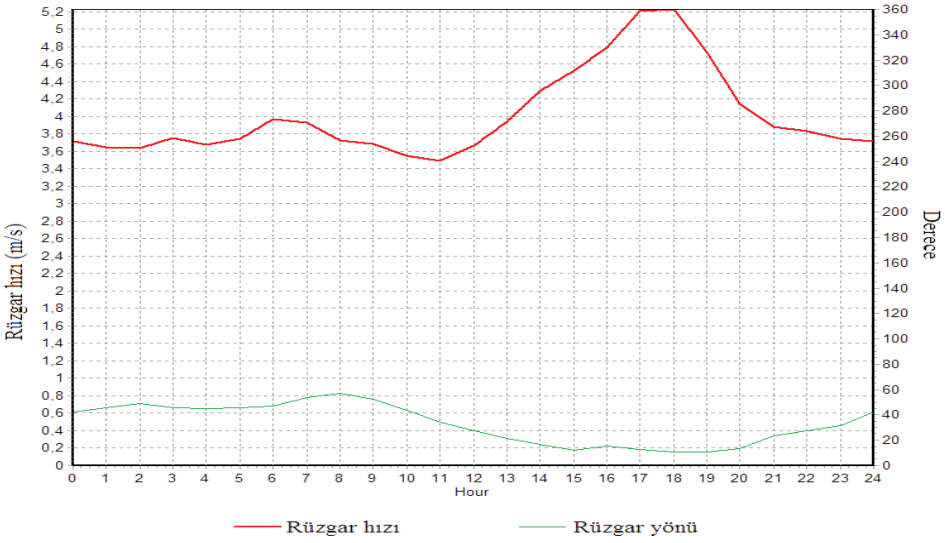




Şekil 2. Sektörel ortalama rüzgâr frekansı (%)

Şekil 3. Sektörel ortalama rüzgâr hızı (m/s)

Rüzgâr hızının frekans dağılımı Şekil 1'de gösterilmiştir. Ayrıca sektörel tüm aylar için ortalama rüzgâr hızı, Weibull parametreleri ile frekans değerleri, Tablo 2, Şekil 2 ve Şekil 3'de gösterilmiştir. Tablo 2 incelendiğinde, en büyük rüzgâr hızı frekansının % 21.68 değerinde kuzey yönde olduğu ve bu yönde yıllık ortalama rüzgâr hızının 4.52 *m/s* olduğu görülmüştür. Tablo 2 ve Şekil 2'de görüldüğü gibi bölgede hâkim rüzgâr yönünün kuzey olduğu, hâkim yönde Weibull (*k*) şekil parametresinin 2.20, (*c*) ölçek parametresinin ise 5.10 *m/s* değerinde olduğu belirlenmiştir. Ayrıca kuzey–doğu yönünde önemsenecek büyüklükte bir rüzgâr frekansının olduğu görülmüştür. Sektörel ortalama rüzgâr hızı değerleri Şekil 3'de gösterilmiştir. Tablo 2 ve Şekil 3 incelendiğinde, yıllık ortalama rüzgâr hızı değerinin kuzey, kuzey-doğu, güney ve güney-batı yönlerinde 4 *m/s*'lik hız değerinden büyük olduğu görülmektedir. Şekil 2'de görüldüğü gibi hakim rüzgâr yönünde rüzgâr hızlarının 5-10 m/s hızları arasında önemsenecek değerlerde olduğu görülmüştür.



Şekil 4. Saatlik ortalama rüzgâr hızı ve yönü

Şekil 4'de tüm aylar için saatlik ortalama rüzgâr hızı ve yön değerlerinin değişimi verilmiştir. Bu şekilden de görülebileceği gibi ortalama hız değerlerin 30 *m*'lik ölçüm yüksekliğinde, saat 14:00 ile 20:00 arasında 4-5 *m/s* arasında değiştiği, ortalama hız değerinin saat 12:00' dan saat 17:00'a kadar artarak yaklaşık 5.2 *m/s* değerine kadar yükseldiği ve daha sonra normalleştiği belirlenmiştir. Aynı şekle göre saatlik rüzgâr yönü değerlerinde çok belirgin ve keskin sapmaların görülmediği belirlenmiştir.

Sonuç ve Öneriler

Bu çalışmada, enerji üretimi, amaçlı yapılan rüzgâr ölçümlerinden elde edilen rüzgâr verilerinin değerlendirilmesi incelenmiştir. Rüzgâr enerjisi potansiyelinin belirlenmesi amacıyla, istatistiksel analiz için örnek bir uygulama

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yapılmıştır. Rüzgâr verilerinin istatistiksel analizi, Weibull dağılımı kullanılarak yapılmıştır. Bulunan önemli sonuç ve öneriler aşağıda özetlenebilir.

1. Rüzgâr elektrik santral projelerinde, rüzgâr enerjisinden elektrik enerjisi üretiminde, mutlaka enerji üretim amaçlı rüzgâr ölçümlerinin yapılması gerekmektedir.
2. Enerji üretim amaçlı rüzgâr ölçümlerinin yapılabilmesi için, rüzgâr elektrik santral sahasında uygun yer veya yerlere rüzgâr ölçüm istasyonu kurulması, bu istasyonlarda yapılan rüzgâr ölçümlerinin standartlara uygun periyodik olarak sürekli yapılması gerekmektedir.
3. Weibull dağılımına göre yapılan analizde, 30 *m* yükseklikte tüm aylar için ortalama rüzgâr hızı 4.12 *m/s*, aylık ortalama en yüksek rüzgâr hızının Kasım ayında, en düşük ise Ekim ayında olduğu belirlenmiştir. Tüm aylar için Weibull parametreleri *k* ve *c* değerleri, 1.85 ve 4.64 *m/s* olarak hesaplanmıştır.
4. Bölgede sektörel bakımdan hâkim rüzgâr yönünün Kuzey olduğu ve bu yönde %21.68'lik bir frekans değerine sahip olduğu bulunmuştur. Ayrıca Kuzey-doğu istikametinde önemsenecek düzeyde rüzgâr frekansının olduğu görülmüştür.
5. Weibull dağılımına göre 10 *m* ve 30 *m* yüksekliklerde yapılan ölçümlerde elde edilen verilerin saatlik değişimleri hesaplanmış ve ortalama saatlik rüzgâr hızı değerlerinin özellikle saat 12:00'den başlayarak arttığı ve bu artışın saat 17:00'a kadar sürdüğü ve sonrası azalarak normalleştiği görülmüştür. Ortalama rüzgâr hızında artışın görüldüğü bu saatlerde hâkim rüzgâr yönünün Kuzey olduğu belirlenmiştir.
6. Weibull dağılımına göre tüm aylar için ortalama güç yoğunluğunun değeri 87.90 W/m^2, ortalama güç yoğunluğunun en yüksek değeri Kasım ayında olduğu belirlenmiştir.
7. Aylık ortalama rüzgâr hızı ve güç yoğunluğu değerlerinin gerçek ve Weibull sonuçlarının birbirine çok yakın olduğu tespit edilmiştir.
8. Sonuç olarak; ölçüm yüksekliğinin artırılması, rüzgâr verilerinin en az bir yılı kapsayacak şekilde değerlendirilmesi ve arazinin farklı bölgelerinde rüzgâr ölçümünün yapılıp araştırılmasıyla birlikte bölgenin rüzgâr enerjisi potansiyeli bakımından elverişli olması beklenmektedir.

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SELECTIVE IRON DISSOLUTION FROM CHALCOPYRITE CONCENTRATE

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In this study, different solubility features of copper and iron compounds in presence of leaching reagents were utilized, so that this was caused to remove the iron from chalcopyrite concentrate.

The effect of various leaching parameters on the iron dissolution was studied. Investigating leach parameters are leaching temperature, leaching time, hydrogen peroxide concentration, and oxalic acid concentration. Stirring speed and liquid-solid ratio was kept constant in all experiments as 400 rpm and 25 mL/g, respectively. More than 60% of Fe was dissolved under optimum leaching conditions.

Keywords: Chalcopyrite; Leaching; Oxalic acid; Hydrogen peroxide

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SOVYET RUSYA'DA BİR PROPAGANDA ARACI OLARAK DİN KARŞITI ALFABE

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Özet: Ekim Devrimi ve İç Savaş yıllarında Sovyet Rusya'da Kilise yönetimi ile yeni rejim anlayışı arasındaki ilişkiler, her iki tarafın da ideolojik anlamda tek söz sahibi olma mücadelesiyle çok yönlü ve karmaşık bir hal almıştır. Sovyet rejimi Kiliseyi burjuva sistemine hizmet eden ve işçi sınıfını körelten bir tehdit olarak algılarken, Kilise, Bolşeviklerin izlediği politikayı din karşıtı olması gerekçesiyle eleştirmiştir. Genç Sovyet hükümeti, dini otoriteyi hükümsüz kılma adına çıkardığı kararnamelerle ve uyguladığı yaptırımlarla Kilisenin ve din adamlarının nüfuzuna son vermiştir. Ayrıca halkın bilincindeki mevcut din olgusunu yok etmek ve yeni bir Sovyet toplumu yaratmak amacıyla sistemli olarak propaganda çalışmalarına başlamıştır. Kültürel belleği değiştirmede çok önemli rol oynayan bu propaganda araçlarından biri de okuma-yazmayı yeni öğrenenler ve çocuklar için hazırlanan resimli, renkli ve açıklamalı bir alfabedir. Yeni rejimin dine bakış açısını açıkça yanıtsan bu alfabe 1933 yılında ünlü Sovyet grafik ve karikatür sanatçısı Mihail Çeremnıh tarafından oluşturulmuştur. Bu çalışmada Sovyetlerdeki din ve Kilise karşıtı politika ve bu amaçla uygulanan propagandalar çerçevesinde söz konusu alfabenin Sovyet toplumu üzerine etkileri ele alınacaktır.

Anahtar Sözcükler: Din Karşıtı Alfabe, Kilise, Propaganda, Sovyet Rusya

THE ANTI-RELIGIOUS ALPHABET AS A MEANS OF PROPAGANDA IN SOVIET RUSSIA

Abstract: During the October Revolution and the Civil War, the relations between the Church administration in Soviet Russia and the new regime understanding had taken on a multi-faceted and complex state due to the struggle of the both sides to have the only say in terms of ideology. While the Soviet regime perceived the Church as a threat which served the bourgeoisie system and blunted the working class, the Church criticized the policy followed by the Bolsheviks arguing that it was anti-religious. The young Soviet government ended the authority of the Church and the clergymen through the decrees and the sanctions it passed with the purpose of invalidating religious authority. In addition, the government began carrying out systematic propaganda to destroy the existing phenomenon of religion and to create a new Soviet society. One of the tools of this propaganda, which played an extremely important role in changing the cultural memory, was the illustrated, colored and annotative alphabet prepared for people who were just beginning to read and write and children. This alphabet which reflected the point of view of the new regime was prepared by the famous Soviet graphic artist and caricaturist Michail Tscheremnych, in 1933. In this study, the effect of the alphabet in question on the Soviet society within the framework of the Soviet policy against religion and the Church and the propaganda carried out for this purpose will be analyzed.

Keywords: Anti-religious Alphabet, Church, Propaganda, Soviet Russia

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Giriş

Rusya'da prenslikler (knezlikler) döneminde 988 yılında Hristiyanlığın kabul edilmesiyle birlikte Ortodoksluk, Bizans'tan Balkanlara, Rus topraklarına ve Orta Avrupa'nın bir bölümüne yayılmıştır. Pagan Rus topraklarına giren ilk kutsal metinlerin dilinin yerel dille benzerlik göstermesi, hem ibadeti hem de din değiştirmeyi kolaylaştırmıştır. Rusya, Ortodoksluğu komşusu Bizans'tan alarak, Batılı devletlerden farklı olarak teokratik bir ruha bürünmüştür. Ruslar, knezlerin de baskısıyla, hiçbir iç çatışma yaşanmadan ama bunun yanında tartışmaya ve düzenlemeye kapalı bir biçimde X. yüzyıldan itibaren Hristiyanlığı devlet sistemine dahil etmişlerdir (Hosking 2011: 64). Rusya'da Sovyet dönemine kadar olan süreçte Ortodoks Kilisesi ve dini otorite organları devlet yönetiminde her zaman baskın olmuştur. Karşılıklı ihtiyaçları ve çıkarları nedeniyle prensler ve çarlar ile Kilise, birbirine mecburen destek vermiştir. Çarın Tanrı konumunda bulunması, bu geleneğin bir sonucudur.

Rusya'da Kilisenin nüfuzunu en fazla sağlamlaştırdığı dönem Moğol hâkimiyetiyle başlamıştır. Bu dönemde Rus Kilisesinde biri halka ve diğeri yöneticilere yönelik olarak iki kutuplu bir maneviyat göze çarpar. Bir yandan kazandığı maddi ve manevi gücünü giderek artıran Kilise, zaman içinde zenginlik, lüks ve dünyevi işlerin merkezi haline gelmiştir. Kilise diğer yandan ise dünyevi güçten tamamen kopuk, içine kapalı, münzevi ve sadece halka ait bir dindarlık merkezidir. Kilisenin her dönemde vergiden muaf tutulması ve ayrıca yapılan para, mal ya da toprak bağışları, zamanla bu ruhani merkezi aşırı güçlü bir toprak sahibi ve en büyük politik güç konumuna getirmiştir. İstanbul'un fethiyle Bizans İmparatorluğu'nun yıkılması sonucu Rus Kilisesi Mesihvari bir Ortodoks anlayışıyla kendisine üçüncü Roma[9] gibi kutsal bir görev de biçmiştir (Figes 2009: 358-359). Böylece Rus Ortodoks Kilisesi daha içe kapalı, diğer inanışlara daha az toleranslı bir devlet kilisesine dönüşmüştür.

Rusya'da Hristiyanlığın kabulünden I. Petro dönemine kadar halkın eğitiminde Kilisenin rolü çok etkili olmuştur. Kiril alfabesinin ve ilk yazılı metinlerin ortaya çıkmasından itibaren halkın eğitimi tamamen dini yönde olmuş, toplumun ahlak ve maneviyat yapısı Ortodoksluk çerçevesinde belirlenmiştir. Ders ya da çocuk kitapları dualarla, Tanrı ve peygamber inancıyla, sevap ve günahların tanımıyla, ahlak öğretileriyle, İncilden alıntılarla, Eski Slavca dilbilgisiyle, kıssadan hisselerle, dini bayram motifleriyle donatılmıştır. I. Petro ile yüzünü Batı'ya çevirmeye başlayan Rusya'da her alanda olduğu gibi eğitim alanında da reform yapılmış ve ders kitapları daha dünyevi ve bilimsel öğretilerle donatılmıştır. Buna rağmen dini eğitim yine de arka plana atılmış değildir. 20. yüzyıla kadar devlet-Kilise ilişkisi sistemli bir mekanizma halinde çalışmış, devlet politik yönüyle ağır basarken Kilise din politikasını düzenlemiştir.

Sovyet dönemine gelinceye kadar din ağırlıklı olan eğitim sisteminin ve ders kitaplarının Tanrı kanunlarını pekiştiriyor olması hem çarların menfaatlerine uygun olmuş hem de halkın manevi anlamda ciddi olarak eğitilmesine yardımcı olmuştur. Ancak geleneksel köy kültürünü esas alan Kilise yapısı, 20. yüzyıl başlarında Avrupa ile birlikte tüm Rusya'da ortaya çıkan çeşitli fikirsel, dini ve felsefi akımların da etkisiyle, toplumsal sınıflar arasında oluşan boşluğu gidermede yetersiz kalmaya başlamıştır. 22 Ocak 1905 tarihinde yaşanan Kanlı Pazar olayının arka planında yine dinsel boşluk rol oynamıştır. Kötü yaşam şartlarından bunalan ve şikâyetlerini kimseye anlatamayan Rus işçi sınıfı, Petersburg'da çara bir dilekçe vermek üzere kitleler halinde toplanmıştır. Bunu bir başkaldırı olarak algılayan çarlık rejimi ise harekete geçmiş ve silah gücü kullanmıştır. Rusya tarihine Kanlı Pazar olarak geçen bu olayda silahsız binlerce sivil öldürülmüştür. Bu olaydan sonra kilise reformu öncelikli konu haline gelmiştir. Son Rus çarı II. Nikolay, halk ile devlet arasındaki uçurumun farkındadır. Çözüm olarak Ortodoks Kilisesinin önderliğinde geleneksel monarşi ile halk arasında yeni bir bağ kurmaya çalışır. 1917 Şubat Devriminden sonra dini yaşamda görülen serbestleşme, aynı yıl Ekim Devrimiyle sona erer. Kilisenin gerçek dönüşümü ise Sovyetler Birliği döneminde yaşanır. Çarların olmadığı bir politik sistemde Kilisenin ne olacağı tartışılır. 1917 Devrimine kadar Kilise, devlet aygıtının bir parçası olarak görev yapmışken yeni yönetim, ideolojisi gereğince Tanrı inancını kökünden kazımaya kararlıdır. Din karşıtı kampanya, imparatorluk rejimiyle yakın bağları bulunan Ortodoks Kilisesini dağıtmak ve halkı batıl inançlar yerine bilimsel bir hayat görüşüne yönlendirmek amaçlı olmuştur (Riasanovsky, Steinberg 2014: 642-643). Sovyetlerle birlikte ders kitaplarından din konusu tamamen çıkarılmış, din ve maneviyat konusundaki sorunlar kişisel ve yüzeysel olarak çözülmeye başlanmıştır.

Sovyet Rusya'nın temel din felsefesi, Marksizm'in 'din halkın afyonudur' görüşüne dayanır. Vladimir Lenin din olgusunu insanların doğaya karşı savaşına benzetir. İlkel dönemlerde doğaya yenik düşen pagan kabilelerin tanrılara, iyi ve kötü ruhlara, mucizelere inanması gibi sömürülen sınıfların kendisini sömüren sınıflar karşısında yetersiz ve aciz hissetmesi de, onları doğal olarak ölüm sonrası çilelerin ve acıların son bulacağı bir yaşamın var

[9] "Üçüncü Roma Kuramı", bir Slav manastırı rahibi olan Filofey tarafından ortaya atılmış ve çar III. İvan'a sunulmuştur. 1505-1533 yılları arasında tahtta oturan Rus çarı III. İvan'ın Bizans prensesi Sofiya Paleolog ile evlenmesinin ardından Rus knezleri kendilerini Bizans'ın vârisleri olarak kabul etmişlerdir. Üçüncü Roma Kuramı'na göre evvelce dünya hâkimiyetinin merkezi Roma idi; sonra Yeni Roma (yani İstanbul) oldu. Her iki Roma da düştü. Oysa üçüncü Roma ayaktadır, o da Moskova'dır. Hristiyanlıktaki kutsal üçlü hükmünce dördüncü bir Roma olmayacaktır. Bu durumda dünya hâkimiyetinin yeni merkezi Moskova'dır (Kurat 1999: 140).

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olduğu inancına iter (Lenin 2013: 6). Marks ve Engels'in dinle doğrudan savaş yerine proletaryanın bilinçlendirilmesi gerektiği tezine karşılık Lenin, din olgusunun kendiliğinden yok olmayacağını savunur. Bunun için propagandalarda ateizmin mutlaka yer alması gerektiğini söyler. Lenin'e göre halkın acizliği, cehaleti ve bilime karşı duyarsızlığı ortadan kaldırılmalıdır ve bu da ancak sınıf anlayışının yok edilmesiyle ve ekonomik köleliğin ortadan kalkmasıyla mümkün olabilir (Lenin 2013: 9). Dini yargılardan kurtulmak için siyasal bilince sahip bir işçi sınıfına gerek vardır ve halkı çaresizliğe sürükleyen koşullar ortadan kaldırılmalıdır (Lenin 2016: xv).

1920-1930 yılları arasında Sovyet hükümetinin aldığı kararla büyük şehirlerdeki manastır ve kiliseler toplu olarak kapatılır ve yıkılır. Sovyet Rusya'da Merkez Komite'ye bağlı olan ve 1946 yılına kadar geçici olarak hükümet adına tüm kararları alan Sovyet Halk Komiserliği, 8 Nisan 1929 yılında çıkardığı "Dini kuruluşlar" hakkındaki kararnameyle ülkedeki tüm dini etkinlikleri devlet kontrolü altına alır. Bu karar, Stalin'in kolektifleştirme politikası ile yeni ekonomi politikasının bir parçasıdır ve Sovyetler Birliği'nde Kilisenin gücünü devletin kontrolüne almıştır. 1929 yılının Mayıs ayında 14. Sovyet Kongresi'nde anayasanın "din ve din karşıtı propaganda özgürlüğü" ile ilgili 4. maddesi, "dini mezhep ve din karşıtı propaganda özgürlüğü" olarak değiştirilir (Lavrinov, Solovyev 2010: 232). Tüm bu kanunlarla Sovyet hükümeti, Kilisenin bütün topraklarına ve mülkiyetine, karşılığında hiçbir tazminat ödemeksizin el koyar ve dini kurumların yasal statülerine son verir. Böylece resmiyette dinin manevi ve sosyal önemi de zamanla yok edilir. Asırlar önce yapılmış olan dini binalar yaklaşık on yıl kadar kısa bir süre içinde yakılıp yıkılır. Örneğin, Ekim Devrimi öncesinde Moskova'da 551 kilise ve manastır mevcut iken bu sayı 1937 Martında 75'e düşer (Lavrinov, Solovyev 2010: 222). Bu oran, devrim öncesindeki kiliselerin sayısının ancak yüzde birine eşittir. Aynı dönemde kilise çanları da eritilip ağır sanayide kullanılmak üzere sistemli olarak toplatılır. Böylece Ortodoks Rusya'da yüzyıllardır sabırla dökülen çanlar birkaç yıl içinde eritilir. Sadece 1933 yılı içinde devlet kararıyla 6300 ton çanın eritilmesine izin verilir (Kozlov, www.librero.ru). Bazı çanlar ise belli başlı tiyatrolar tarafından sahne dekoru olarak kullanılmak üzere sahiplenilir ya da yurt dışına satılır. Kapatılmayan ya da yıkılmayan kiliselerin çoğu, kutsal objeleri alınmış ve duvarları badanalanmış bir halde fabrika, müze ya da sosyal faaliyet alanı olarak kullanılır. Bazı kiliseler ise devlet koruması altında mimari anıtlar olarak boş bırakılır.

Sovyet ideolojisinin özellikle 1920-1930'lu yıllarda büyük önem verdiği propaganda ve ajitasyon çalışmaları, geniş halk kitlesinin kültürel belleğini ve yaşam tarzını kökten değiştirmeyi hedeflemiş, tüm Sovyet dönemi boyunca halk üzerinde beklenen etkiyi yaratmıştır. Sovyet hükümeti, yeni kurduğu düzende kendi ideolojisini, yeni dünya anlayışını, makineleşme hedefini ve yeni Sovyet insanının nasıl olması gerektiğini sloganlar yardımıyla anlatmış; renkli, resimli, küçük hacimli ama büyük anlamlar içeren çarpıcı sloganlar ve afişler sayesinde büyük kitlelere kolayca ulaşabilmiş, halkı motive etmede başarılı olmuştur. Büyük kitlelere en hızlı ve etkili ulaşma yolu olarak radyo, gazete, miting, toplantı, tören, tiyatro, sessiz sinema, pankart, afiş gibi propaganda araçları tercih edilmiştir. Sovyet hükümeti her Sovyet vatandaşını propaganda çalışmalarına etkin olarak katılmaya mecbur etmiş, böylece Komünist Parti'nin tüm ideolojisi hızlı ve etkin bir şekilde büyük kitlelere kolayca ulaşmıştır. Parti, 1923 yılı Nisan ayında toplanan 20. Kongresi'ne kadar din karşıtı propagandaya fazla ağırlık vermemiştir. Söz konusu kongrede, halkı din karşıtı propaganda konusunda eğitme kararı alınmış ve bu amaçla parti okullarında, çeşitli kurslarda ve toplantılarda, bilim ve edebiyat dergilerinde Kilisenin din karşıtı faaliyetlerinden söz edilmeye başlanmıştır (Siegelbaum 1992: 160). Komünist Parti, Kiliseye karşı izlediği ateist propagandayı, "Komsomol", "Genç Öncüler", "Bilimsel Ateizm Müzesi", "Tanrıtanımaz Militanlar Derneği" gibi çeşitli sendika ve örgütlerle yürütmüş, din karşıtı propaganda konferansları Devlet Merkezî Propaganda ve Ajitasyon Komitesi tarafından mecbur kılınan yıllık faaliyetler haline getirilmiştir (Pospielovsky 1987: 44-45).

Propagandanın amacı, halk kitlesini siyasi görüş olarak ortak bir paydada toplama, ideolojiyi yayma, mevcut sosyal bilinç kalıplarını yeniden şekillendirme, insanların inanç sistemlerini yönlendirme ve yeniden organize etme, yeni oluşmakta olan Sovyet sistemine uyum sağlama konusunda halka önderlik etme ve bunun için gerekli olan metotları gösterme şeklinde özetlenebilir. Komünist Parti tarafından öngörülen din karşıtı propagandanın amaçları ise, eski sosyal yapıyı yıkarak yerine yenisini kurmak, büyük çoğunluğu okuma-yazma bilmeyen halkı eğitmek, aydınlatmak, insanları sosyal yaşamda aktif hale getirmek, toplumun kültür düzeyini yükseltmek ve halka materyalist görüşü benimsetmek olarak belirlenmiştir (Aleynikova 2013: 33). 1930 yılı sonlarına doğru din karşıtı program dahilinde halka okuma-yazma öğretme, din dışı konularda yayın yapma, köylerde kütüphaneler kurma ve bu şekilde halkı bilinçlendirme faaliyetlerine hız verilmiştir. Bu amaçla temel seviyede ve küçük hacimli bazı ders kitapları ve çeşitli alfabeler basılmıştır. Örneğin, 1920 yılında 16 sayfadan oluşan "İşçiler İçin Ders Kitabı", 1921 yılında 27 sayfalık "Demiryolu İşçisinin Ders Kitabı", 1922 yılında 32 sayfalık "Köylünün Ders Kitabı", 1925 yılında 100 sayfadan oluşan "Öncü. Ders Kitabı", 1926 yılında 80 sayfalık "Dere. Köy Okulları İçin Ders Kitabı", 1928 yılında 99 sayfalık "Tarım ve Orman İşçileri İçin Ders Kitabı" gibi kitaplar basılmıştır (Mumrikova 2009: 190). Bu tür kitapların amacı hem cahil işçi ve köylüyü bilgilendirmek hem de Sovyet ideolojisini halkın her kesimine tanıtmak ve yaymaktır. Toplumsal belleği değiştirmede çok önemli rol oynayan propaganda araçlarından biri de okuma-yazmayı yeni öğrenenler ve çocuklar için hazırlanan resimli, renkli ve açıklamalı din karşıtı alfabe olmuştur. Yeni rejimin dine bakış açısını açıkça yanıtsan ve hatta kimi yerlerde din eleştirisini uç

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noktalara vardıran bu alfabe, 1933 yılında ünlü Sovyet grafik ve karikatür sanatçısı Mihail Mihayloviç Çeremnıh (1890-1962) tarafından oluşturulmuştur. Gerek resimli ve renkli görselliği, gerekse kısa ama çarpıcı sloganlarıyla bu alfabe[10], yeni yetişen genç nesle, köylülere ve işçilere hem okuma-yazmayı hem de din karşıtı yaşamı öğretme misyonunu üstlenmiştir.

Mihail Çeremnıh 1890 yılında Tomsk şehrinde emekli bir albayın on ikinci oğlu olarak doğmuştur. Moskova'da grafik ve sanat eğitimi alan Çeremnıh, çeşitli hiciv dergi ve gazetelerinde karikatürler çizmiş, Mayakovski ile ROSTA Pencereleri'ni[11] kurmuş, Sovyet döneminin en ünlü mizah dergilerinden biri olan Krokodil'in kurucularından biri olmuştur. 1942 yılında SSCB Devlet Nişanı ve çeşitli madalyalar almış, 1950 yılında profesör, 1952'de ise halk sanatçısı unvanını almıştır. 1962 yılında Moskova'da hayata veda etmiştir. Çeremnıh'ın yaratıcılığı, okuyucunun kararlarına aktif olarak etki edecek derecede satirik alegori ve sembolizm unsurlarıyla doludur. Montaj tekniğiyle, kendine özgü sanatlararası geçişlerle ve nüanslı tonlarla döneminin poster ve afiş sanatında ve aynı zamanda Sovyet ideolojisinin din karşıtı çalışmalarında çığır açmıştır. Çoğu çalışması isimsiz olarak yayınlanmasına rağmen kendine has kurgusu, mizahı, hafif kaba ama şematik olmayan çizgileri kolayca Çeremnıh adını belli eder. Sanatçının 1932 yılında hazırladığı kitapçık şeklindeki alfabe, her harfi tanıtmak üzere din karşıtı bir slogan içermektedir. Her slogan, ait olduğu harfle başlayan, iki satırlık ve kafiyeli dört kelimeden oluşmaktadır. Resimler ve yazılar oldukça büyük ve çok renklidir. Rusça alfabe 33 harften oluşmasına rağmen Çeremnıh bu alfabeye 25 harf almıştır. Çalışmamızda, alfabedeki sloganlar tanıtılırken harflerin sıralaması Kiril alfabesine göre yapılacaktır.

Alfabenin İçeriği

Çeremnıh'ın hazırladığı alfabe kitapçığının başlangıç harfi olan **A** sayfasında, elinde bir alfabe taşıyan ve gülümseyen, mutlu bir Bolşevik çocuk resmedilir. Çocuğun başındaki Budenovka[12] türü şapka, Rusya'daki İç Savaş ve sonrasında Kızıl Ordu askerlerinin kullandığı üniformanın bir parçası olan şapkadır. İkinci harf olan **B** sayfasıyla birlikte tüm alfabe boyunca devam edecek güçlü bir din karşıtlığı propagandası başlar. **B** harfinin sloganı, "*Tanrılardan Korkmayı Bırakın Kardeşler*" (**Б**росайте братцы, богов бояться) şeklindedir. Sloganda Bolşevikleri temsil eden kızıl bir süpürge; kutsal kitap, ikon, haç, buhurdan gibi dini objeleri süpürürken resmedilir. Kiril alfabesinin üçüncü harfi olan **V** harfinin bulunduğu sayfanın sloganı *"İnanç Zararlıdır, Şaraptan Daha Zararlıdır"* (**В**ера вредна, вреднее вина) şeklindedir. Resimde, başındaki silindir şapkadan, göbekli oluşundan ve tek camlı gözlüğünden kapitalist ya da burjuva olduğu anlaşılan bir adam, elinde bir tüp tutmakta ve çeşitli dinlere mensup halkın üzerine zehir saçmaktadır. Zehir tüpünün üzerinde büyük harflerle "din" yazmaktadır. Çeremnıh, dinin toplum üzerindeki zararlı etkisini, dindar kişilerin elinde bulunan sopa, bıçak, hançer gibi nesnelerle ve dökülen kanla pekiştirmiştir. Alfabenin **G** harfi için "*Tanrının Sesi Efendilerin İşine Gelir*" (**Г**лас господень господам годен) sloganı kullanılmıştır. Resimde bir işçinin sırtına binmiş olan kapitalist/burjuvanın elinde bir kırbaç vardır ve bir yandan vururken bir yandan da işçiye 'sabret' yazılı bir tabelayı işaret etmektedir. **D** harfi için *"Kahrolsun Dedem Zamanından Kalma Köy"* (**Д**олой деревню дедовскую деревню) sloganı kullanılmıştır. Resimde köydeki eski düzeni temsil eden papazın, eski tip köylünün, tarlaların ve kilisenin üzerinden kızıl bir traktör geçmekte, yeni düzeni ve makineleşmeyi temsil etmektedir. Sovyet yüzyılı boyunca makineleşme başta olmak üzere üretimde hız, canlılık, yenilik, kalite, verimlilik ve işlerlik önem kazanmış ve her Sovyet vatandaştan bir makine gibi dakik ve verimli çalışması talep edilmiştir. Alfabede **E** harfinin olduğu sayfada *"Piskoposlar Yemeklerini Zoraki Yediler"* (**Е**ле-еле епископы ели) yazmaktadır. Resimde ise bir din görevlisi, kendisine getirilen ördeği, tavuğu ve balığı iştahla yemektedir. O kadar büyük bir iştahla ve kendinden geçmişçesine yemektedir ki afiyet olsun demeye bile gerek görülmemektedir. Ayrıca din görevlilerinin sürekli halk tarafından beslendiği ve hiç aç kalmadıklarına da bir gönderme yapılmaktadır.

J harfi için *"Rahibin İğnesi Kurbanını Beklerdi"* (**Ж**реца жалко жертву ждало) sloganı kullanılmıştır. Bu slogan için başında bir haç olan ve ruhban sınıfını temsil eden dev bir örümcek seçilmiştir. Örümcek, kendi ayaklarına bağladığı ikonları göstererek yoldan geçen ve halinden cahil bir köylü olduğu anlaşılan kadın kurbanını kandırarak kendine çekmeye çalışmaktadır. Alfabenin **Z** harfi için seçilen slogan *"Otacının Büyü Sözlerini Bilgiyle Değiştir"*

[10] Edebi bir tür olarak alfabe kitapçığı, Rus yazın geleneğinde her zaman var olmuştur. İki farklı dönem ve iki farklı alandan örnek vermek gerekirse; heykeltıraş sanatçısı İ. İ. Terebenev (1780-1815), Napolyon savaşları temalı ve grafik çizimlerle süslediği alfabesine "Çocuklara Hatıra Olarak 1812 Yılı Olayları Anısına" adını vermiştir. Bu alfabe çocuklara hem savaşı anlatmakta hem de Rus milliyetçiliğini aşılamaktadır. Bir başka örnek, postmodern şair A.G.Bitov'un (1937-) 60. doğum günü için "Bitov'un Alfabesi" adıyla hazırlanmıştır ve a harfinden z harfine kadar Bitov'un sanatı ve yaşamıyla ilgili aforizmalarla doludur (Şmelyova 2009: 24).

[11] ROSTA Pencereleri, 1919-1921 yılları arasında özellikle M. Çeremnıh, V. Mayakovski ve D. Moor gibi Sovyet şair ve sanatçılarının yaptığı hiciv ve propaganda posterlerine verilen genel addır. Posterler Bolşeviklerin haber ajansı olan Rusya Telgraf Ajansı tarafından başlatılmış ve özellikle savaş ve yeniden yapılanma dönemlerinde kısa içerikli bir haberi, hükümet kararnamesini ya da talimatını yaymak açısından oldukça etkili olmuştur.

[12] Budenovka, Rusya'nın İç Savaş yıllarında kullanılan ve sonradan Bolşeviklerin savaş üniformasının ayrılmaz bir parçası ve sembolü haline gelen bir şapka türüdür.

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(**З**нахаря заклинания замени знанием) şeklindedir. Bu slogan için resim ikiye bölünmüş, bir tarafta batıl inancı simgeleyen kemik, ölü fare, mum, okunmuş su gibi büyü malzemeleri resmedilirken diğer tarafta cetvel, kitap, mikroskop gibi modern bilim aletleri çizilmiş ve insanların aradaki farkı görüp bilinçlenmeleri hedeflenmiştir. Gerçekten de Sovyet dönemi boyunca bilimsel ilerlemeye fazlaca önem verilmiştir. **İ** harfi için *"Hainin Maskesi İndirildi"* (**И**зобличено ими изменника имя) sloganı kullanılmıştır. Bu afişte ön planda Mahatma Gandi vardır. Sovyetlerin ilerleyen dönemlerinde Gandi olumlu bir lider olarak algılansa da ilk zamanlarda pasif duruşu ile SSCB'de olumsuz tepkiler çekmiştir. Hindistan'da ve diğer bazı ülkelerde Gandi'nin sıra dışı, ermiş ve neredeyse Tanrının bir yansıması olarak algılanması nedeniyle bu afişte Gandi, başında ikonlardaki azizler gibi dünyevi ve ilahi kudrete sahip olduğunu simgeleyen bir haleyle resmedilmiştir. Aynı zamanda Hazreti İsa'nın şiddet karşısında güç kullanmama duruşuna gönderme yapılarak Gandi'nin kendi halkına ihanet ettiği de vurgulanmak istenmiş olabilir.

Alfabenin **K** harfi için *"Çanların Sonu Geldi, Döv, Demirci"* (**К**олоколам конец - куй, кузнец) şeklinde bir slogan tercih edilmiştir. Resimdeki güçlü demirci, çanları dövdükçe kırılan parçalar makine parçalarına dönüşmektedir. Bu resim, eritilen ya da kırılan kilise çanlarının sanayide nasıl kullanıldığını simgelemektedir. **L** harfi için *"Şeytani Yalanın Lavı Akıyor"* (**Л**ьется лава лжи лукавой) sloganı tercih edilmiştir. Resimde, bu alfabenin en başında görülen mutlu Bolşevik çocuk gülümseyerek elinde bir şemsiye taşımakta, böylelikle çeşitli din temsilcilerinin ağızlarından akan temsili lavlardan/cehennem ateşinden rahatlıkla korunmaktadır. **M** harfinde *"Kutsal Mumyalar Makinenin Gücüne Engel Oluyor"* (**М**ешают мощи машинной мощи) ifadesi yer almaktadır. Burada dinin, gelişme yolundaki en büyük engel olduğu anlatılmak istenmiştir. İnsanlar ölen ve artık bir fayda sağlamayacak kişilerin ardından, mezarlıklarda dua ederken vakit kaybetmek yerine fabrikalara gidip çalışmaları, iş gücüne katkı sağlamaları konusunda uyarılmaktadır. Özellikle sanayi ve makineleşmeye çok büyük önem verilen Sovyet döneminde kadınlara da erkeklerle eşit imkânlar sağlanmış, çocuklar için kreş ve kimi zaman yatılı olan bakım evleri açılmış, böylece kadının ev ortamından çıkıp iş gücüne dahil edilmesine olanak sağlanmıştır. Yeni yapılandırılan Sovyet insanından, uzun mesai saatleri boyunca verimli çalışması ve iş dışında dikkatini dağıtacak başka alanlarda vakit kaybetmemesi sık sık afiş ve propaganda araçlarıyla hatırlatılmaktadır. Alfabede **N** harfi için *"Göklerden Gelecek Ödüle İhtiyacımız Yok"* (**Н**ебесной награды не надо) şeklinde bir slogan kullanılmıştır. Resimde bir papazın karşısında durmuş olan bir Sovyet genci, elinde kızıl bir bayrak tutmakta ve papazın vaat ettiklerini istemediğini belirten bir el işareti yapmaktadır. Gencin elinde tutuğu bayrakta Sovyetlerin beş yıllık Yeni Ekonomik Planı'nın dört yılda bitirileceğini gösteren bir ibare vardır. Bunun simgesel anlamı, Sovyet halkının papazların cennet vaatlerine değil kalkınma planlarının getireceklerine inanması gerektiği şeklindedir.

O harfi için yine dinsel anlamda bir içerik seçilmiş ve *"Baba Tasvirlerle Çok Kandırırdı"* (**О**бразами отче обманывал очень) şeklinde bir slogan kullanılmıştır. Rusya'da bazı kutsal ikonların mucizevi olarak gözyaşı akıttığına inanılır. Dolayısıyla bu harf için seçilmiş ilginç resimde gözyaşı döken Baba ikonuna bir mekanizmayla su haznesi ve küçük bir boru bağlanmıştır. Bir rahip bu hazneyi sürekli suyla doldurmakta, böylece ikonda hiç dinmeyen sahte gözyaşları yaratılmakta ve mucizenin yalan olduğu anlatılmaya çalışılmaktadır. Bu çizimle ruhban sınıfının halkın vicdanıyla nasıl oynadığı anlatılmak istenmiştir. Alfabenin **P** harfi için *"Kutsal Keşişlere Proletarya Tekmesi"* (**П**ресвятым пастырям пролетарского пластыря) sloganı kullanılmıştır. Resimde boynunda haçı, elinde hançeri ve ayaklarında svastika işaretleriyle ruhban sınıfını temsil eden bir rahip, siyah bir bot giymiş bir ayak tarafından atılan güçlü bir tekme yerken resmedilmiştir. Din adamlarının ülkeye hiç gerekli olmadığı vurgulanmaya çalışılmıştır.

Alfabenin **R** harfi için seçilen slogan *"Resim, Din Cennetinin Maskesini İndir"* (**Р**елигии рай, рисунок, разоблачай) şeklindedir. Bunun için çizilen resimde inançlı kişiler bir dağın tepesinde melek figürüyle simgelenmiş cennete doğru gitmeye çalışırken uçurumdan düşmektedir. Aslında cennet vaadinde bulunan kişi, bir kapitalisttir. Halk, onun elinde tuttuğu 'cennet' yazılı tabelaya koşarken uçurumdan düşmekte, uçurumun dibinde ağzını açmış olarak bekleyen kapitalist ise onları yutmaktadır. **S** harfi için seçilen slogan, *"Kutsal Metinler Ancak Eğlenmek İçindir"* (**С**казки-вятцы стоит смеяться) şeklindedir. Resimde bu alfabenin başkahramanı olan Bolşevik çocuk, elinde bir İncil tutmakta ve okuduğu hikâyelere gülmektedir. Alfabenin **U** harfinde *"Azizleri Yok Et. Hasadı Artır"* (**У**годников уничтожай, умножай урожай) şeklinde bir slogan kullanılmıştır. Bu harfi anlatmak üzere çizilen resim, ikiye bölünmüştür. Bir tarafta ruhban sınıfının temsilcileri, ellerinde tuttukları eski bir maşrapa ile seyrek otları sulamaktadır. Resmin üzeri, bu metotların artık geçersiz olduğunu gösteren koyu ve siyah bir çarpıyla çizilmiş, bunun yerine sağdaki resme dikkat çekilmek istenmiştir. Sağ taraftaki resimde ise dolgun başak tarlasının üzerinde bir kitap sayfası açıktır. Kitabın açık olan sayfasında bir traktör ve o dönemde Sovyetlerin teknolojik gelişimini simgeleyen bir tarım aletleri istasyonu görülmektedir. Aynı sayfada 'makineleşmiş tarım' ve 'gübreleme' kelimeleri yer almakta, böylece yeni sistemde verimin ne şekilde artırılacağı simgelenmektedir. Alfabenin **F** harfi Henry Ford karşıtıdır. Slogan, Henry Ford'un Almanya'daki faşist gruplara parasal destek sağladığı gerekçesiyle hazırlanmıştır ve *"Fabrikatör Ford Faşizmin Destekçisidir"* (**Ф**абрикант Форд фашизма форт) şeklinde bir içeriğe sahiptir. Resimde, üzerinde gamalı haç işareti olan silindir şapkasıyla Henry Ford vardır. Elinde 'bütün insanlar kardeştir' yazan bir pankart tutmakta ama etrafındaki tüm insanlar

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makineli tüfek, silah ve bombalarla birbirlerini öldürmektedir.

Alfabenin **Н** harfindeki slogan şu şekildedir: *"İsa İle Övünürler, Kırbaçla Yönetirler"* (**Х**валясь христом, хозяйничают хлыстом). Resimde, elleri zincirlenmiş bir köleye bir kapitalist kırbaçla vururken karşısında bir din görevlisi kutsal kitabı tutmakta, kitabın içinde ise 'birbirinizi seviniz' yazmaktadır. Kiril alfabesindeki **TS** harfi için *"Kilise Krallığı Zincirlerin Krallığıdır"* (**Ц**арство церквей - царство цепей) sloganı kullanılmıştır. Resimdeki inançlı kişinin gözleri bir bağla kapatılmıştır. Boynundaki haç ise bir zincirle kiliseye bağlanmıştır ve bu kişi kilisenin önünde boyun eğer vaziyette resmedilmiştir. **Ç** harfinin sloganı, *"Dikkatli Oku: Tespih Saçmalıktır"* (**Ч**итай четко: чушь четки) şeklindedir. Resim olarak yine bu alfabenin başkahramanı seçilmiştir. Bolşevik çocuk elinde zincirli bir haçı sallamakta ve dini objelerin saçma ve gereksiz olduğunu vurgulamaktadır. **Ş** harfinin sloganı *"Şamanlara ve Şarlatan Çetelerine Saldır"* (**Ш**турмуй шаманов - шайку шарлатанов) şeklindedir. Resimde yine bu alfabenin başkahramanı olan Bolşevik çocuk vardır. Bu kez bir elinde, üzerinde 'ateist' yazan ve bir traktör resmi bulunan bir kitap, diğer elinde ise dolmakalem tutmaktadır. Dolmakalemi bir silah gibi çeşitli dinlerin mensuplarına ve şamanlara karşı kullanmaktadır. Alfabenin **ŞÇ** harfinde *"Kerpeten, Sıkıştır Tüylü Dokunaçları"* (**Щ**емите, щипцы, щетинистые щупальцы) sloganı tercih edilmiştir. Silindir şapkasında gamalı haç işareti bulunduğu için Nazi Almanyası'nı/Batıyı temsil eden devasa ve tüylü bir örümcek, bütün dünyayı sarmış halde resmedilmiştir. Örümceğin kollarında din adamları ve elleri silahlı ve bıçaklı insanlar vardır. Dünya haritasında kızıla boyanmış SSCB'den uzanan, kocaman kızıl bir kerpeten ise örümceğin tüylü kollarını kesmektedir. Bu resim, dünyayı Sovyet rejiminin kurtaracağı şeklinde kurgulanmıştır. Alfabede son olarak ele alınan harf, **YU** harfidir ve sloganı *"Meczup ve Oynak Ermiş Deli Gibi Divanelik Yapıyor"* (**Ю**родивый юркий юродсвует юрко) şeklindedir. Resimde, boynunda haçlar olan bir din görevlisi kukla yerine konmuştur. Kuklaların iplerini ise bir kapitalist elinde tutmaktadır. Din görevlisi, karşısında duran köylü kadına Sovyet döneminde kurulan kolektif çiftliklere girmemesini söyleyerek onu kandırmaya, ideolojiden uzaklaştırmaya çalışmaktadır.

Sonuç

Mihail Çeremnıh'ın hazırladığı bu alfabe kitapçığında yer alan çizim ve sloganlar, din ve Batı karşıtlığını oldukça keskin çizgilerle, sert ve taraflı eleştirilerle açığa çıkarmaktadır. Kitapçığın bu kadar sembolik olması, küçüklerden çok büyükler için hazırlandığı algısını uyandırmaktadır. Hem üslup hem de tarz olarak alfabe kitapçığı daha çok ideolojik pankartları çağrıştırmaktadır. Sovyetler Birliği döneminde toplumsal hayatın bütün alanlarında yürütülen propaganda çalışmaları, kültürel belleği değiştirmede, komünist ideolojinin yaygınlaştırılmasında ve yeni insan tipinin oluşturulmasında kitlesel güce sahip en etkili silah olmuştur. Propaganda aracılığıyla, kendisini her anlamda topluma ve ideolojiye adayan, bedenen ve zihnen sağlıklı, dinç, kültürlü, materyalist ve ateist bir gençlik hedeflenmiştir. Özellikle makineleşmenin ve bilimsel gelişmenin büyük ivme kazandığı bu dönemde, insanlardan bir makine dakikliği ve verimliliğiyle çalışması beklenmiş, din konusu başta olmak üzere insanların zihnini ve bedenini oyalayacağı düşünülen her türlü tutum ve davranış, devlet kontrolüne alınmıştır. Böylece Sovyet döneminde din karşıtlığı propagandasıyla birlikte sosyal alanda ve maneviyatta yaşanan kırılma noktası, halkın yüzyıllardır süregelmekte olan inanç, gelenek ve dini uygulamalarını büyük oranda kesintiye uğratmıştır. Çoğu insan için, özellikle de yeni yetişmekte olan genç nesil için, bu köklü değişim, dini inançların zayıflaması, kafa karışıklığı ve gelişmelere genel bir kayıtsızlık olarak sonuçlanmıştır. Sovyet rejimi, sınırları dahilindeki bütün dini kimliklerin silinmesi için her ne kadar inanç sistemlerini ve dini uygulamaları toplum hayatından çıkarmaya çalışsa da bunda kısmen başarılı olabilmiştir. Din eğitimi sekteye uğramış olmasına rağmen dinsel pratik, kültürel geleneğin ve insan ihtiyacının ayrılmaz bir parçası olarak, gözlerden uzak da olsa, her koşulda varlığını sürdürmeye devam etmiştir.

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SPACE OF Λ SEQUENCES OF ORDER α DEFINED BY AN ORLICZ FUNCTION

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Abstract: Let $\Lambda = \{\lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity. Let M be an Orlicz function, $0 < \alpha < 1$ and $p = (p_n)$ be a bounded sequence of positive reals such that $p_n \geq 1$, $\forall n \in \mathbb{N}^0$. We define the following sequence space

$\Lambda_{\hat{p}}^{\alpha}(M) = \{x = (x_k) \in \omega : \sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{\rho})]^{p_n} < \infty, p > 0\}$

and give some properties about this space. Here and in the sequel, we agree to put $\lambda_{-1} = 0$ and $\Delta\lambda_k = \lambda_k - \lambda_{k-1}$, $\forall k \in \mathbb{N}^0$.

MSC 2010: 40C05,46A45,40A05

Key words: Sequence spaces, α− order, $\lambda_{\hat{p}}$− sequence spaces, Orlicz function.

Preliminaries, Notations and Introduction

$\mathbb{R}$ and $\mathbb{C}$ are the real and complex fields, respectively, and the space of all real (or complex) valued sequences is denoted by ω. $\mathbb{N}^0 = \{0,1,2,\ldots\}$ is the set of natural numbers with 0.

Throughout the study, spaces of all bounded and convergent sequences are denoted by ℓ_∞ and c, respectively. Simply, any vector subspaces of ω is called a sequence space. An Orlicz function is a function $M : [0,\infty) \to [0,\infty)$, which is continuous, nondecreasing and convex with $M(0) = 0$, $M(x) > 0$ for $x > 0$ and $M(x) \to \infty$ as $x \to \infty$.

An Orlicz function M is said to satisfy the Δ_2−condition for all values of u if there exists a constant $K > 0$, such that $M(2u) \leq KM(u)$ $(u \geq 0)$. It is easy to see that $K > 2$. The Δ_2−condition is equivalent to the inequality $M(Lu) \leq KLM(u)$ for all values of u and $L > 1$. The inequality $M(\mu x) < \mu M(x)$ is provided for all μ (0,1) by an Orlicz function.

We shall give the well known inequality below

$$|\omega_i + z_i|^{p_i} \leq T(|\omega_i|^{p_i} + |z_i|^{p_i}) \tag{1.1}$$

Where $\omega_i$and z_i are complex numbers, $T = \max(1,2^{H-1})$ and $H = sup\ p_i < \infty$.

The multipliers from X into Y are given by $X^Y = \{y \in \omega | xy \in Y, \forall x \in X\}$ for $X,Y \subset \omega$, where xy is the coordinatewise product, i.e., $xy = (x_k y_k)_{k \in \mathbb{N}^0}$ (Boos & Cass, 2000).

If A is an infinite matrix with complex entries a_{nk}, $(n,k \in \mathbb{N}^0)$, then we write $A=(a_{nk})$ instead of $A=(a_{nk})_{n,k=0}^{\infty}$. Also, we write A_n for the sequence in the n-th row of A, that is $A_n = (a_{nk})_{k=0}^{\infty}$ for every $n \in \mathbb{N}^0$. Further, if $x = (x_k) \in \omega$ then we define the A − transform of x as the sequence $Ax=(A_n(x))_{n=0}^{\infty}$, where

$$A_n(x) = \sum_k a_{nk}\, x_k \ ; \quad n \in \mathbb{N}^0 \tag{1.2}$$

provided the series on the right hand side of (1.2) converges for each $n \in \mathbb{N}^0$. For simplicity in notation, here and what follows, the summation without limits runs from 0 to ∞. Furthermore, the sequence x is said to be A − summable to $a \in \mathbb{C}$ if Ax converges to a which is called the A − limit of x.

Let $\lambda = (\lambda_k)$ satisfy the condition;

$$0 < \lambda_1 < \lambda_2 < \ldots \text{ and } \lambda_k \to \infty \ (k \to \infty). \tag{1.3}$$

$x = (x_k) \in \omega$ is λ− convergent to the number $\ell \in \mathbb{C}$, if $\Lambda_n(x) \to \ell$, $n \to \infty$ where

$$\Lambda_n(x) = \frac{1}{\lambda_n}\sum_{k=1}^{n}(\Delta\lambda_k)x_k \ , \ \Delta\lambda_k = \lambda_k - \lambda_{k-1} \ , \tag{1.4}$$

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$\forall n \in \mathbb{N}^0$ and $\lambda_{-1}= 0$. Here ℓ is called as the $\lambda-$ limit of x and if especially $\ell = 0$ then x is a λ – null sequence if $\Lambda_n(x) \to 0$, $n \to \infty$. We say that x is $\lambda-$ bounded if $sup_n|\Lambda_n(x)| < \infty$ (Mursaleen & Noman, 2010).

A $\lambda-$convergent sequence x converges in the ordinary sense if and only if $S(x) =(S_n(x))_{n=0}^{\infty} \in c_0$, where $S_0(x) = 0$ and for n ≥ 1,

$$S_n(x) = \frac{1}{\lambda_n}\sum_{k=2}^{n} \lambda_{k-1}\Delta x_k. \tag{1.5}$$

The matrix $\Lambda = (\lambda_{nk})$ is given by

$$\lambda_{nk} = \begin{cases} \frac{\lambda_k-\lambda_{k-1}}{\lambda_n} & , \quad (1 \le k \le n) \\ 0 & , \quad (k > n) \end{cases} \tag{1.6}$$

The sequence spaces ℓ_{∞}^{λ}, c^{λ} , c_0^{λ} as the sets of all $\lambda-$ bounded, $\lambda-$ convergent, $\lambda-$null sequences are *BK*- spaces with norm $\|x\|_{\ell_{\infty}^{\lambda}} = sup_n \left|\frac{1}{\lambda_n}\sum_{k=1}^{n}(\Delta\lambda_k)x_k\right|$ (Mursaleen & Noman, 2010).

The following due to Mursaleen and Noman (2010).

The inclusions $c_0 \subset c_0^{\lambda}$, c ⊂ c^{λ} and $\ell_{\infty} \subset \ell_{\infty}^{\lambda}$ strictly hold iff

$$\liminf_n \frac{\lambda_{n+1}}{\lambda_n} = 1 \tag{1.7}$$

The equalities $c_0 = c_0^{\lambda}$, c = c^{λ} and $\ell_{\infty} = \ell_{\infty}^{\lambda}$ hold iff

$$\liminf_n \frac{\lambda_{n+1}}{\lambda_n} > 1. \tag{1.8}$$

Bala (2012) proposed to extend ces_M to a more general space *ces*(*M*,p) in the same manner as ℓ_1 has been extended to $\ell(p)$ by Simons (1965). He studied various algebraic and topological properties of *ces*(*M*,p).

Main Definitions and Results

Now we shall give a generalization of the space *ces*(*M*,p).

Definition 1.1 Let $\Lambda = \{ \lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity. Let *M* be an Orlicz function, 0 < α < 1 and $p = (p_n)$ be a bounded sequence of positive reals such that $p_n \ge 1$, $\forall n \in \mathbb{N}^0$. We define the following sequence space

$$\Lambda_{\hat{p}}^{\alpha}(\mathrm{M}) = \{x = (x_k) \in \omega : \sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n} < \infty, \mathrm{p} > 0\} \tag{1.9}$$

Some well-known spaces are obtained by specializing λ_n, M and p.

(i) The space $\Lambda_{\hat{p}}(M)$ can be obtained from $\Lambda_{\hat{p}}^{\alpha}(M)$ by choose α = 1, (Karakuş & Bilgin, 2017).

(ii) The space ces(M, p) can be obtained from $\Lambda_{\hat{p}}^{\alpha}(M)$ by choose $\lambda_n = n$ and α = 1, (Bala, 2012).

(iii) If M(*x*) = *x*, $\lambda_n = n$ and $p_n = p$, (1 ≤ p < ∞) for all n, then $\Lambda_{\hat{p}}^{\alpha}(M) = ces_p$, (Shiue, 1970).

Now we give algebraic and topological properties of the space $\Lambda_{\hat{p}}^{\alpha}(M)$.

Since that are routine verifications and the proof follows by standard techniques, we give the following theorems without proof.

Theorem 1.1 Let $\Lambda = \{ \lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity, 0 < α < 1 and $p = (p_n)$ be a bounded sequence of positive reals such that $p_n \ge 1$, $\forall n \in \mathbb{N}^0$. For any Orlicz function M, $\Lambda_{\hat{p}}^{\alpha}(M)$ is a linear space over $\mathbb{C}$.

Theorem 1.2 Let $\Lambda = \{ \lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity, 0 < α < 1 and $p = (p_n)$ be a bounded sequence of positive reals such that $p_n \ge 1$, $\forall n \in \mathbb{N}^0$. For any Orlicz function M, $\Lambda_{\hat{p}}^{\alpha}(M)$ is a Fréchet space paranormed by

$$\mathrm{p}(x) = \inf\{p^{\frac{p_n}{T}} : \left(\sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n}\right)^{\frac{1}{T}} \le 1, \mathrm{H} = \sup p_n < \infty, \mathrm{T} = \max(1,\mathrm{H})\}.$$

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We now give an inclusion relation between $\Lambda_{\hat{p}}^{\alpha}(M)$ and $\Lambda_{\hat{q}}^{\alpha}(M)$ spaces. Here, we put

$$\Lambda_{\hat{q}}^{\alpha}(M) = \{x = (x_k) \in \omega : \sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{q_n} < \infty, p > 0\},$$

where $\Lambda = \{\lambda_k : k = 0,1,2,\ldots\}$ is a strictly increasing sequence of positive numbers tending to infinity, M is an Orlicz function, $0 < \alpha < 1$ and $q = (q_n)$ is a bounded sequence of positive reals such that $q_n \geq 1$, $\forall n \in \mathbb{N}^0$.

Theorem 1.3 Let $\Lambda = \{\lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity and $0 < \alpha < 1$. If $p = (p_n)$ and $q = (q_n)$ are bounded sequences of positive reals such that $p_n \geq 1$, $q_n \geq 1$, $\forall n \in \mathbb{N}^0$ and olso $p_n \leq q_n$, $\forall n \in \mathbb{N}^0$, then for any Orlicz function M, the inclusion $\Lambda_{\hat{p}}^{\alpha}(M) \subseteq \Lambda_{\hat{q}}^{\alpha}(M)$ holds.

Proof. Let $x \in \Lambda_{\hat{p}}^{\alpha}(M)$. Then there exists some $p > 0$ such that

$$\sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n} < \infty.$$

This iplies that $M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p}) \leq 1$ for sufficiently large values of n, say $n \geq n_0$ for some fixed $n_0 \in \mathbb{N}^0$. Since M is non-decreasing and $p_n \leq q_n$, we have

$$\sum_{n \geq n_0} [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{q_n} \leq \sum_{n \geq n_0} [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n} < \infty.$$

This completes the proof.

Theorem 1.4 Let $\Lambda = \{\lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity and $0 < \alpha < 1$. If $r = (r_n)$ and $t = (t_n)$ are bounded sequences of positive reals with $0 < r_n, t_n < \infty$ and if $p_n = \min(r_n, t_n)$, $q_n = \max(r_n, t_n)$, $\forall n \in \mathbb{N}^0$ then for any Orlicz function M, $\Lambda_{\hat{p}}^{\alpha}(M) = \Lambda_{\hat{r}}^{\alpha}(M) \cap \Lambda_{\hat{t}}^{\alpha}(M)$ and $\Lambda_{\hat{q}}^{\alpha}(M) = G$, where $G \subset \omega$ generated by $\Lambda_{\hat{r}}^{\alpha}(M) \cup \Lambda_{\hat{t}}^{\alpha}(M)$.

Proof. Since the proof is similar given in (Bala, 2012). We omit details.

Corollary 1.5 The following are equivalent:

(i) $\Lambda_{\hat{r}}^{\alpha}(M) \subseteq \Lambda_{\hat{t}}^{\alpha}(M)$,

(ii) $\Lambda_{\hat{p}}^{\alpha}(M) = \Lambda_{\hat{r}}^{\alpha}(M)$,

(iii) $\Lambda_{\hat{q}}^{\alpha}(M) = \Lambda_{\hat{t}}^{\alpha}(M)$.

Corollary 1.6 The following are equivalent:

(i) $\Lambda_{\hat{r}}^{\alpha}(M) = \Lambda_{\hat{t}}^{\alpha}(M)$,

(ii) $\Lambda_{\hat{p}}^{\alpha}(M) = \Lambda_{\hat{q}}^{\alpha}(M)$.

Next theorem gives an inclusion on multipliers for $\Lambda_{\hat{p}}^{\alpha}(M)$.

Theorem 1.7 Let $\Lambda = \{\lambda_k : k = 0,1,2,\ldots\}$ be a strictly increasing sequence of positive numbers tending to infinity, $0 < \alpha < 1$ and $p = (p_n)$ be a bounded sequence of positive reals such that $p_n \geq 1$, $\forall n \in \mathbb{N}^0$. For any Orlicz function M which satisfies the Δ_2-condition, the following inclusion holds:

$$\ell_{\infty} \subset \Lambda_{\hat{p}}^{\alpha}(M)^{\Lambda_{\hat{p}}^{\alpha}(M)}.$$

Proof. Let $a = (a_k) \in \ell_{\infty}$, $T = sup_k|a_k|$ and $x = (x_k) \in \Lambda_{\hat{p}}^{\alpha}(M)$. Then

$$\sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n} < \infty$$

for some $p > 0$.

Since M satisfies the Δ_2-condition, there exists a constant K such that

$$\sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|a_k x_k|}{p})]^{p_n} \leq \sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|a_k||x_k|}{p})]^{p_n}$$

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$$\leq \sum_n [M(\frac{(1+[T])\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n}$$
$$\leq (K(1+[T]))^H \sum_n [M(\frac{\frac{1}{\lambda_n^{\alpha}}\sum_{k=1}^{n}\Delta\lambda_k|x_k|}{p})]^{p_n}$$
$$< \infty$$

where $[T]$ denotes the integer part of T. this completes the proof.

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SPECIATION OF ANTIMONY USING DITHIZONE LIGAND VIA CLOUD POINT EXTRACTION AND DETERMINATION BY USN-ICP-OES

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Abstract: In this paper, a cloud point extraction (CPE) method is described and inorganic antimony species were determined by using an inductively coupled plasma optic emission spectrometer coupled to an ultrasonic nebulizer (USN-ICP-OES). Dithizone complexed Sb(III) species were trapped in the micelle from the aqueous phase using the Triton X-114 surfactant with increasing temperature. After centrifugation and phase separation, the surfactant-rich phase was dissolved with 2 M HNO3 and measured with the USN-ICP-OES. Indium (In) was used as an internal standard in order to reduce noise, random and systematic errors.

The effects of pH, surfactant concentration, ligand concentration, heating time, heating temperature and interfering ions were optimized. The effect of the rate of foreign ions and their species, as well as the parameters such as pH, surfactant concentration, ligand concentration, heating time and temperature were optimized. In the described method, Sb(V) species were reduced to Sb(III) species by L-cysteine for determination of total antimony.

For Sb(III), the determined LOD value was 0.04 µgL-1 with %RSD of 2.59 (n=12) (pH=4, 0.04 mmoL-1 dithizone, 0.06% (w/v) Triton X-114). The developed method was applied to the analysis of real water and fruit juices and validated using a certified reference material.

Keywords: Cloud point extraction, Dithizone, Ultrasonic nebulizer, ICP-OES, Speciation, Antimony.

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STATISTICAL SIGNIFICANCE TESTING OF THE PARTICLE CIRCULARITY VALUES FROM VARIOUS PRODUCTS OF SPHALERITE COLUMN FLOTATION BENEFICIATION WITH ULTRASONIC PRE-TREATMENT

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Abstract: In this study, circularity of particles from various streams (such as feed and concentrates) of sphalerite beneficiation by column flotation with and without ultrasonic pre-treatment were measured by a recent technique; Dynamic image analysis (DIA) by counting more than 20 000 particles for each population. Then the statistical significance of mean circularity values was tested by using one way ANOVA (analysis of variance) and post hoc Tukey test. ANOVA results showed that circularity values of each particle from these product streams of column flotation with and without ultrasonic pre-treatment was statistically different from each other at the confidence level of 95%. DIA results showed that the highest circularity value was obtained in the concentrate of column flotation with ultrasonic pre-treatment which gives the highest zinc grade and recovery indicating that particle circularity has small but positive effect on the sphalerite column flotation beneficiation with ultrasonic pre-treatment.

Keywords: Zinc, circularity, column flotation, ultrasonic treatment, ANOVA

Introduction

Zinc is used by the industries such as rubber, chemical, paint, and agricultural. About three-fourths of zinc used is consumed as metal for coating, alloying metal, and zinc-based die casting applications and rolled zinc (http://www.niton.com/docs/literature/infographic_zinc3.pdf?sfvrsn=2). Zinc mine production in the world in 2014 was about 13 million tons (U.S. Geological Survey, 2015) indicating that it plays an important role in the global mineral economy.

Flotation is the most widely used separation process for the recovery of sphalerite from low grade complex Pb-Cu-Zn ores. Column flotation which is a patented process since 1962 have accomplished substantial industrial application over mechanical flotation since 1981 (Wheeler, 1988). Ameliorated concentrate grades and recoveries with decreased reagent consumption are the advantages ascribed to column cells which can operate with very deep froths and can be sprayed with wash water thus achieve high concentrate grades (Deglon, 1998).

Ultrasonic bath is a tool that uses high frequency sound waves (above the range of human hearing) to agitate an aqueous that in turn acts on contaminants adhering to substances like metals. By using ultrasonic effect with zinc column flotation our recent study has shown that ultrasound pre-treatment has improved column flotation performance with respect to zinc grade and recovery in multiple stages of column flotation (19.91 and 4.96 units, respectively) (Kursun and Ulusoy, 2015).

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It is well known that flotation is a complex phenomenon in which particle shape is one of the affecting parameters of physical parameters of the particulates. Effect of particle shape on flotation has been investigated by various works regarding attachment-detachment process (Wotruba et al., 1991), the induction period for particle-bubble attachment in flotation (Verrelli et al., 2012), flotation kinetics constant of the particles (Dehghani et al., 2013; Rahimi et al., 2012), wettability (Ulusoy et al. 2004; Hiçyılmaz et al, 2004), flotation recovery (Forssberg and Zhai, 1985), and column flotation (Kursun and Ulusoy, 2006). Thus, the particle shape distribution of feed and concentrate streams of mineral flotation circuits needs to be characterized to understand how shape affects the recovery of minerals (Durney and Meloy, 1986). Dynamic Image Analysis (DIA) which is defined as image analysis methods while particles are in motion entails using techniques for dispersing particles in liquid, taking in focus, and analyzing the images using shape parameters (http://www.micromeritics.com/Repository/Files/The_Effects_of_Particle_Shape_on_Measured_Particle_Size_2011.pdf). DIA is a fast method that eradicates operator prejudice and fatigue. It brings reliability, accuracy and reproducibility regardless who is performing the analysis. In addition, it allows statistically substantial sampling of 10 000 - 500 000 particles in one measurement.

One Way ANOVA (Analysis of variance) is an analysis of variance which is used to compare mean differences in two or more groups of measurements in image analysis. When the F-test is statistically significant, the null hypothesis is rejected. However, it is still necessary to determine which of the means were significantly different from each other. Post hoc tests are essential to determine which groups are actually different (Boslaugh and Watters, 2008; Ulusoy, 2008).

The aim of this work is to measure the particle circularity values of feed and column flotation concentrates with and without ultrasonic pre-treatment (Kursun and Ulusoy, 2015) and to corroborate the statistical significance of mean circularity values from these various column flotation streams tested by using one way ANOVA and post hoc Tukey test.

Materials and Methods

In this study, the same sphalerite ore which was taken from zinc feed of the selective zinc flotation circuit in a plant (GESOM A.Ş.) treating lead-zinc-copper complex ore (Kursun and Ulusoy, 2012; Kursun, 2014; Kursun and Ulusoy, 2015) in Turkey was used. The XRD of the ore which includes 3.23% Pb, 0.52% Cu and 2.71% Zn was already reported elsewhere (Kursun, 2014). The particle size of the sample was smaller than 74 µm (100 %) for the column flotation tests (Figure 1) which were performed by a 5 x 75 cm tubular flotation column cell (Ünal Mühendislik A.Ş., Turkey). The detailed information about the column flotation experiments by single and multistage was already described in the previous study (Kursun and Ulusoy, 2015). The pulp density was used as 30%. Flotation chemicals such as KAX (Dow Chemical), $CuSO_4$ (Merck), Aerofloat 211 (Cyanamid), 2-Ethyl hexanol (Merck) and Na_2SiO_3 (Merck) were used as collector, activator for sphalerite, collector for selective sphalerite flotation, frother and gangue depressant, respectively. Operational parameters of column flotation were optimized by single stage column flotation without ultrasonic pre-treatment. Optimized dosage values of these flotation conditions include 400 g/t of $CuSO_4$, 100 g/t of Aerofloat 211, 15 g/t of 2-ethyl hexanol, 50 g/t of Na_2SiO_3, 90 g/t of KAX, 160 rpm of stirring speed, 0.170 cm/sec of superficial wash water rate, 0.425 cm/sec of superficial feed rate, 1.5 cm/sec of superficial air rate, 4 min. of residence time, 0.437 cm/sec of tailing flow rate, 0.170 cm/sec of superficial wash water rate, 0.0123 cm/sec of bias flow rate, 0.425 cm/sec of superficial feed rate and 1.5 cm/sec of superficial air rate was. Tap water (pH: 8.2) was used for the experiments and pH was arranged as 11.5 by using lime (Merck). Collected concentrates were weighed and analyzed when the system was reached to steady state. Experiments were iterated until the consistent grade and recovery values were obtained as 3 repeats. Multiple stages (3 stages of cleaning and 3 stages of scavenging) of column flotation tests were carried out with and without ultrasonic pre-treatment after single stage column flotation experiments with and without ultrasonic pre-treatment. After column flotation tests, the feed and concentrates of multiple stages (3 stages of cleaning and 3 stages of scavenging) of column flotation tests were subjected to DIA analysis for the measurement of circularity values.

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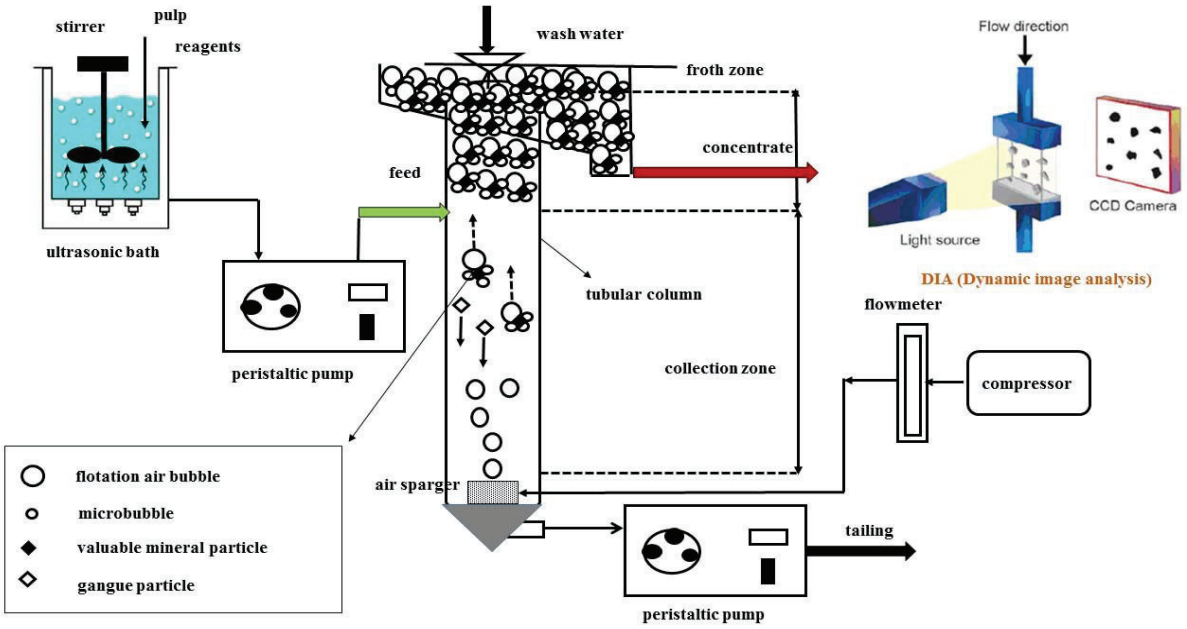

Figure 1. The experimental set-up used in this study (redrawn from Kursun and Ulusoy, 2015).

For the preparation of a few grams of representative sample to perform DIA, automatic rotary spinning riffler (Quantachrome® Instruments) was used. Then, prepared representative samples were placed in a 25 ml glass sample container added with water and hold in the ultrasonic bath for 5 min for good dispersion of the representative sample for DIA measurements.

Circularity (C) which is a fractional measure indicating shape of the particles and calculated from area (A) and bounding circle diameter (D_{BC}) as $4A/\pi D^2_{BC}$. For a spherical particle C is equal to 1 on the other hand C is lower than 1 for irregular particles such as elongated particles (Ulusoy and Yekeler, 2014).

Circularity values of sphalerite particles from three column flotation streams such as feed (C_F), concentrate with ultrasonic pre-treatment (C_{CFCUP}) and concentrate without ultrasonic pre-treatment (C_{CFC}) were determined as the average of three measurements by using a new 3D real-time dynamic image analyzer **(**Particle Insight Dynamic Image Analyzer, Micromeritics® Instrument Corp., Norcross, USA**).**

Results and Discussion

Shape results by DIA

Figure 2 illustrates the re-plotted grade and recovery results of sphalerite column flotation with and without ultrasonic pretreatment (Kursun and Ulusoy, 2015). As seen from Figure 2 ultrasonic pretreatment has increased the zinc grade and recovery obtained for both single stage and multi-stage column flotation.

Mean Circularity values of sphalerite particles from column flotation feed and concentrates with and without ultrasonic pre-treatment by DIA was shown by Figure 3 indicating that the highest circularity values obtained for concentrate with ultrasonic pre-treatment (C_{CFCUP}). Overall circularity trends were found as $C_F<C_{CFC}<C_{CFCUP}$.

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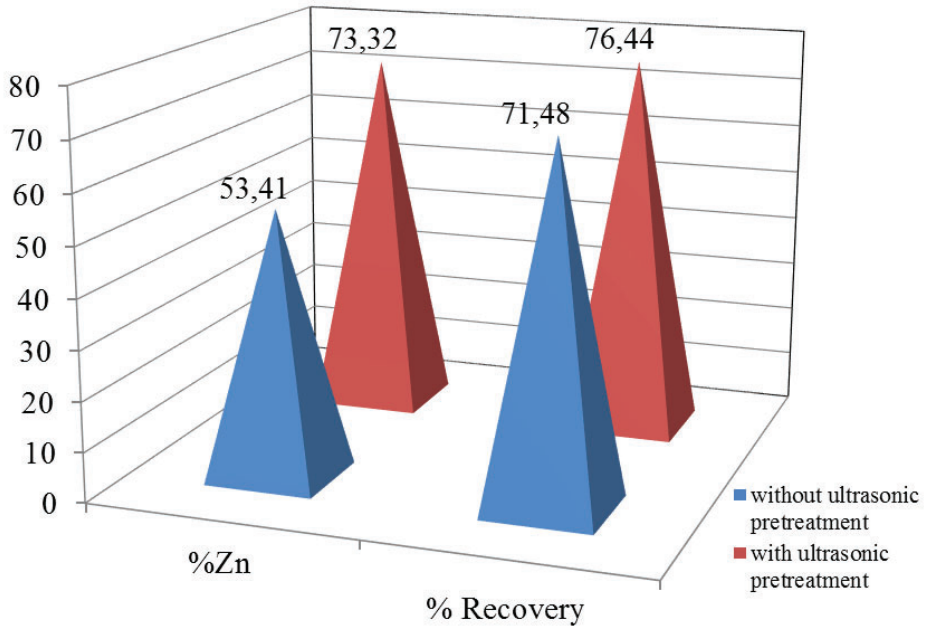

Figure 2. Zinc grade and recovery obtained for multi-stage zinc column flotation with and without ultrasonic pre-treatment (redrawn from: Kursun and Ulusoy, 2015)

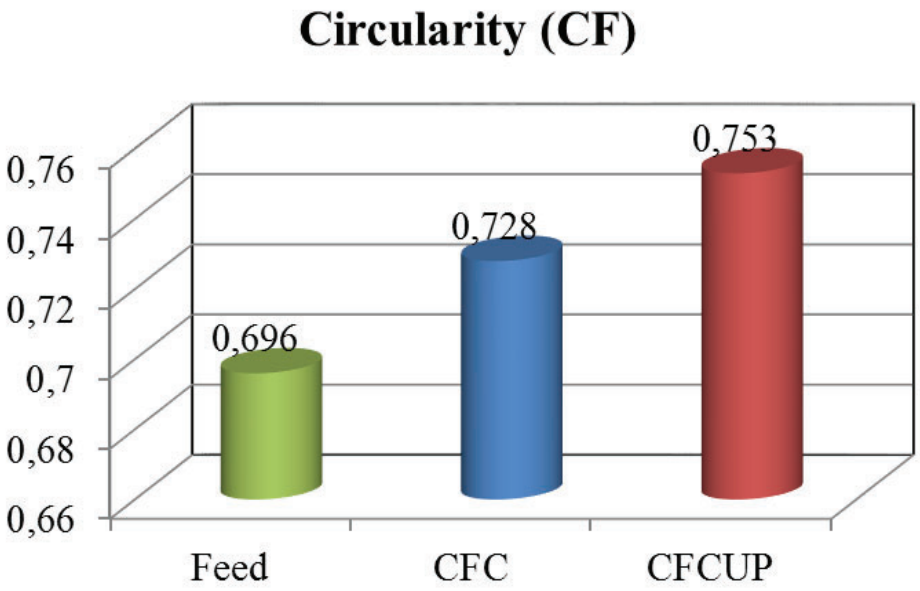

Figure 3. Circularity values measured by DIA from streams of zinc column flotation with and without ultrasonic pre-treatment (*where, F: Feed, CFC: Column flotation concentrate, CFCUP: Column flotation concentrate with ultrasonic pre-treatment)*

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As seen from Figure 4 circularity values of sphalerite column flotation concentrates for multistage column flotation were increased with increased zinc grade of the concentrates. Fig. 5 illustrates the particle thumbnail images (C_F, C_{CFCUP} and C_{CFC}) from the circularity measurements by DIA. After analysis and a review of all particles in these thumbnail images which were only a small part of about 20 000 particles for each population, they consist of partly elongated particles and partly blocky (equi-dimensional) particles not represent one type of particle shape since there are small differences in circularity values of particles from each column flotation streams.

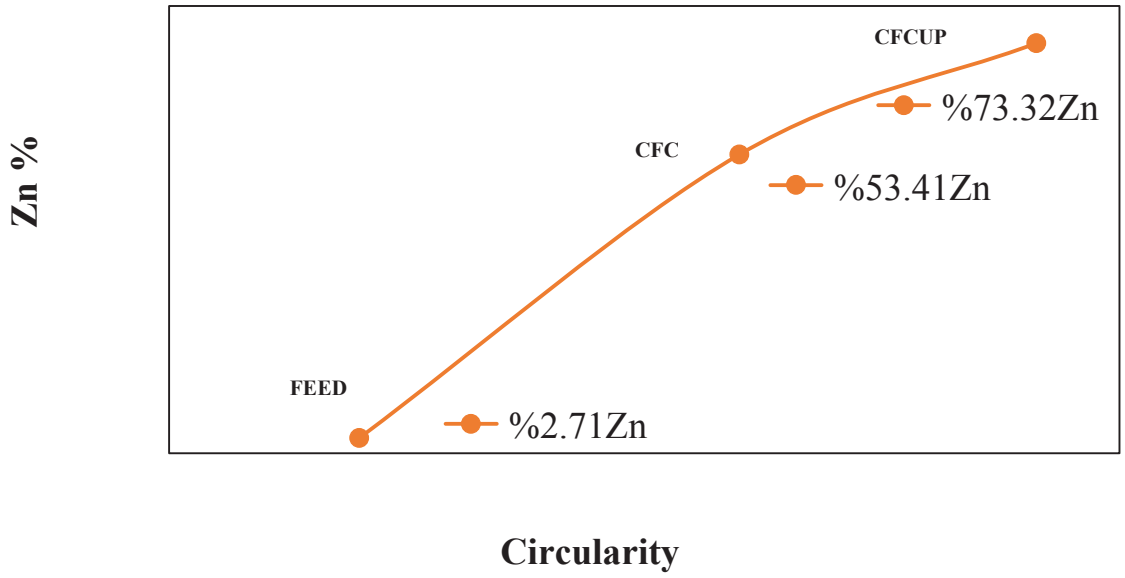

Figure 4. Changes of zinc grade with circularity values measured by DIA various streams of zinc column flotation with and without ultrasonic pre-treatment (Zn data from: Kursun and Ulusoy, 2015)

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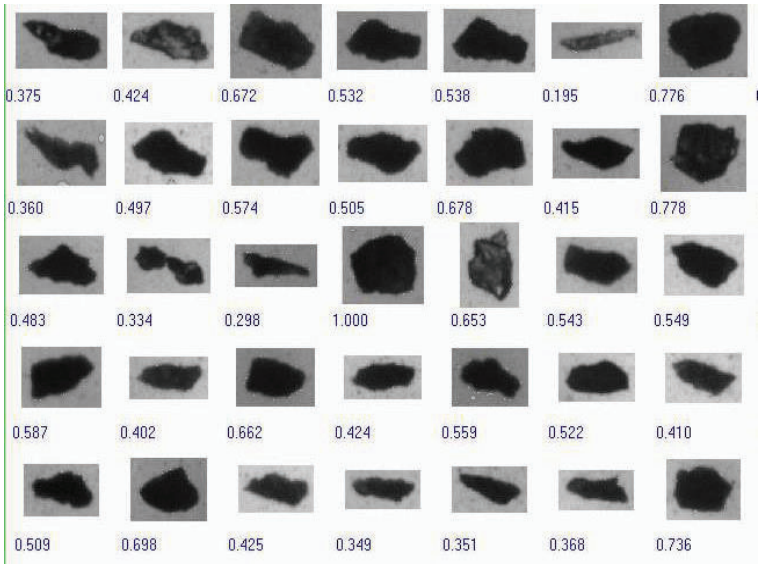
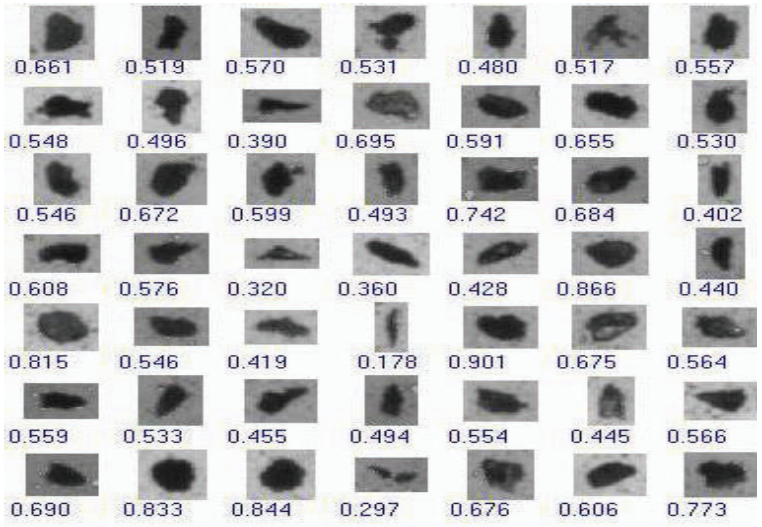


(a)



(b)

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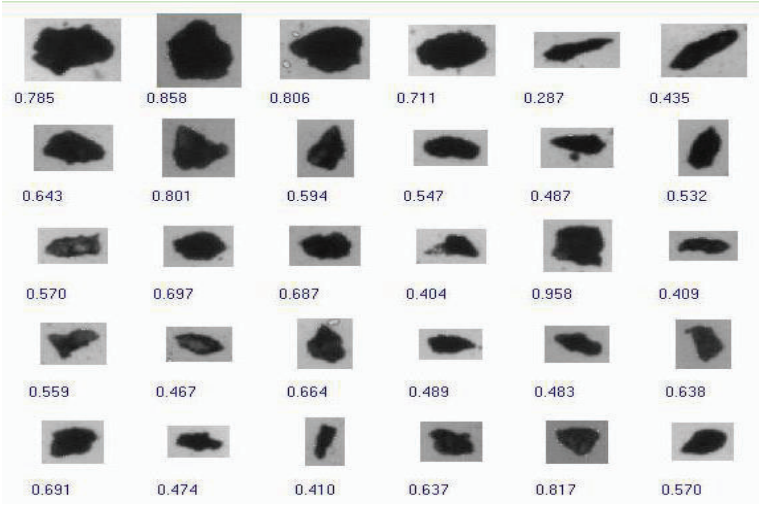

(c)

Figure 5. DIA thumbnail images of various streams of zinc column flotation with and without ultrasonic pre-teratment (a) Feed, (b) CFC, (d) CFCUP *(Where, F: Feed, CFC: Column flotation concentrate, CFCUP: Column flotation concentrate with ultrasonic pre-treatment)*

ANOVA Results

Since there is a small trend of increasing for circularity values considering the result of DIA, the significance of the circularity values of each sphalerite samples (feed, concentrate with ultrasonic pre-treatment and concentrate without ultrasonic pre-treatment) must be proved by the statistical test namely ANOVA.

The purpose of ANOVA is to assess whether the observed differences among sample means are statistically significant. ANOVA tests the null hypothesis that the population means are all equal $(H_0: \mu_1 = \mu_2 = \mu_3)$ while the alternative is that they are not all equal. This alternative could be true because all the means are different or simply because one of them differs from the rest. If H_0 is not rejected, we conclude that the population means are indistinguishable based on the data given. On the other hand, if H_0 is rejected, we would like to know which pairs of means differ. Multiple-comparisons methods address this issue. It is important to keep in mind that multiple comparisons methods are used only after rejecting the ANOVA H_0 (Moore et al., 2009).

Standard Excel™ spreadsheet data from the automated DIA analyzer were imported by a software called "Statistical Package for Social Science" 22.0 (SPSS Inc., Chicago, IL, USA) to determine whether the circularity parameter of three different sphalerite column flotation streams (feed, concentrate with ultrasonic pre-treatment, concentrate without ultrasonic pre-treatment) were statistically different from each other (Fig 6). Mean values of shape parameter for these products were compared by applying one way ANOVA (Ulusoy, 2008) and post hoc Tukey's multiple comparison tests at significance level of 0.05.

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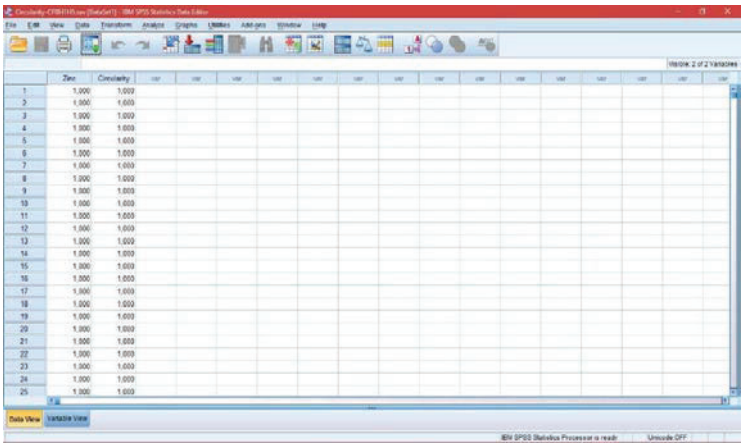
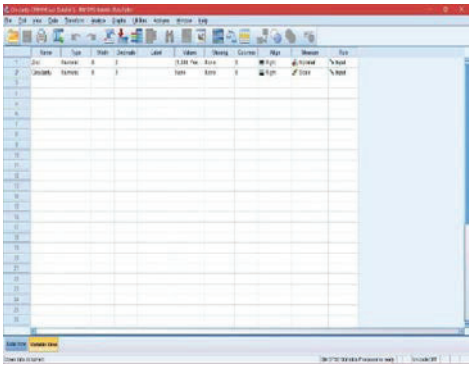
(a)



(b)



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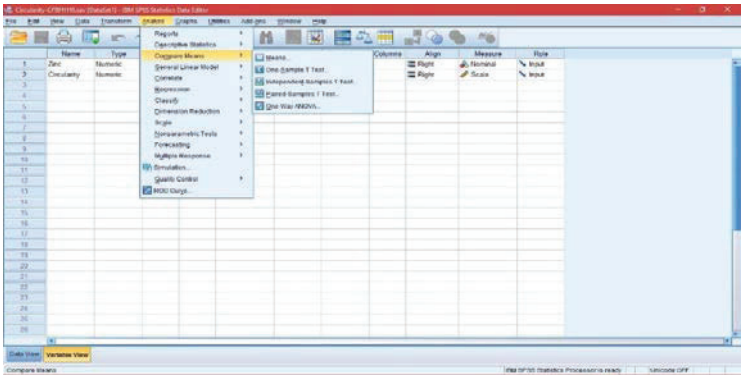

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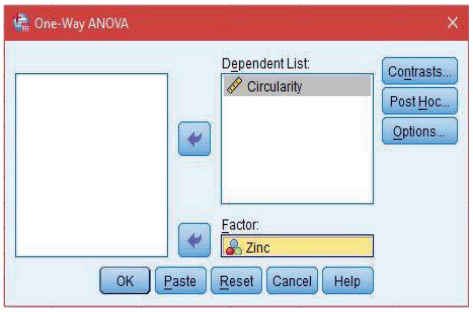

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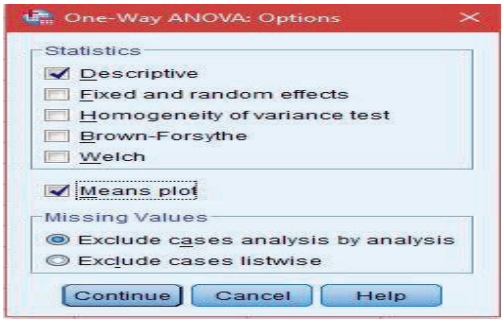
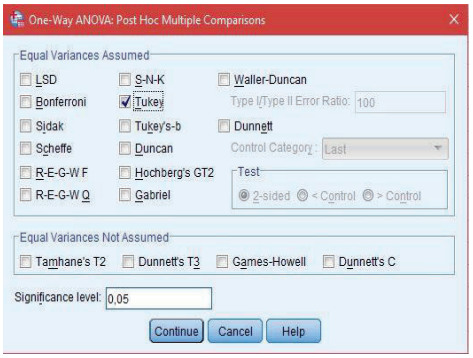


(f)



(g)

Figure 6. ANOVA study conditions by SPSS (a) version (b) data view (c) variable view (d) ANOVA menu (e) ANOVA variable (f) ANOVA options (g) Post hoc multiple comparisons.

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In Table 1 there are group statistics, which provide the means and standard deviations of the groups. Table 2 shows the test of homogeneity of variances for circularity values of sphalerite column flotation streams. From Table 2, circularity results show that the test for homogeneity of variances is significant since p=.000 which is greater than 0.05. This means that (p-value is indicating not equal variances) in the homogeneity of variances assumption is not met. The One-Way ANOVA Output was given in Table 3.

Table 1. Descriptive ANOVA results of circularity values of streams of sphalerite column flotation with and without ultrasonic pre-treatment

					95% Confidence Interval for Mean			
Circularity	N	Mean	Std. Dev.	Std. Error	Lower Bound	Upper Bound	Min.	Max.
Feed	19764	.69610	.175971	.001252	.69365	.69856	.031	1.000
CFC	19514	.72368	.161446	.001156	.72141	.72594	.110	1.000
CFCUP	19452	.75422	.166987	.001197	.75187	.75656	.054	1.000
Total	58730	.72451	.169941	.000701	.72314	.72589	.031	1.000

Where, F: Feed, CFC: Column flotation concentrate, CFCUP: Column flotation concentrate with ultrasonic pre-treatment

Table 2. Test of homogeneity of variances for circularity values of streams of sphalerite column flotation with and without ultrasonic pre-treatment

Circularity

Levene Statistic	df1	df2	Sig.
93.598	2	58727	.000

The results of the overall F test in the ANOVA summary table can be examined to determine whether group means are different. As shown in Table 3, the mean-square ratio experimentally derived (584.974) is higher than the sig. F ratio (0.00) for 95% confidence. So, it can be concluded with 95% confidence that there are significant differences among circularity values obtained for three sphalerite column flotation streams (such as feed, concentrate without ultrasonic pre-treatment and concentrate with ultrasonic pretreatment).

If the significance value (which is usually labeled p in research reports) is less than alpha H_0 is rejected; if it is greater than alpha, H_0 is not rejected. As indicated, the overall F test is significant (i.e., p value < 0.05), indicating that means among circularity values of each groups are not equal. In other words, since the value of p value is 0.000 as shown in Table 3 there are significant difference among circularity values of each groups for at the 0.05

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alpha levels. So, in this case, because the p value of .000 is less than 0.05 alpha level, the null hypothesis was rejected. The results of this ANOVA showed that there are significant differences among the groups.

Table 3. ANOVA results for circularity values of of streams of sphalerite column flotation with and without ultrasonic pre-treatment

ANOVA					
Circularity	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.129	2	16.565	584.974	.000
Within Groups	1662.963	58727	.028		
Total	1696.093	58729			

However, it is necessary to conduct post hoc comparison tests to determine which of the group means are different. Results of Tukey post hoc tests were presented in Table 4. From the Table 4 we can see that the circularity values of each sphalerite samples (feed, concentrate with ultrasonic pre-treatment and concentrate without ultrasonic pre-treatment) are significantly different from each other. Because the p value of 0.000 is less than alpha value of 0.05.

Table 4. Results of multiple comparisons by Tukey HSD post hoc tests

					95% Confidence Interval	
(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Feed	CFC	-.027576*	.001698	.000	-.03156	-.02360
	CFCUP	-.058114*	.001700	.000	-.06210	-.05413
CFC	Feed	.027576*	.001698	.000	.02360	.03156
	CFCUP	-.030538*	.001705	.000	-.03453	-.02654
CFCUP	Feed	.058114*	.001700	.000	.05413	.06210
	CFC	.030538*	.001705	.000	.02654	.03453

*. The mean difference is significant at the 0.05 level.

Where, F: Feed, CFC: Column flotation concentrate, CFCUP: Column flotation concentrate with ultrasonic pre-treatment

The homogenous subsets table (Table 5) can help us to divide the three groups into homogenous subgroups. Within each sub-group the difference in means is statistically significant for circularity. The results also indicate that groups can be put into three subsets, based on mean differences. As the Table 5 indicates, circularity means of sphalerite particles from feed, concentrate without ultrasonic pre-treatment and concentrates with ultrasonic pre-treatment are not grouped together because their means are not similar.

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Table 5. Homogeneous subsets of Tukey post hoc tests

		Subset for alpha = 0.05				
Tukey HSD[a.b]	N	1	2	3	4	5
Feed	19764	.69610				
CFC	19514			.72368		
CFCUP	19452					.75422
Sig.		1.000	1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 19575.741.

b. The group sizes are unequal. The harmonic mean of the group sizes is used.

Where, F: Feed, CFC: Column flotation concentrate, CFCUP: Column flotation concentrate with ultrasonic pre-treatment

The mean plots (graphically displays the circularity means for the three groups) that SPSS created are an effective way to illustrate the mean differences. The difference between groups was confirmed graphically by looking at the plot of means shown in Fig 7.

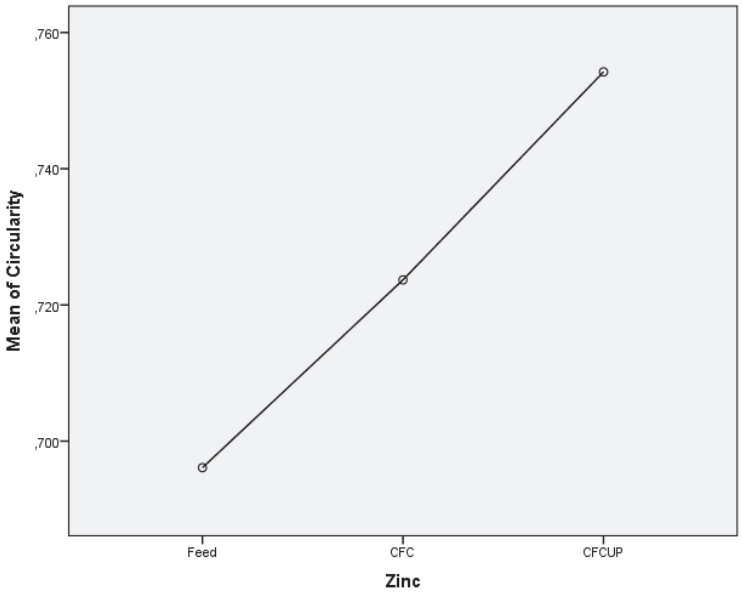

Figure 7. Mean plots for circularity of multiple comparisons for by SPSS

Conclusions

DIA results revealed that the highest mean circularity value was received in the concentrate of sphalerite column flotation with ultrasonic pre-treatment which gives the highest zinc grade and recovery pointed out that particle circularity has small but positive effect on the beneficiation by column flotation with and without ultrasonic pre-treatment.

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The differences in circularity parameter of particles among the three populations from various column flotation streams were found statistically significant with a 95% confidence level. In other words, mean circularity values analyzed by counting more than 20 000 particles for each population using DIA were not identical.

Nomenclature

ANOVA	: Analysis of variance
C	: Circularity
CFC	: Column flotation concentrate
CFCUP	: Column flotation concentrate with ultrasonic pretreatment,
DIA	: Dynamic Image Analysis
F	: Feed
H_0	: Null hypothesis
p	: Significance value
μ_1	: Population mean
Alpha	: Confidence level

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SYNTHESIS AND CHARACTERIZATION OF NOVEL SCHIFF BASES CONTAINING BENZOIMIDAZOLE AND THEIR COPPER (II) COMPLEXES

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Benzoimidazole derivatives exhibit a variety of biological and chemical activities. They are also used as dye, drug and enzyme inhibitors. In this work,novel ligands containing benzoimidazole (C,D, and E) and copper complexeswere synthesized and their structures were characterized using LC-MS, FT-IR ^{1}H-NMR and ^{13}C-NMR spectroscopic techniques.

Key Words: Benzoimidazole, schiff base and copper complex.

Synthesis and Characterization of Vegetable oils/oily acids Graft Copolymers

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Synthesis and Characterization of Vegetable oils/oily acids Graft Copolymers

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Abstract: Various polymerization techniques have been used to synthesize polymeric oil or oily acid graft copolymers using macroperoxy initiators [1,2]. The autoxidation process can occur with unsaturated oil or an oily acid under oxygen and daylight, primarily via the hydroperoxidation, peroxidation, epoxidation, and perepoxidation reactions. Free radical polymerization (FRP) [1-3], one-pot polymerization [4], redox polymerization [5], and nitroxide-mediated radical polymerization [6] have been recently used to obtain polymeric oil or oily acids polymers in our laboratories.

We reported the polymerization of autoxidized polymeric soybean oil, autoxidized polymeric linoleic acid, and polymeric linolenic acid, using N-Isopropyl acrylamide to synthesize graft copolymersand investigate their thermo-responsive properties for bioengineering and medicine applications. Another application area of graft copolymers is electronic applications due to the flexibility of their mechanical, physical, chemical and electrical properties by a selection of monomers from main chain to side chains. Through a purposeful change in monomers, mentioned properties can be adjusted. For this reason, graft copolymer materials have an important role in the development of novel smart and purposive polymers for various applications due to the fact that these materials have flexible, simpler and cheaper fabrication process.

The obtained graft copolymers were characterized by fourier transform infrared spectroscopy (FT-IR), proton nuclear magnetic resonance (1H NMR), gel permeation chromatography (GPC), thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC) and scanning electron microscopy (SEM) techniques.

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Keywords: Autoxidation, Polymeric oil/oily acid, free radical polymerization, One-pot polymerization, NMRP

ŞANLIURFA İLİ BİRECİK İLÇESİ KÖY YERLEŞMELERİNİN TOPONİMİK ANALİZİ

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Abstract: Şanlıurfa iline bağlı Birecik ilçesi Güneydoğu Anadolu Bölgesi'nin Orta Fırat Bölümü'nde bulunur. Millî kültürümüzün önemli konularından biri de ad vermedir. Adbilimin dallarından biri olan yer adları (Toponimi) ise, bir toprak parçasını vatan haline getirmesi bakımından daha çok önem kazanmıştır. Tarih boyunca Birecik çeşitli devletlerin egemenliğine girmiştir. Burada yaşayan insanlar yayıldığı geniş coğrafyadaki dağ, ova, nehir ve ırmaklara, kurduğu yerleşim merkezlerine yeni adlar vererek, buraları vatan haline getirmek ihtiyacı duymuşlardır. Aslında yer adları, yalnız orada yerleşen insan topluluklarından değil, zaman zaman o bölgenin doğal çevre özelliklerinden yani yerin yapısından, iklim şartlarından, bitki örtüsü ve üzerinde yaşayan canlılardan, ekonomik ve kültürel ürünlerinden etkilenmiş ve bu etki altında, yerler adlandırılmış yer adları ile üzerinde yaşayanlar ve çevre bir bütünlük kazanmışlardır. Bu projede Birecik ilçesindeki köy yer adı coğrafi bakış açısıyla fiziki, beşeri ve ekonomik özelliklerine göre sınıflandırılmaya çalışılmıştır. Bunu yaparken de, ülkemizin kültür zenginliğini oluşturan unsurlardan biri olan yer adlarının kaynaklarının incelenmesi ve öneminin belirlenmesine katkıda bulunma amaçlanmıştır.

Keywords: Şanlıurfa, Birecik, toponomi, coğrafya, tarih.

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ŞANLIURFA ŞEHRINDE SURIYELILERIN SOSYAL ENTEGRASYONUNDA YAŞANAN SORUNLAR

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Özet: İçişleri Bakanlığı Şanlıurfa Göç İdaresi verilerine göre Mart 2016 tarihi itibariyle Şanlıurfa ilinde 393.988 Suriyeli bulunmaktadır. Resmi rakamlara göre Suriyelilerin (393.988 kişi) % 24.7(97.483 kişi)'si Şanlıurfa şehrinde yaşamaktadır. Şanlıurfa şehrindeki Suriyelilerin hem uyum sorunu hem de kayıt dışı çalışanların yerel işgücü piyasasına olumsuz yönde etkileri bulunmaktadır. Suriyelilerin Şanlıurfa şehrinde sosyal entegrasyon sorunu yanında özellikle bazı sektörlerde (kozmetik, kuaförlük, gıda, kuyumculuk, konaklama vb.) çalışanların bir kısmının işsiz kalmasına, bir kısmının daha düşük miktarda ücret almasına ve bir kısmının da işini kaybetme riski taşımasına neden olmuş ve olmaya devam etmektedir. Dolayısıyla bu çalışmada, spesifik olarak Şanlıurfa şehrinde küçük esnaf işgücü piyasası üzerinden hem Suriyelilerin hem de Şanlıurfalıların kritik bazı küçük esnaf sektörlerinde (kozmetik, kuaförlük, gıda, kuyumculuk, konaklama vb.) bir taraftan istihdam sorununu diğer taraftan da sosyal entegrasyonun önündeki engelleri ve olası çözüm önerileri anket ve odak grup görüşme yöntemleri kullanılarak ortaya konulmaya çalışılacaktır.

Keywords: Şanlıurfa Şehri, Suriyeli Mülteciler, Sosyal Entegrasyon

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ŞEHİRSEL ARAZİ KULLANIMI VE ŞEHİRSEL ARAZİ KULLANIMI SORUNLARI: SURUÇ ŞEHRİ (ŞANLIURFA) ÖRNEĞİ

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Özet: Şehirler beşeri ve ekonomik fonksiyonları olan ve bu fonksiyonları itibariyle içinde yaşayanlara ve çevresindeki kırsal alanlar ile daha küçük şehirlere bu hizmetleri götüren ve bir takım ihtiyaçlarını bu alanlardan karşılayan yerleşmelerdir. Bu nedenle şehirlerde birçok beşeri (ikamet, sağlık, eğitim, kültür, eğlence ve dinlence, dini) ve ekonomik (endüstri, ticaret, ulaşım, turizm, bankacılık/ sigortacılık ve diğer mali işler) fonksiyonlar gelişmiştir. Her bir şehirsel fonksiyonun icra edilmiş olduğu alanlar şehirsel kullanım özelliklerini ortaya çıkarmaktadır. Şehirsel arazi kullanımının düzenli olması, şehirsel yaşam konforunu artıran bir özellik iken, yanlış arazi kullanımı, ulaşım, elektrik, su, yol vb altyapı hizmetlerini, eğitim ve sağlık olanaklarına ulaşmada güçlükler, hava, toprak ve su kirliliği, tarımsal alanların imara açılması gibi birçok zoruna yol açmaktadır.

Bu çalışmada yaklaşık olarak 5 bin yıllık bir yerleşme tarihi olan Suruç şehrinin, şehirsel fonksiyon ve alanları ile şehirsel arazi kullanımından kaynaklanan sorunların ortaya çıkarılması ve çözüm önerileri geliştirilmesi hedeflenmiştir. Bu amaçla Suruç şehrinde coğrafyanın temel araştırma metodu olan gözlem metodu kullanılmıştır. Yerinde yapılan gözlemlerle şehrin fonksiyon alanları haritalanmış, fonksiyon alanlarının dağılışı coğrafyanın dağılış, bağlantı ve nedensellik ilkeleri ışığında analiz edilmiştir.

Çalışmanın sonucunda idari fonksiyon alanlarının şehrin merkezi alanlarında, ticari fonksiyon alanların Mürşitpınar Caddesi etrafında yoğunlaştığı ve ikamet alanlarının bu alanların etrafında geliştiği ortaya çıkmıştır. Ayrıca sağlık, eğitim, dini fonksiyon alanları şehrin farklı kesimlerinde dağılış gösterirken, sanayi fonksiyonu genel olarak şehrin kuzeyinde yoğunluk kazanmıştır. Bu arazi kullanımın bir sonucu olarak trafik, imar, tarım alanlarının işgali, cadde ve sokak sisteminde yetersizlik/düzensizlik gibi sorunlar tespit edilmiştir.

Anahtar Kelimeler: Şehir Coğrafyası, Şehirsel Arazi Kullanımı, Şehirsel Fonksiyonlar, Şehirsel Problemler, Suruç.

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TEACHING ENGLISH FOR CHEMISTRY AT A JAPANESE UNIVERSITY

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Abstract: Although studying English presents considerable difficulties for Japanese university students, in this time of globalism, our students are expected to read and write academic articles in English. To address this problem, we chose a basic word list of 2188 words, and compiled an academic word list of 776 words for a sub-discipline of organic chemistry using a "tailored" corpus. The two lists combined cover 85.72% of words in 100 papers from an academic journal, which would facilitate students' access to the sub-discipline in English.

Keywords: ESAP, academic word lists, tailored corpora

Introduction

Reading and writing academic papers in English presents considerable difficulties for Japanese university students. One important contributing factor to this difficulty is the students' lack of appropriate vocabulary needed to consume and produce academic papers in English. In a Japanese context, these lexical gaps can be attributed, in part, to the absence of informed and carefully created word lists based on students' needs. In order to begin approaching the word coverage necessary to read academic articles in English, not only do learners need to know high frequency words from a basic word list, but also a sufficient number of academic words connected to their specific sub-discipline. Thus, one means of alleviating this difficulty that Japanese students face is by employing corpora in the selection and compilation of basic and academic word lists.

As for a basic word list, although the Japanese Ministry of Education and Science states that a student should learn 3,000 English words at junior and senior high school, it does not specify exactly which words to learn. Thus, an English instructor at a Japanese university needs to select which basic word list to provide students with prior to teaching academic words. However, there are some reasons why basic word lists compiled in English-speaking countries such as *GSL*, *NGSL*, *the BNC/COCOA lists* are not appropriate as the basic word lists in Japan. Another issue is an academic word list: we need a concise and precise word list for our students to learn efficiently over a short period of time. To solve this problem, Coxhead (2000a, b) proposed The Academic Word List, hereafter AWL for short. She claimed, together with a basic word list of 2,000 words, her AWL covers 95% of any kind of academic writing. Since then, a number of English for General Academic Purposes (hereafter EGAP) academic word lists have been compiled. Hyland & Tse (2008), however, who contend that it is impossible to compile a list for academic English in general. Instead, they posit that all we can do is compile academic word lists for each individual discipline, namely, English for Specific Academic Purposes (hereafter ESAP) academic word lists. Since then, several ESAP academic word lists have been compiled. In this research, we discuss issues concerning a basic word list, an academic word list for Chemistry, and how to compile an academic word list for Chemistry using a "tailored" corpus.

Materials and Methods

We chose JACET2188 as the basic word list for two reasons: 1) the list is based on English teaching textbooks published by major Japanese textbook companies and 2) the list is oriented towards academic writings, which differentiates itself from lists complied in English-speaking countries (e.g. GSL, NGSL, BNC, COCA,

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Oxford2000/3000), which are oriented towards conversation. We designed our academic word list to be ESAP for chemistry majors. Moreover, we decided it should not be chemistry in general but a sub-discipline of chemistry, namely, organic chemistry. This would allow for us to develop more fine-tuned word lists for those learners involved in this sub-discipline of chemistry. Furthermore, we selected one academic journal of organic chemistry rather than several academic journals of organic chemistry. It is crucial that the list is entirely made for the journal. This reason is that a highly customized list for a specific journal would allow for learners to engage in the narrow reading of highly similar articles. As learners begin to learn words from the word lists, not only will their word coverage increase for the journal's articles, but they will also be able to deepen their lexical knowledge through seeing the same words many times and in varied contexts. By developing a list in such a way, we "tailor" it to suit the specific needs of a learner population, which in this case are Japanese chemistry students who engage in the narrow reading of organic chemistry in a targeted journal. That is why we call the list "tailored". Just like tailors pick up a fabric, we picked up one particular academic journal. To the best of our knowledge, this is the first academic word list targeted for a single academic journal. 100 papers from an online journal, *Journal of American Chemical Society* (hereafter JACS for short) were chosen, around 0.6 million in total. We turned the 100 papers into an online corpus database, which allowed us to retrieve words automatically. Out of the corpus, we retrieved words automatically. See Shimizu & Murata (2010, 2012, 2013, & 2015) for how to compile a corpus and retrieve words. After compiling the corpus, we parsed the texts, tagged and stemmed words, extracted all words according to occurrences, and obtained nouns, verbs, adjectives, adverbs, and others. Following this, we selected frequent words, which we defined as those words occurring over 50 times for nouns, verbs, and adverbs, and over 100 times for adjectives and others. Next, we deleted words listed in New JACET2188 from the academic word list unless they were: 1) listed with different parts of speech or, 2) technical terms. The final stage was also key to this research because frequency searches alone cannot account for the full range of what makes a word useful. Thus, we asked chemistry experts for their opinions on English for the journal, and deleted and added words accordingly.

Results and Discussion

As a result, an academic word list of 598 nouns, 134 verbs, 38 adjectives, 4 adverbs, 4 others, and 787 words in total, were obtained.

First, we will turn our attention to the nouns. The top 10 most frequent nouns are *Figure* (1064 times), *datum* (742), *protein* (722), *molecule* (495), *complex* (459), *substrate* (480), *pH* (438), *NMR* (426), *spectra* (425), and *mechanism* (419). We might regard a few words such as *Figure*, *datum* and *mechanism* as EGAP. Observe *Figure* is spelt with the capital *F* here because the word is used as *in Figure 3.2*. EGAP words, however, consists of just 14.16% of all nouns in the list. The majority of nouns are ESAP words such as *protein, molecule, complex, substrate, pH, NMR,* and *spectra*. Note the word *complex* here is not an adjective but a noun, "a type of compound."

The top 10 most frequent verbs are *observe* (595), *support* (519), *determine* (425), *contain* (419), *bind* (415), *suggest* (405), *form* (378), *obtain* (377), *provide* (364), and *indicate* (335). The majority of the top 10 most frequent verbs are EGAP words such as *observe, support, suggest, obtain, provide, indicate, determine* and *contain*. However, we also have ESAP words such as *bind* and *form*. When we consider the whole verbs, we recognise that EGAP words are only 28.57 % of all verbs of the list.

EGAP words such as *experimental (480), binding (362), molecular (346), structural (298), catalytic (269), solvent (251), significant (223), consistent (211), available (205), radical (179)* are the top 10 most frequent adjectives. However, we also have ESAP words such as *binding, molecular, catalytic,* and *solvent*. EGAP words consist of 37.57% of adjectives in the list. The top 10 most frequent adverbs, *respectively* (199), *previously* (164), *significantly* (131), *approximately* (100), *relatively* (97), *typically* (67), *furthermore* (67), *readily* (64), *experimentally* (64), *negatively* (61) are all EGAP words, but we also have ESAP words. EGAP words consist of 28.57% of adverbs in the list. Others, mainly prepositions and conjunctions, *due to* (101), *such as* (86), *whereas* (84), and *as well as* (54), are all EGAP words.

Let us now discuss whether the academic word list should be EGAP or ESAP. According to Paquot (2010), her Academic Keyword List (henceforth AKL), an EGAP academic word list consisting of 354 nouns, 233 verbs, 180 adjectives, 87 adverbs, and 75 others, covers 95% of any academic writing, including academic journal articles, textbooks, PhD dissertations, MA theses, and lab reports. We compared AKL with The JACS academic word

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list. It turned out that only 18.29% of all words are common. The nouns common to AKL and The JACS academic word list, for instance, are *Figure, datum,* and *mechanism*, which are general, but occur frequently in the academic journal.

In contrast, nouns occurring only in the JACS academic word list are specific to Chemistry. Note that the word *complex*, for example, is not an adjective meaning "difficult to understand" but a noun meaning "a kind of compound". We took chemistry experts' advice and deleted quite a few words such as *sugar* and *H*, which they considered too basic. There was another set of words we deleted after following their advice such as *alamethicin*, *bicelles*, and *dysfanction*, which were too technical. We also added words which chemistry professors recommended. In other words, their opinion aided in fine-tuning the list for maximum utility.

We now turn to nouns occurring only in AKL, namely, *ability*, *action*, *advice*, *adult*, *age*, and so on. We see that they are not relevant to Chemistry. We could safely claim that an EGAP list might not be very efficient.

We checked the coverage of New JACET2188 and the JACS academic word list. We discovered that the coverage of the former is 70%. Incidentally, the coverage of General Service List is 63%, which suggests that the JACET list is a more suitable basic list for students. The coverage of the JACS academic word list is 15.72%. The total coverage is 85.72%, and we would like to state that it is satisfactory for a start.

Conclusion

To conclude, we claim that a basic word list and an ESAP academic word list can provide an efficient platform for English for Chemistry majors reading academic papers in English. We would like to improve the coverage of 85.72% to 90% in the near future, and 95% ultimately, so that English learners can reach the threshold necessary for reading seamlessly without the need to consult a dictionary.

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TECHNOLOGICAL PROPERTIES OF PLYWOOD BONDED WITH PHENOL-FORMALDEHYDE RESOL RESIN MODIFIED WITH BIO-OIL

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Abstract: Phenol-formaldehyde (PF) resol resins were produced by substituting up to 20 wt% of phenol with bio-oil by modifying the chemical synthesis process. Pine sawdust was converted into renewable chemical feedstock for the production of bio-oil modified PF resins. FT-IR analysis was performed to characterize the organic functional groups in bio-oil modified PF resins. In comparison to a commercial and lab-made PF resins, the bio-oil modified PF resins were found to have larger average molecular weights, higher polydispersity indices and shorter gel times. The plywood composites produced with bio-oil modified PF resin up to 20 wt% had better mechanical properties and wet bond strength as compared to commercial and lab-made PF resins.

Keywords: Bio-oil, technological properties, Phenol-formaldehyde, wood

Inroduction

Phenol formaldehyde (PF) resol resins are made from formaldehyde and phenol in the presence of an acid or a basic catalyst. PF resins have long been used widely as wood adhesives in the production of wood-based panels such as plywood, fibreboard, and particleboard, due to their excellent bonding performance, water resistance and durability. More than 95% of phenol all over the world, the primary component in PF resins, is made from petroleum-derived benzene (YI et al., 2012). Its price and availability are linked to that of petroleum. Due to growing concern for environmental pollution, reduction of availability of fossil energy resources (petroleum and coal), and increasing prices of petroleum chemicals, researchers have focused on renewable resources as an alternative resources to substitute for phenol in PF resins (Wang et. al., 2009; Roy et al., 2000; Wang et. al., 2011; Alma et al., 2011; Tejado et al., 2007; Junming et al., 2010; Aslan et al., 2015). Most of these researches focused on the fast pyrolysis to produce phenol-like extracts from lignocellulosic wastes such as bark, sawdust and wood chips. For example, Himmelblau and Grozdits (1991) synthesized PF resins with a phenol substitution of 50 wt% by bio-oil obtained from fast pyrolysis of mixed hardwoods (maple, birch, and beech) (Himmelblau and Grozdits, 1991). These resins showed nearly as well in making three-ply plywood of southern pine as a commercial resin. In other study, Amen-Chen synthesized the bio-oil-PF with a phenol substitution of 25-30% by bio-oil from the bark of softwood and prepared OSB (Amen-Chen et al., 2002). Bio-oil derived from the pyrolysis of biomass is a potential phenolic substance in biomass because it has a high amount of several phenolics (Ngo et al., 2013). Pyrolysis converts biomass at temperatures around 500 °C in absence of oxygen to liquid (bio-oil), gaseous and solid (char) fractions. The bio-oil is a mixture of about 20 types of major and minor organic compounds including phenols, aldehydes, alcohols and carboxylic acids, derived primarily from the lignin in the feedstock (Aslan et al., 2015).

The aim of this work is to demonstrate the performances of bio-oil modified PF resol resins considered as adhesive in the production of plywood used for outdoor applications. The PF resins were produced by substituting up to 20 wt% (5, 10, 15, and 20 wt%) of the phenol with bio-oil by modifying the chemical synthesis process under alkali condition. The technological properties of plywood panels produced with the PF resins modified with different amounts of bio-oil were determined and the results were compared with those of plywoods produced with commercial PF and lab-made produced PF resins.

Materials and Methods

Biomass and wood veneer

Scots pine (*Pinus sylvestris* L.) wood was used in this study as lignocellulosic biomass, which was one of the widespread and abundant tree species in the world. Biomass was ground in a laboratory type grinder and then sieved to less than 1 mm. The wood sawdust was dried in an oven at 102 °Cfor 12 h prior to use as a pyrolysis

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sample. Defect-free beech wood (*Fagus orientalis* Lipsky) veneers with dimensions of 500 mm x 500 mm x 1.5 mm were used in the production of plywood samples.

Chemicals

Two types of control resin which were commercial PF resin and lab-made produced PF resin were used as reference resins in comparison to the bio-oil modified PF resins. The ready-to-use commercial PF adhesive was supplied by *Polisan chemical company* in Izmit, Turkey. Lab-made PF resin and bio-oil modified PF resins were produced in the laboratory reactor in the chemistry laboratory of Karabuk University, Karabuk city, Turkey. Bio-oil modified phenol resins were synthesized by using commercial phenol (liquid) and formaldehyde aqueous solution (37 wt%) supplied by *Gentaş chemical Company*, Izmit, Turkey. The commercial NaOH chemical used in these experiments was purchased from *Sigma Aldrich Com.*

Production and chemical characterization of the bio-oil

The pyrolysis of biomass was carried out at a final temperature of 500 °C and a total pressure lower than 10 kPa. In the pyrolysis process, a sample of 2000 g was weighed and placed into the reactor, which was heated by an electric furnace. During the experiments, the heating rate and pyrolysis temperature were controlled with a Proportional-Integral-Derivative (PID) controller. The pyrolysis final temperature was set to 500 °C and maintained for 60 min. After the pyrolysis was terminated, the liquid product was collected from the condensers. The chemical composition of the bio-oil was determined by GC/MS analysis. The procedure was extensively explained in previous publications (Ozbay, 2015; Ozbay; Ayrilmis, 2014). The data acquisition system used was G1035A software with a NIST library.

Chemical synthesis of resins

Bio-oil was used without further pre-treatment for the synthesis. The preparation procedure was as follows: the reactor was charged with 700 g of phenol, and then 1100 g formaldehyde (37 wt%) and 62.5 g of NaOH solution (50 wt%) (1/3 of total NaOH weight) were mixed in the resin reactor. The replacement levels of phenol by the bio-oils were 5 wt%, 10 wt%, 15 wt%, and 20 wt%. The reaction temperature increased from room temperature to 60 °C within 60 minutes. The reaction mixture was heated to 90 °C and kept at 90 °C until dynamic viscosity of resin reached between 600-800 cPs, and then the second part NaOH (50 wt%) solution was added into the reactor at temperature of 60 °C. After the reaction was completed, the reactor was cooled to room temperature.

Characteristics of resins

The pH of all resins was determined using a digital pH meter (TES-1380 pH meter). The pH value from the instrument was recorded. The dynamic viscosity of resins was measured with a rotational viscometer (Brookfield digital viscometer, model: Dv-IPrime) according to ASTM D1084-08 (2008). Measurement of solids content was performed according to ASTM D 3529 (2008). Gel time was measured by charging 5 g of resin into a test tube and heating the test tube in an oil bath at 100 °C. Gel time was defined as the time period from the immersion of the test tube into the oil bath to the beginning of the resin. The elapsed time until the point when no further stirring was possible was defined as the gel time for the sample. FT-IR measurements were carried out in an Alpha FT-IR instrument by direct transmittance using KBr pellet technique. Each spectrum was recorded at a rate of 10 scans, in the range from 4000 to 400 cm^{-1} with a resolution of 4 cm^{-1}.

Production of plywood samples

The plywood specimens were produced under laboratory conditions. For this aim, each of control and bio-oil modifed PF resins was spread on a single bonding surface of the beech veneers with dimensions of 500 mm x 500 mm x 1.5 mm at the rate of 220 g/m^2 based on wet mass, using a hand brush. Both surface of the core veneer was glued with the PF resin. Top and bottom veneers were placed with their grain directions perpendicular to the grain direction of core veneer to produce three-layer plywood. The plywood mats were hot pressed under a pressure of 0.2 N/mm^2 and press temperature of 160 ºC for 6 min. Six different types of plywood panels were produced using the experimental PF resins which were commercial PF resin, lab-made PF resin, and PF resins modified with bio oil of 5, 10, 15, and 20 wt% contents, respectively. The resulting plywood panels were conditioned in a conditioning room having 65% relative humidity and 23 °C.

Determination of mechanical properties and bonding performance of plywood

Mechanical test specimens were prepared from the conditioned plywood panels. The bending properties of the plywood specimens, three-point bending strength (MOR) and modulus of elasticity (MOE), were determined according to EN 310 (1993) standard. For the bending properties, 20 specimens (10 specimens parallel to the plywood face grain and 10 specimens perpendicular to the plywood face grain) from each group, in total 120 specimens, were tested. Testing specimens were immersed in boiling water for 4 h, dried in the ventilated drying oven at 60±3 °C for 16 h, immersed in boiling water for 4 h, followed by cooling in water at 20±3 °C for at least

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1 h to decrease the temperature of test specimens to 20 °C. The tensile shear strength parallel direction to the grain of the surface layers of the conditioned specimens was determined on the universal testing machine (*Lloyd instruments*) according to class 3: exterior conditions specified in EN 314-1 (2004) standard. Tensile shear strength determines the bonding strength between the veneers of plywood. 15 specimens for each type of plywood, in total 90 specimens, were tested for the tensile shear strength.

Statistical analysis

For each PF resin formulation, one-way analysis of variance, ANOVA, was conducted ($p< 0.01$) to evaluate the effect of bio-oil content in PF resin type on the flexural properties mechanical properties of plywood panels. Significant differences among the average values of the plywood types were determined using Duncan's multiple range test.

Result and Discussion

GC/MS analysis of the bio-oil

The main peaks identification of compounds was performed by using GC/MS was presented in Figure 1. It was found that the bio-oil was mainly composed of phenolics such as phenol, 3-methyl-phenol, 4-methyl-phenol, 2-methoxy-phenol, 2,3-dimethyl-phenol, 2-methoxy-4-methyl-phenol. The high content of phenols could be used as feedstock for chemical synthesis such as adhesive production. Therefore, many researchers focus on pyrolysis to produce phenolic compounds (OZBAY, 2015; CHEN et al., 2008; WANG et al., 2010).

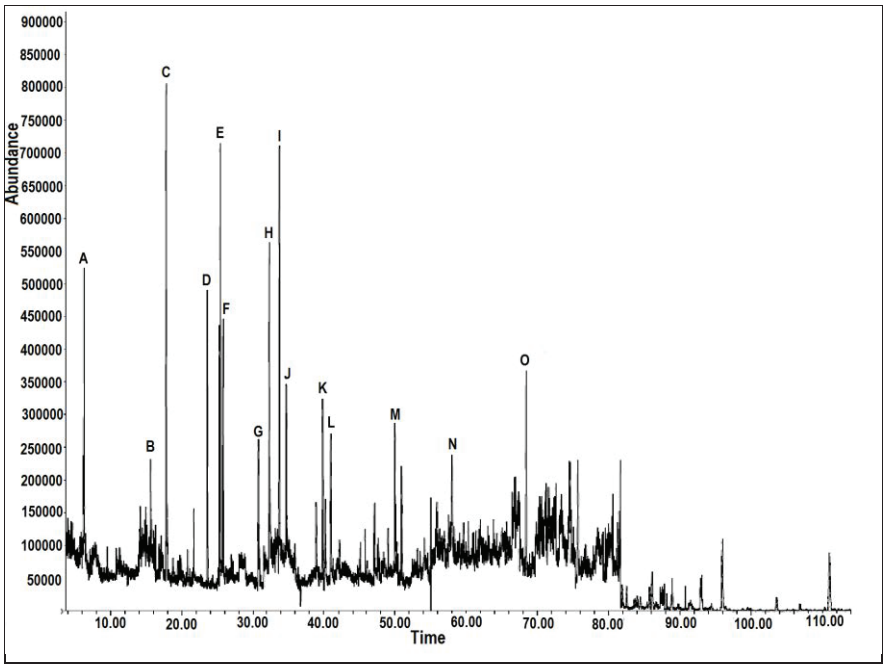

Figure 1. GC/MS chromatogram of bio-oil (**A**: furfural, **B:** 5-methyl-2-furancarboxadehyde, **C:** phenol, **D:** 3- methyl-phenol, **E:** 4-methyl-phenol, **F:** 2-methoxy-phenol, **G:** 2,3-dimethyl-phenol, **H:** naphthalene, **I:** 2-methoxy-4-methyl-phenol, **J:** benzenediol).

Physical properties of resins

The properties of the control and synthesized resins were given in Table 1. The pH values for the modified resins and the lab PF resin were similar, while pH value of commercial PF resin was lower than all modified resins (Table 1). The presence of bio-oil during the synthesis process of a biopolymer clearly affects the viscosity of the resulting resins. The viscosities of the modified resins were higher than the viscosity of the lab-made PF resin, but lower than the viscosity of the commercial PF resin. Some larger molecular compounds came from bio-oil could give rise to high viscosity in the bio-oil modified PF resol resins. The solids content of 5, 10, 15, and 20 wt% bio-oil modified PF resins were found to be 42.62, 42.84, 44.14, and 44.58 wt%, respectively. The solids content of the modified resins was lower than that of the commercial PF resin (48.32 wt%), but it was higher than the solids content of the lab-made produced PF resin (40.65 wt%). Commercial PF resin usually contains a high amount of urea (Zhao et al., 2010). Urea is the main cause of high solids content.

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Table 1. Properties of the unmodified and modified PF resins.

Type of adhesive	Properties of the PF resins			
	pH (20 °C)	Viscosity (25 °C, cPs)	Solids content (%wt)	Gel time at 100 °C (s)
Commercial PF resin	11.00 (0.014)[1]	385 (1.1)	48.32 (0.21)	170 (0.44)
Lab-scale PF resin	11.95 (0.009)	205 (1.2)	40.65 (0.17)	164 (0.28)
PF resin modified with 5 wt% bio oil	11.83 (0.023)	354 (1.6)	42.62 (0.11)	156 (0.57)
PF resin modified with 10 wt% bio oil	11.78 (0.014)	364 (1.3)	42.84 (0.56)	148 (0.34)
PF resin modified with 15 wt% bio oil	11.76 (0.016)	371 (1.2)	44.14 (0.32)	122 (0.42)
PF resin modified with 20 wt% bio oil	11.64 (0.011)	374 (1.3)	44.58 (0.28)	120 (0.53)

[1]The values in the parentheses are standard deviations.

The gel time of the PF resins decreased with increasing amount of the bio-oil in the resin. Among the modified resins, the PF resin modified with the 20 wt% bio-oil had the shortest gel time with a value of 120 s while the PF resin modified with the 5 wt% bio-oil had the longest gel time with a value of 156 s. The gel time of the bio-oil modified resins were longer than that of the commercial and lab-made resins The gel time values of the lab-made PF resin and commercial PF resin were found to be 164 s and 170 s, respectively. These findings were similar to the properties of the bio-based PF resins investigated in previous studies (Aslan Et Al., 2015; Ozbay; Ayrilmis, 2014; Zhao et al., 2010; SukhbaataR et al., 2009). The bio-based PF resol resins had higher molecular weights, higher polydispersity indices, shorter gel times, and faster curing rates than the lab synthesized control PF resin (Zhao et al., 2013). A similar behaviour of the bio-oil modified PF resin was observed in this study.

Chemical analysis of resins

The FT-IR spectra of commercial PF resin, lab-made PF resin, and a representative bio-oil modified PF resin are presented in Figure 2. The changes in the functional groups of bio-oil modified PF resins given in the FT-IR spectrum were compared with commercial and lab-made produced PF resins**.** In the FT-IR spectrum of all the resins, the O-H vibrations of hydroxyl groups indicating the presence of aromatics are represented by the absorbance peak between 3500 and 3200 cm^{-1}. The presence of alkanes was shown by the absorbance peak of C-H stretching vibrations between 2900 and 2800 cm^{-1}. An appearance of new bands at around 1650 cm^{-1} was observed in the resin modified with bio-oil (5-20 wt. %). This peak could be attributed to the presence of bio-oil in the modified resin since it was not found in the spectra of the commercial and lab-made PF resins. In a previous study, Tejado et al. (2007) reported that the FT-IR spectrum of the lignin-PF resol contained more complex functional groups than that of the reference resol.

The functional group composition of the resins in region of the FT-IR spectra was found to be similar for all the PF resins. It could be said that synthesis of bio-oil, phenol and formaldehyde was successful performed based on the FT-IR spectrum of the functional groups. In comparison with the commercial PF resin and lab-made PF resin and, the bio-oil modified PF resol resins were found to have higher molecular weights, higher viscosities and shorter gel times. Phenolic compounds of the lignocellulosics can be used used as an accelerator of the PF resin in wood-based panel industry due to its ability to minimize gelation and shorten press time (Vázquez, 1989; Vázquez, 2002; Trosa, 2001). Similar results were observed for the phenolic compounds of the bio-oil in this study.

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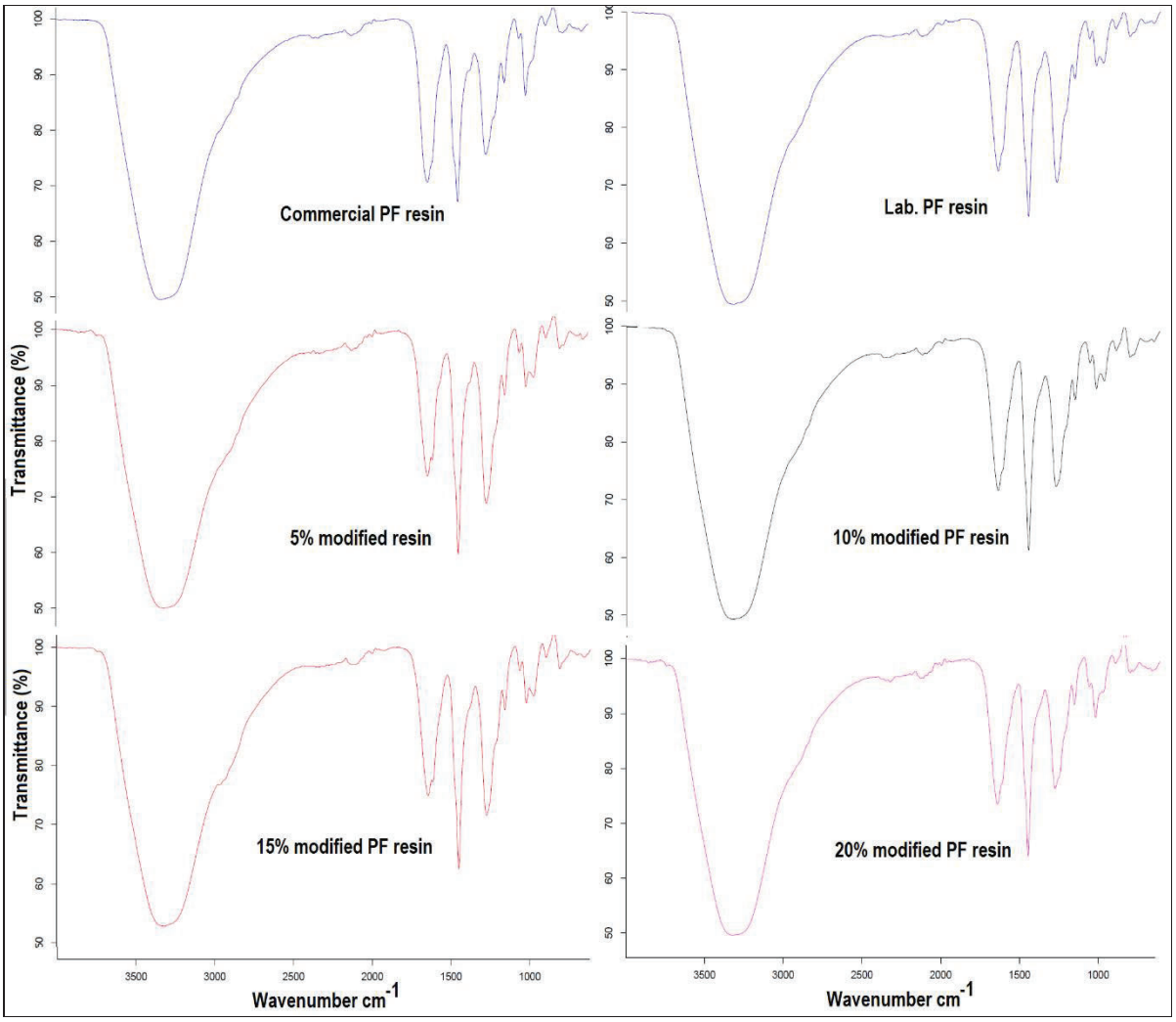

Figure 2. FT-IR spectra of PF resins with and without bio-oil.

Mechanical properties and bond performance of plywood panels

The MOR and MOE of the plywood specimens are presented in Table 2. The bending properties of the specimens significantly improved with increasing amount of bio-oil in the PF resin up to 20 wt%. Significant differences ($p<0.01$) were found in the MOR and MOE values of the plywood types. Significant differences were determined individually for these tests by Duncan's multiple comparison tests. The letters in Table 2 show the results of Duncan's multiple range test. The PF resin produced with the bio-oil (5-20 wt%) had better flexural properties as compared to the commercial and lab-made PF resins. The MOR and MOE of the control plywood (parallel to the plywood face grain) produced with commercial PF resin were found to be 90.4 MPa and 10248 MPa, respectively. As the PF resin was produced with 20 wt% bio-oil, the MOR values (parallel to the plywood face grain) were found to be 107.3 MPa and 13567 MPa, respectively. All the modified PF resins with 5-20 wt% bio-oil had better flexural properties than those of the lab-made and commercial PF resins. Similar trends were also observed in the MOE values (Table 2). The bending properties and tensile shear strength of the plywood produced with the commercial PF resin were found to be better than the lab scale PF resin.

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Table 2. Mechanical properties of plywoods produced with unmodified and modified PF resins.

Resin type used in the production plywood code	Density	Mechanical properties				
	g/cm^3	Modulus of rupture (MPa)		Modulus of elasticity in bending (MPa)		Tensile shear strength (MPa)
		//	⊥	//	⊥	
Commercial PF resin	0.77 (0.014)[1]	90.4 (3.4) a[2]	23.0(1.4) ab	10248 (357) a	1042 (75) a	2.11 (0.36) a
Lab-scale PF resin	0.76 (0.010)	89.1 (2.8) a	21.6 (1.1) ab	10017 (368) a	1012 (89) a	2.01 (0.41) a
PF resin modified with 5 wt% bio oil	0.75 (0.013)	92.6 (2.4) ab	23.8 (0.9) a	10567 (402) a	1178 (79) ab	2.18 (0.34) a
PF resin modified with 10 wt% bio oil	0.77 (0.012)	95.0 (3.1) bc	24.6 (1.6) bc	11374 (394) a	1240 (97) bc	2.32 (0.11) ab
PF resin modified with 15 wt% bio oil	0.76 (0.015)	97.9 (2.6) c	26.1 (1.2) c	12985 (425) bc	1365 (102) c	2.47 (0.22) b
PF resin modified with 20 wt% bio oil	0.77 (0.011)	107.3 (3.4) d	29.7 (1.8) d	13567 (487) c	1596 (129) d	2.50 (0.26) ab

[1] The values in the parentheses are standard deviations.
[2] Groups with same letters in column indicate that there is no statistical difference ($p<0.01$) between the specimens according to Duncan's multiply range test.

The tensile shear strength results of the plywood specimens produced with the control and modified PF resins are presented in Table 2. The tensile shear strength of the plywood specimens produced with all the modified PF resins were found to be higher than that of the specimens produced with lab-made and commercial PF resins. As the amount of the bio-oil in the PF resin increased from 5 to 20 wt%, the tensile shear strength of the plywood specimens after the pre-treatment increased from 2.18 to 2.50 MPa. This property was found to be 2.01 and 2.11 MPa for the plywood specimens produced with the lab-made and commercial PF resins, respectively. The results of the tensile shear strength were found to be above minimum standard requirement (1 MPa) of EN 314-2 standard for gluing quality of class 3 (exterior conditions) (Table 2). The tensile shear strength of PF resins produced with the bio-oil was found to be higher than that of the commercial PF bonded plywood reported in the literature (Aydin et al., 2006; Bekhta et al., 2014). For example, Bekhta et al. (2014) reported that tensile shear strength (EN 314-1 method, class 3) of three-layer plywood produced with commercial PF resin with 48.3% solids content was 1.2 MPa. In other study, Aydin et al. (2006) reported that tensile shear strength of three-layer plywood produced from beech wood veneer and PF resin was 1.25 MPa. The PF resin produced with the 20 wt% bio-oil included lots of hydroxyl methyl and hydrocarbons, which was beneficial to form the crosslinking structure and improved the bonding performance of between the wood veneers. This resulted in better tensile shear strength and bending properties for the plywood samples.

Conclusions

The changes in functional groups of resins were determined according to the results of the FT-IR spectra of modified resins as compared to commercial and lab-made PF resin. The FT-IR spectra of the bio-oil modified PF resol resins contained more complex functional groups than those of the control resin. Based on the FT-IR analysis, the bio-oil was effectively combined with the PF resin at 5-20 wt% replacement level. The PF resin produced by substituting up to 20 wt% of the phenol with the bio-oil showed an improvement in the mechanical properties of the plywood. The bio-oil modified PF resins exhibited better wet bond strengths as compared to the commercial and lab-made PF resins. The bio-oil also can be used as accelerators of the PF resins in wood-based panel industry due to their ability to minimize gelation and shorten press time. High-performance plywood panels used for outdoor applications could be successfully produced with PF resin modified with 20 wt% bio oil.

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THE ANALYSIS OF A POLICY DOCUMENT: "TURKISH SCIENCE POLICY FROM 1983 TO 2003"

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Abstract: This study aims to analyze the text entitled "Turkish Science Policy from 1983 to 2003" using the conceptual framework of public policy. Having been prepared over a period of more than two years with contributions by some 300 scientists and experts from universities, TUBITAK and other public institutions of research who come from a diversity of disciplines, this text embraces a system approach in determining a science and research policy for Turkey. For this reason, the set of concepts in the discipline of public policy will be used to analyze it. This will allow us to reveal what reasons lied behind such a text in the circumstances of the day, how successfully the text identified the issues in the system of science and technology, and how well-placed the proposed long-term solutions to these issues were. The study has been designed in four main parts. While the first part will address the conceptual framework regarding public policy, the second part will review the pre-1980 science agenda of the state. The third part will deal with the methodology and content of the document "Turkish Science Policy from 1983 to 2003" from the perspective of public policy, and finally the fourth part will investigate the reasons for its failure through comparison with similar documents that were produced later.

Keywords: Science and technology, public policy, science policy.

Introduction

The emergence of science policy comes with the Second World War when scientific research turns its focus toward strategic goals and military projects (Türkcan, 2003). The wave of research and development investments that begins with the Manhattan Project, the clearest example of strong government intervention in science policy, continues throughout the Cold War (Conner, 2003: 461). The increased importance of science leads to its use not only in the military but also in other public policy domains (Erat & Arap, 2016a). In this regard, science policy starts to spread in developed and developing nations in the '60s owing to a new understanding of the power of science, a search for rationality in all public policy domains, and initiatives by international actors like the OECD.

Science policy first appears in Turkey around the same time. It emerges in the era of planned development that opens in the '60s since, first, planning is a research-driven product and requires research institutions, and second, science itself makes part of the policy agenda (Erat & Arap, 2016b). From 1960 to 1980, however, no comprehensive science policy emerges, and even the goals in the much-emphasized issues of research staff and research areas cannot be achieved. For this reason, the country lags behind other countries working on science policy during the same period.

Turkish Science Policy from 1983 to 2003 was produced following a detailed study to meet the desired level of progress. The document bears significance in three aspects. First, while some development plans and other earlier documents involves elements that can be interpreted as science policy, this has been the first study to carry out serious analyses, propose long-term solutions to issues, and formulate policy in clear terms. Second, it was prepared using a systems approach. Third, no such study had hitherto been encountered in the formulation of other public policies, either. *Turkish Science Policy from 1983 to 2003* is not only a reference document for all scientific work in this area but also an object of study by itself. Elmacı's work focuses on particular policies in the document rather than its methodology (Elmacı, 2015).

The present study will analyze *Turkish Science Policy from 1983 to 2003* using the conceptual framework of public policy. Thus, it will cover the systems approach as used in the document and the methods it resorts to in policy

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formulation. The study has been designed in four parts. While the first part will address the systems approach, the second part will review the pre-1980 state science policy. The third part will deal with the methodology and content of *Turkish Science Policy from 1983 to 2003* from the perspective of public policy, and the last part will put the document in a comparison with similar later documents.

Policy As a System

A system is a set of interdependent or interrelated parts that make up an organized or complex collective whole. The systems approach in political science works to account for the entire political process, including the functions of fundamental political actors, through a systems analysis (Heywood, 2012: 45). The systems approach rests on the 1937 work *General Systems Theory* by the biologist Ludwig Von Bertalanffy (Altan, 2016: 306). According to Bertalanffy, the origin of the concept *system* dates back to the pre-Socratic era, and the Aristotelian statement that *the whole is more than the sum of its parts* is an important expression of the ongoing problematic of system. While advancements in Western science did away with the Aristotelian worldview, he argues, the problems concerning the organization of living systems were largely ignored rather than solved. Bertalanffy tries to justify his theory by referring to some particular advancements in science. Modern science is characterized by a tremendous availability of data, technical complexity, and an increase in specialization in every area required by theoretical structures. As a result, physicists, biologists, psychologists, and social scientists have each reverted to their own universe, and it is hard to transition from one area to another. Strikingly, however, similar problems and concepts exist in different areas that evolve independently of each other. Parallel developments occur in different areas within mutual independence and often without knowledge of what is going on elsewhere. For instance, there is a similarity in procedure between a biological theory, which works with concepts such as individuals, species, and competition coefficients, and quantitive economics or econometrics. On the other hand, the impact of new advancements in biological, behavioral, and social sciences requires us to expand our conceptual schema where physics applications fall short. For instance, while living organisms exchanging matter with their environment are open systems, conventional physics and physical chemistry deal with closed systems only.

Bertalanffy argues that such new developments point to the need for generalized systems and make it legitimate to work on a theory of universal principles. He proposes the General Systems Theory as a discipline, which deals with the formulation of principles that hold true for systems. According to him, this indicates the major aims of general systems theory: (1) There is a general tendency towards integration in the various sciences, natural and social. (2) Such integration seems to be centered in a general theory of systems. (3) Such theory may be an important means for aiming at exact theory in the nonphysical fields of science. (4) Developing unifying principles running "vertically" through the universe of the individual sciences, this theory brings us nearer to the goal of the unity of science. (5) This can lead to a much-needed integration in scientific education.

Bertalanffy uses his theory in biology and psychology and suggests that it can be used in all scientific fields. David Easton is the first to adapt the theory to political science and thus to contribute to the development of basic concepts in contemporary policy analysis (Jr, Hedge & Lester, 2008: 95; Knoepfel, Larrue, Frédéric & Hill, 2007: 7). While it is not originally intended for public policy, Easton's work is used in conceptualizing the relationship between policymaking, policy outputs, and the environment, and it influences public policy work produced in the '60s (Parsons, 2001: 23-24). According to Easton, political inquiry concerns itself with how decision-making takes place in society and how decisions are implemented, and considering political life as a system of activities must be key in any approach to analyze the working of this system. Taking the system of political activity as a whole, Easton states that different inputs (demands and supports) exist that sustain the working of the system, that these inputs are transformed into outputs (decisions or policies) by the system processes, and that these outputs bear consequences for the system and the environment both (Easton, 1957: 383-384).

Public policy is viewed as the reaction of the system to demands from the environment. The political system as defined by Easton involves interrelated institutions and processes that generate binding decisions on society and are generally considered to be governmental institutions and political processes. The environment, on the other hand, involves all phenomena such as the social system, the economic system, and the biological environment that lie outside the boundaries of the political system. Thus, the political system differs from all other components of society. The demands that enter the political system as inputs from the environment are actions by individuals and groups to fulfill their interests and values. The "supports" part of the inputs consists of the agreement of individuals and groups to respect election results, pay tax, abide by law, and accept decisions and actions the political system offers as responses to demands. Legislations, rules, court decisions etc., on the other hand, make up the system's outputs (Anderson, 1994: 27). These outputs generate feedback, which, in turn, shapes later demands and supports (Heywood, 2013: 41). The main condition for the system to succeed is to process inputs in the political system and to generate outputs that can meet demands and draw majority support. Therefore, the assessment of how outputs impact the environment and the political system is highly crucial for the system (Saybaşılı, 1985: 25-26).

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The systems approach is seen to be helpful in organizing policymaking research and also illuminating in other important aspects of the political process. How do demands from the environment affect the content of public policy and the functioning of the political system? How does public policy affect the environment or consequent policy demands? How good is the political system at converting demands into public policy and preserving itself over time? (Anderson, 1994: 27) Nonewithstanding, the most important critique brought up to Easton's systems approach is that it takes the system as a black box, leaving the internal functioning of the political system unexplained (Birkland, 2011: 27; Birkland, 2005: 188). Since it fails to talk about decision-making procedures and processes in length and treats policy as the product of a black box called the political system, the use of his approach in public policy is believed to be restricted with general and abstract qualities (Anderson, 1994: 27). This is not an issue from the viewpoint of policymakers, however. The fundamental elements of the political system do not bother to open up the black box, and they may often be quite unwilling for any such action. In this regard, judging from the perspective of the actors of the political system, the systems analysis seems to be a good approach since it responds well to questions such as the nature of inputs that enable the sustenance of the system, the challenging pressure conditions brought about by inputs, environmental and systemic problems that constitute such pressure, and the place of outputs in problem solving (Saybaşılı, 1985: 26). It has certain shortcomings for social scientists, however, who want to open up the black box and look into the conditions under which policymaking takes place, that is, the events inside the political system. As a result, the attempts to open up the black box that begin in the '70s continue throughout the '80s and '90s (Jr, Hedge, & Lester, 2008: 96; Parsons, 2001: 77).

The Pre-1980 State Science Policy

In Turkey, the state has always resorted to science in certain areas, both before and during the Republican days. On the other hand, it is only in early '60s that science becomes a policy domain itself. Science policy is nothing more than a concept in many countries around that period. In the OECD's first Ministerial Meeting on Science, only four of the participating ministers actually represent a ministry relating to science and research. Science policy becomes more widespread in time, and in the third meeting, which takes place in 1968, all but a few countries are represented by a minister of science (Türkcan, 1981: 46). In Turkey's science policy move, the introduction of planned development plays a part along with an international trend. After all, science is not only part of the planning agenda or a policy headline but also an important instrument for good planning. Rational planning requires detailed research. The formation of staff and institutions to conduct research for public policy depends on the existence of a science policy. In this regard, important steps in science policy in Turkey include the emergence of science as a policy headline in the plans by the State Planning Institution (DPT), founded in 1960, and the establishment of the Scientific and Technical Research Council of Turkey (TÜBİTAK) to assume an active role in scientific work by the Institution's first five-year development plan (Göker, 2002: 2).

The first five-year development plan (1963 to 1967) sees research as the most efficient way to solve problems in the areas in which development is planned and covers the question of science under the "research" headline. It identifies the numbers of research staff present in higher education and the public sector at the time and offers calculations of research spending. It also lays down objectives to form a proper research environment, train staff, engage in building and equipment investments, and centralize the management of research activities (DPT, 1963). It is significant that in a country that has not been industrialized yet and is still developing, science policy aims to establish infrastructure needed for advanced research (Türkcan, 2009: 496). The single most important development in science policy around this time is the setting of the goal to found TÜBİTAK and the Social and Economic Research Institute to lead any research effort in technology and make relevant policy. While the Institute never comes to life, TÜBİTAK continues to enjoy its place as the main actor in science policy in the country today.

The second five-year development plan (1968 to 1972) identifies that many objectives in the previous plan could not be accomplished. Thus, it states the main goal in science policy to be eliminating structural shortcomings in research and building up manpower. Other important headlines include international collaboration to benefit from other countries' knowhow and collaboration between universities, industries, and the public sector to achieve technical sophistication required for domestic development (DPT, 1968).

By the third five-year development plan (1973 to 1977), neither international collaboration nor domestic inter-institutional coordination reaches the desired level. In addition, while the goal set by the first two plans is to send 6000 students abroad for graduate study, only 1181 (19.7 %) of them can eventually be sent. The budget share of research and development spending falls from 0.41 % in 1964 to 0.35 % in 1970. Therefore, the third five-year development plan diagnoses the main problem in science policy to be the inability to build research infrastructure and proposes new objectives accordingly (DPT, 1973). On the other hand, the fourth five-year development plan (1970-1983) states that the problems previously identified continue to trouble the scientific field and puts forward the criticism that TÜBİTAK fails to establish the necessary connections between the development plans and the

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science and technology system and to shift the domain of activity to industry (DPT, 1979). Indeed, TÜBİTAK has been founded to support research activities that would be the engine of development. In its first twenty-five years, however, it supports 2868 projects through its Research Groups, 2385 of which are eventually finalized, but only 180 ever come to life (TÜBİTAK, 1989). While it shares the goals specified in the previous plans, the fourth plan is a more critical text, but upon the changes in Turkish economic thinking introduced by the decisions of January the 24th, 1980, and the military intervention of September 12th, 1980, it loses all prospects of being implemented. One critical point suggested by the plan is that ambiguities exist in science policy (DPT, 1979: 48). In other words, it makes clear that setting goals relating to the budget share and the number of researchers only is an inadequate approach to science and technology. Thus, it is safe to argue that this period does not display systematic or consistent policy thinking but merely consists of the beginning of science policymaking. *Turkish Science Policy 1983 to 2003* (Şenses & Taymaz, 2003), which attempts to formulate science in the light of a certain system and is considered to be the first science policy document in Turkey, is born under such circumstances.

The Document *Turkish Science Policy from 1983 to 2003*

Turkish Science Policy from 1983 to 2003 consists of five main parts: (i) the importance of science policy, (ii) science history from Turkish-Islamic science to the 1980s, (iii) the systems approach, (iv) Turkey's science and research system, its problems, and international comparisons, and (v) Turkey's long-term science and research policy (The Department of State, 1983). For the purposes of this study, the document will be analyzed beginning from the part on the systems approach.

The third part of the document talks about the systems approach and the reason why it is chosen in methodology. According to this part, the main point of departure for science policymaking is that science is such an important area that we cannot afford to manage it without planning. The reason why the systems approach is embraced in science policy, on the other hand, is that this approach allows us to take science in all its aspects and circumstances. As much as science and technology, which is considered an open system, is in interaction with other policy domains, the problems resulting from this system are in interaction with the problems of society. The systems approach enables us to take the system as a whole, to focus on its parts, and to pay attention to the interaction among the parts rather than solely deal with each element individually. In other words, every output of the system can shape the actions of the system. This, in turn, makes the feedback control feature of the systems approach useful. This way, the science and technology system earns the ability to constantly adapt through feedback and develop policy accordingly. In this regard, feedback functions as a performance assessment system.

In *Turkish Science Policy from 1983 to 2003*, in the center of the science and technology system lie all research and development institutions. Close systems include industry and trade, agriculture, healthcare, higher education, physical infrastructure, and national defense. The international science and technology scene, the natural environment, and culture stand a little further in its periphery (Figure I). The document first examines Turkey's science and technology policy with its subsystems and environment and depicts it through both qualitative and quantitive indicators. Second, it diagnoses the problems and shortcomings of the current system and draws comparisons with countries that it takes as examples. Third, it sets the main goals and policies for future work. Lastly, it highlights the ways in which the science and technology system is connected with the close systems and specifies which areas should be prioritized.

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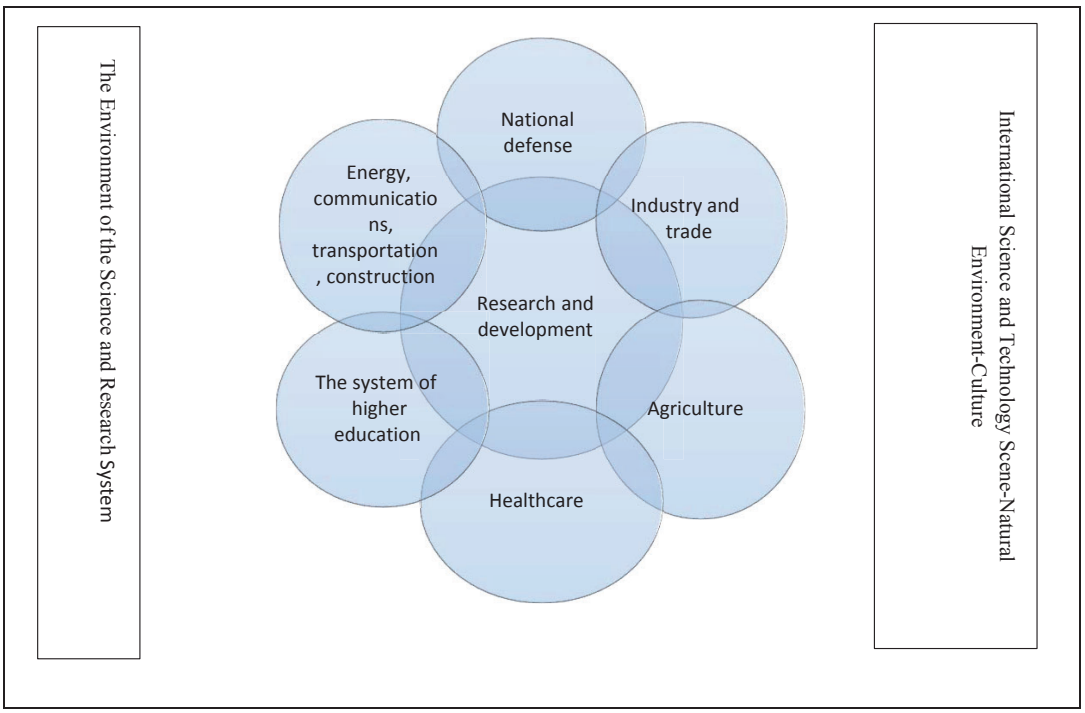

Source: Devlet Bakanlığı, 1983:29 (The Department of State, 1983: 29)

Figure I: The Science and Technology System and Its Environment.

In assessing the science and technology system, six comprehensive indicators are defined, which are: institutional structure, manpower recruited in research and development, research and development spending, technological structure and sophistication, the informations system, and external relations. The indicators stand in relation with one another. In other words, not only may development in one area affect other areas, but at the same time true progress is not possible without a shared development taking place in all areas. For this reason, first, the situation relating to each indicator is evaluated. As can be seen in Table I[13], these evaluations are made based on various sub-indicators. The sub-indicators, all of which are components of the science and technology system, are also each dealt with as a system by itself. This way, each subsystem provides important data concerning the indicators, based on which the problems of the science and technology system are identified using the method of international comparison. Comparisons are generally drawn with countries with sophisticated science and technology systems.

The problem assessments and the comparisons are followed by the last part, in which Turkey's long-term science policy is formulated. A detailed policy formulation is offered without breaking away from the systems approach. Before this is done, however, a general set of principles are defined for science and research policy, which apply for the entirety of the science and research system. This is important since it shows that the system has common goals. In other words, not only policies are made to eliminate the problems unique to each subsystem and move that subsystem forward, but at the same time, principles are set for the science and research system as a whole. The following are the principles defined:

- Science and research policy should constitute a dynamic system that tracks change well.
- Decisions in policy formulation and implementation should be made at the government level and have the same sanctioning force as development plans.
- Policy should be such as to contribute to national welfare and development.
- Policy should aim to deliver national technical self-sufficiency.
- Caution should be taken in seeking solutions to problems of a social nature.

[13] The table was created by the authors to show the indicators the document *Turkish Science Policy from 1983 to* 2003 uses to depict the science and research system, the evaluation criteria for these indicators, the evaluation methods and results, and the policies developed.

- Attention should be paid to make policy in agreement with economic development, put research results into application, absorb imported technology, and recruit qualified staff in fundamental and applies sciences.

In addition to these principles, five main goals are set for the entire system under the so-called "ideal to reach the level of contemporary civilization in science":

- Raising the level of scientific development, and cultural enrichment,
- Increasing the impact of science and technology in economic and social development,
- Using science and research in defense force,
- Using science and research to contribute to the infrastructure and service sectors,
- Improving healthcare and welfare, and protecting nature.

Besides these main goals, 84 subgoals are defined across industries, which we will not go into here. Table I shows the main policies for each indicator. In addition, fundamental sciences, national defense research, and science and research areas by different industries are assessed, and policies are offered accordingly. The policies are made considering the then-current situation of the country.

Science Documents after *Turkish Science Policy from 1983 to 2003*

While *Turkish Science Policy from 1983 to 2003* leads to the formation of a Supreme Council of Science and Technology (BTYK) in line with international norms to make long-term policy in the scientific domain, the document is laid aside without ever being applied (Göker, 2002). The fifth five-year development plan, dated 1984, states that the science and technology masterplan set up by *Turkish Science Policy from 1983 to 2003* should be the main point of departure in science policy (DPT, 1984). In 1988, the State Planning Organization Ad Hoc Committee issues a report entitled *The Science, Research and Technology Masterplan*. Having been prepared by over 100 members from 8 subcommittees in 13 months, the report reviews the situation in Turkey and in the world at the time, the problems that exist in science, research, and technology, and the likely remedies. It highlights that the governments, research institutions, and universities have failed to remain faithful to the policy of guiding scientific research systematically for the purposes of social welfare, specified by *Turkish Science Policy from 1983 to 2003*. The report uses the six indicators in Table I and embraces the policies in *Turkish Science Policy from 1983 to 2003,* without adding a word, in certain areas. In addition, it makes occasional references to the document and uses much of its data dated 1983 (DPT, 1988). On the other hand, the report does not take *Turkish Science Policy from 1983 to 2003* as its main point of departure, and while it displays resemblance to the document, it was prepared using no specific model.

This report never finds application, either, and in its second meeting, which takes place in 1993, the Supreme Council of Science and Technology releases a report by the name *Turkish Science and Technology Policy from 1993 to 2003*, which depicts the situation in Turkey at time relying on data concerning the number of researchers, research spending and scientific publications. The "goals" part of the report covers concepts such as competition and innovation that reflect international developments (TÜBİTAK, 1993). On the other hand, it has a poor methodology in comparison to the document *Turkish Science Policy from 1983 to 2003*. *The Project for Advancement in Science and Technology*, which comes two years later based on the seventh five-year development plan and focuses directly on goals, manages to set goals that are in tune with its day, but it still fails to reach the same level of comprehensiveness as *Turkish Science Policy from 1983 to 2003* (TÜBİTAK, 1995). Nonewithstanding, the '90s is a decade that sees more initiatives in science and technology as opposed to the '80s (Göker, 2002: 10). Finally comes *The National Science and Technology Policies 2003 to 2023 Strategy Document / Vision 2023,* which is in effect today. *Vision 2023* appears closer to *Turkish Science Policy from 1938 to 2023* in methodology. Having been prepared in a period of over two years beginning in 2002, this document is the product of 250 experts, 192 meetings, and 36 panel meetings and workshops. For its technological forecasting work, 7000 experts were sent surveys, 2400 of whom returned a response. The report portrays the existing situation and offers roadmaps for policies, strategies, and goals in the areas likely to bring the country more competitive power (TÜBİTAK, 2004). While it does not mention the systems approach or any other method, *Vision 2023* does not overlook the subsystems that make up the science and research system in *Turkish Science Policy from 1983 to 2023*. The other documents mentioned above demonstrate a similar approach as well. In other words, not only is *Turkish Science Policy from 1983 to 2023* Turkey's first comprehensive science policy, but at the same time it has invented a tradition influencing all later policy documents.

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Conclusion

Turkish Science Policy from 1983 to 2003 was the product of Turkey's efforts to catch up at a time when it found itself staying behind the developments in science policy since the field's emergence in the '60s until the '80s. Previously, the development plans set goals relating to research spending and the numbers of researchers, but a comprehensive science policy never came into being. TÜBİTAK, which was founded in the '60s to be an important actor in science policy and conduct research in fundamental sciences, failed to play an active role. However, in Germany, for instance, where similar points were being made, the policy to spread an interest in fundamental sciences among youth brought about a great advancement (Altuğ et al., 1997). *Turkish Science Policy from 1983 to 2003* was prepared with the idea that the country could not afford to remain behind in the world scientific system anymore.

The document uses the systems approach to formulate science policy objectives. It considers science and research to be in connection and interaction with one another and with their environments so much so that the two make up a single whole with their structures, functioning, and relations. Departing from this, it relies on a detailed study to identify the issues particular to the country's conditions and propose different policies for each headline. *Turkish Science Policy from 1983 to 2003* aims at policies that are legitimate and up-to-date in its time. This document designates technological fields like electronic engineering, computer science, instrumentation, and telecommunications as the areas to be given first priority in development. While South Korea, which adapted the Japanese program to herself and came up with similar projections, made significant advances, Turkey eventually put aside whatever work it was planning to carry out during the same period (Göker, 2002). The policy documents could not be implemented, either, with the exception of *Vision 2023,* which is currently in place. Not only did many initiatives attempted during this period fail to be as comprehensive as *Turkish Science Policy from 1983 to 2003*, but at the same time they lacked a clear approach.

The most critical aspect of *Turkish Science Policy from 1983 to 2003* is that it has been the most detailed science policy document up to its day, and it has taken quite long for another study with such careful science policy planning to follow. Also important is that no similar work can be encountered in other public policy domains. In addition, the document has handed down an approach to science policy, which, while it has not often been used in later science policy documents, sees science and research to constitute a single system.

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Table I: The Roadmap for Science and Research Policymaking

Indicators Used In Determining the Level of the Science and Research System	Institutional Structures and Their Current Situation	Manpower Employed In Research and Development and Its Current Situation	Research and Development Spending and Its Current Situation	Technological Structure and Its Current Situation	The Informations/Documentation System	External Relations
	Universities	Researcher	Research and development spending per capita	Industry	Scientific information	Bilateral collaboration
	Institutions affiliated with the Office of the Prime Minister	Technician and equivalent	Research and development spending per researcher		Technological information	Multilateral collaboration
	Agriculture, forestry, veterinary medicine, and livestock farming research	Other support personnel	Total research and development/GDP		Socioeconomic information	
	Other research structures under Ministries					
Evaluation Criteria	Private sector research institutions					
	Issues	**Issues**	**Issues**	**Issues**	**Issues**	**Issues**
	-Goals unclear. -Necessary size yet to be reached. -Insufficient collaboration. -Inadequate accumulation of knowhow. -Lack of equipment. -Administrative issues.	-7 times increase in research and development staff needed. -Low numbers of researchers in private sector. -Education system cannot meet needs. -Wrong wave policy.	-Insufficient research and development funding.	-Low levels of coordination between science and technology. -Technology transfer needed in intermediary and investment goods industry.	-Insufficient training and public awareness. -Weak government support. -No structure to coordinate. -No information network. -No connection with international system.	-Ambiguities and irregularities in collaboration.
	International Comparison	**International Comparison**	**International Comparison**	**International Comparison**	**International Comparison**	**International Comparison**
Evaluation Results and Method	Germany, France, Japan, Spain	Germany, France, Japan, Britain, USA, USSR	21 countries	USA, USSR, France, Japan	Germany, France, Japan, Spain, Brazil	
	Body to carry out judicial functions	Increasing number of staff	University research funding	Technology transfer	Informations training	To make bilateral agreements
	Body to carry out executive functions	Improving staff quality	Public sector research funding	Technological innovation incentives	Planning in national informations system (scientific, technological, and socioeconomic)	Following universal developments closely
The Long-Term Science and Research Policy Determined	Body to constantly monitor science policy	Sectoral distribution to be done in situ	Private sector research incentives	Active and efficient use of technologies transferred	Connections with international informations system	

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THE ANALYSIS OF COMPUTER ENGINEERING PHD THESIS IN TURKISH UNIVERSITIES BETWEEN 2010 AND 2017

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In this paper, the PhD thesis completed in Computer Engineering programs in Institute of Science and Technology of Turkish universities between 2010 and 2017 were investigated according to their subjects. For this reason, 163 PhD thesis headers and abstracts were investigated and classified according to the subjects. The subjects were determined as the basic fields such as computer hardware, software engineering, image processing, computer networks, signal processing, natural language processing, data mining, information security and so on. Some thesis belong to both computer engineering and another field and this type of thesis were grouped as "multidisciplinary". The thesis were grouped into 1 or 2 subjects. By this way, it was tried to examine the most popular study fields of Computer Engineering programs today.

Keywords: computer engineering

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THE DEVELOPMENT OF INITIAL ATOMISM AND EMPIRICAL ATOMISM: THE EPISTEMOLICAL RUPTURE

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In the present research, we present a historical view of the development of atomic theories, from Democritus to Dalton. We have regrouped in two categories the conceptions that followed one another: the initial atomism and the empirical atomism. We will see that in each of these two categories, several conceptions were developed. We will also see that such a review allows the confrontation of the students` conceptions about the atomic aspect of matter and those conceptions developed during history to give rise to conceptual conflicts. This study made it possible to bring out the epistemological ruptures that marked the development of the initial atomism and the empirical atomism. It attempted to show that the atomic models from Democritus to Dalton are in logical discontinuity since the modes of construction of the knowledge, imagined by these thinkers, are not always founded on the same epistemological premises. In addition, this study of different models will allow in a teaching and learning context to identify in the discourse of teachers and students the notion of epistemological rupture in the development of initial atomism and empirical atomism.

Keywords: epiemological rupture, atomism initial, atomism empirical, teaching

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THE DEVELOPMENT OF TEMULAWAK (CURCUMA XANTHORRHIZA) HERB PRODUCT AND PHARMACOLOGICAL TEST AS ANTI HYPERCHOLESTEROLEMIA

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The objective of this study is to develop high-grade and safety tested temulawak herb products and pharmacological test as anti-hypercholesterolemia. The research was started with the making of temulawak capsule product from standard raw materials. After that, the gained products were being tested for its safety as temulawak capsule products; including pathogen microbe test (*Escherichia Coli, Salmonella, Staphylococcus aureus*, and *Pseudamonas aeruginosa*), mold/leavened test, ALT test,and heavy metal level (Hg, Pb, Cd) test, as well as product quality test including water content test, weight similarity, and product stability, curcuminoid content and the volatilematerials. The activity as anti-hypercholesterolemia assay by *in vivo* using female Wistar strain rats aged 50 days with a weight around 150 grams which was fed with pellets and quail egg yolk. There were five rats in each group and were placed in a cage with a temperature of 25-32º C, and 98% relational humidity. The treatment to the tested animals was done to observe the rat blood lipid profile due to the treatment with temulawak powdered and instant herb products, compared to the negative control (without quail egg yolk) and the positive control which was given the quail egg yolk and simvastatin as an anti-hypercholesterolemia.The result of the study is temulawak capsule product which meet the demand of safety and product quality standard. The result of the temulawak capsule product safety test are following: temulawak capsule product does not contain pathogen bacteria (*Escherichia Coli, Salmonella, Staphylococcus aureus*, and *Pseudamonas aeruginosa*), pathogen mold, and leavened, whereas ALT and heavy metal level (Hg, Pb, Cd) are up to standard (do not exceed the standard). The result of the temulawak capsule product safety are as follow: the water content and the weight similarity of temulawak capsule product meet the requirements (do not exceed the standard), whereas the product stability measured from curcuminoid content and its volatile materials is relatively consistent from the first to the third month.The results show that there are effects of the dose and four week duration of administration of temulawak powdered and instant herb products on the levels of cholesterol, triglycerides, HDL, and LDL in the rats' blood.

Keywords: temulawak herb, quality; herb product safety; anti-hypercholesterolemia; Curcuma xanthorrizha

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THE EFFECT OF CHENILLE YARN PROPERTIES ON THE UPHOLSTERY FABRIC PERFORMANCE

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Abstract: Chenille yarns are widely used in upholstery sector in textiles. For these chenille fabrics, the most important property is the abrasion resistance due to occurring pile loss. Therefore in this study, we have aimed to determine the abrasion resistance of upholstery fabrics made of chenille yarns. In order to examine the relationship, we initially produced Nm 4 and Nm 5 count of 100% PES chenille yarns with three different of pile lengths (0.8, 1.0 and 1.5 mm) and with four different twist levels (830, 900, 930 and 950 T/m). These yarns were then tested for their friction test, breaking strength and elongation. The upholstery fabrics woven from these yarns were also examined for their abrasion resistance on the Martindale Abrasion Tester. The results indicate that twist levels and pile lengths have significant effect on the abrasion resistance of upholstery fabrics. Also, the appearance of these chenille fabrics were examined with their rubbing results and it was found that chenille yarns are vulnerable to rubbing according to their fabric surface after abrasion resistance test.

Keywords: Chenille, upholstery fabric, pile length, twist level, abrasion resistance, breaking strength

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Introduction

A fancy yarn is one that differs from the normal construction of single and folded yarns by deliberately produced irregularities in its construction (McIntyre, 1995). Fancy yarns are therefore, widely used for aesthetic effects as they help to create decorative appearances. The distinguished ones are bouchle, slubbed, flame, knop types and chenille yarns. Since 1970s non-traditional fancy yarns have shown a sudden increase in the textile market (Testore, 1988) and nowadays fancy yarns are fundamental part of the bunch in spinning and twisting processes (Grabowska, 2000).

Chenille is a type of pile fancy yarn which was believed to have originated in France; the original technique involved weaving a *leno* fabric and then cutting the fabric into strips to make the chenille yarn (Figure 1.). Chenille yarns commercially produced in 1970s and its machinery appeared in the early 1990s in Europe and North America (Gong, 2002).

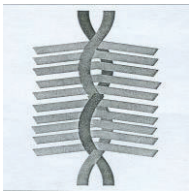

Figure.1 Chenille yarn structure

Chenille yarn consists of short lengths of spun yarn which is known as *pile* or filament that are held together by two ends of highly twisted fine strong yarn which is called *core* or *lock* yarn (Ulku, 2003). Chenille yarns can be produced from various types of fibers and yarns such as cotton, viscose, acrylic, and polypropylene along with different yarn counts ranging from Nm 0.2 to Nm 15. The pile and lock yarn can be either same or a different material, though filament yarns are not used for lock yarn due to easy pile loss. This is because existence of low friction between filament yarns and pile yarns.

Chenille yarns are generally used in outerwear fabrics, sweaters, household fabrics, car interiors, blankets and rugs in the textile industry. Especially, furnishing fabric designers choose chenille yarns for many items, such as decorative curtains and upholstery fabrics because of their beautiful shiny appearance, reflection effect and softness. In upholstery fabric production, chenille yarns are used as filling yarns. However, due to fabric

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construction and chenille yarn properties, seam slippage and pile loss are the main problems of upholstery chenille fabrics. Kalaoglu and Demir (Kalaoglu, 2001) studied the effect of chenille yarn properties on the abrasion resistance and seam slippage of the upholstery fabrics; they stated that fabric construction affects the seam slippage of the fabrics. On the other hand, Ozdemir et.al. (Ozdemir, 2004) reported that the abrasion resistance is improved with an increase in twist, pile length and the use of natural fibers. Moreover, Ilhan (Ilhan, 2005) studied tensile characteristics of chenille yarns and developed a theoretical model to predict the yarn properties before production; it was concluded that the significant effective factors on breaking force were count of binder yarn and the twist level of chenille yarn. More recently, studies on chenille yarns were conducted with the help of image processing techniques by Maros et.al (Maros, 2011); they determined yarn defects with the help of a modified exponentially weighted moving average (EWMA) control charts.

In this current study and from the highlights of the literature mentioned above, we aimed to observe the properties of chenille yarns, i.e yarn counts, twist and pile lengths, to see if they have any effect on the yarn mechanical properties and later to report the chenille yarn properties on the abrasion resistance of produced upholstery fabrics.

Materials and Methods

As is known that the most important property is abrasion resistance for the upholstery fabrics; therefore in this study some of the chenille yarn properties were studied to observe if any relation exist on the woven upholstery fabrics. For this, two different counts of chenille yarns were produced (Nm 4 and Nm 5) from 100% PES three with different of pile lengths (0.8, 1.0 and 1.5 mm) and with four different twist levels (830, 900, 930 and 950 T/m) on the TEPELER machine (Figure 2). The properties of these chenille yarns are presented in the Table 1.



Figure.2 Chenille machine

Table 1: 100% PES Chenille yarn properties

Abbreviations	Chenille yarns		
	Twist (T/m)	Pile length (mm)	Yarn count Nm)
A	830	1	5
B	830	1.5	5
C	900	1	5
D	900	1.5	5
E	900	1	4
F	900	1.5	4
G	950	1	4
H	950	1.5	4

Then these yarns were woven on the jacquard rapier weaving machine with double cloth structure as seen in Figure 3.

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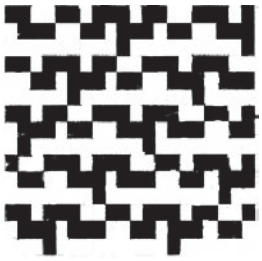

Figure 3. Construction of upholstery fabrics used in the study

All samples have 68 ends/cm warp density and 20 pics/cm weft densities. 150 denier PES yarns were used as warp yarns and the produced chenille yarns were used as weft yarns in the fabrics.

All the tests were performed under the standard atmosphere conditions (20ºC ± 2ºC, 65 ± 2% R.H.). Twist test was done on the JEAMES H HEAL Q tester according to the TSE 247 EN ISO 2061 standard, the friction tests were carried out on the SDL ATLAS Y027 tester and the yarns counts and twist values of the samples are given in Table 2. The breaking strength and elongation of the yarns were measured on the INSTRON 4411 according to the TSE 245 EN ISO 2062 standard. The gauge length was set to 500mm and the crosshead speed was 500mm/min during the testing. Abrasion tests were performed on a Martindale Abrasion Tester. Before starting the abrasion tests, primary trials were made to determine the rubbing cycles that would be applied to the specimens of upholstery fabrics. Since the number of rubs at which specimen breakdown occurred between 6000 - 14000 rubbing cycles for our samples, mass loss values were determined at the end of 3000, 4000, 5000, 6000 and 10000 rubbing cycles, according to BS EN ISO 12947-3 standards. Three tests were made for each set of samples. The breaking strength and elongation of the yarns along with their abrasion results are given in Table 3.

Results and Discussion

The results of the yarns and the chenille fabrics are presented at the below Tables 2 and 3. Yarn counts were determined according to the TSE 244 EN ISO 2060 standard and yarn lengths were set to 100m long for their linear counts. Also, Figure 4 shows abrasion resistance of the produced chenille fabrics.

Table 2: Yarn counts of the samples

Abbreviations	Weights (g)
A	23.431
B	23.652
C	26.858
D	27.178
E	24.745
F	24.592
G	26.633
H	24.734

From the Table 2, the lighter fabric was A coded sample which has fine yarn with lowest twist level and low pile length. The heaviest fabric was D coded sample which has 900 T/m twist level and finer yarn count with higher level of pile lengths.

Table 3: Friction, breaking strength and elongation values of the chenille yarns

Abbreviations	**Friction (rev)**	**Breaking strength (gf)**	**Elongation (mm)**
A	652.6	1364	16.333
B	327.7	1389	15.694
C	659.9	1466	18.099
D	718.2	1052	13.211
E	122.7	1149	31.548
F	124.5	1032	32.950
G	124.0	1210	30.494
H	127.9	1137	36.234

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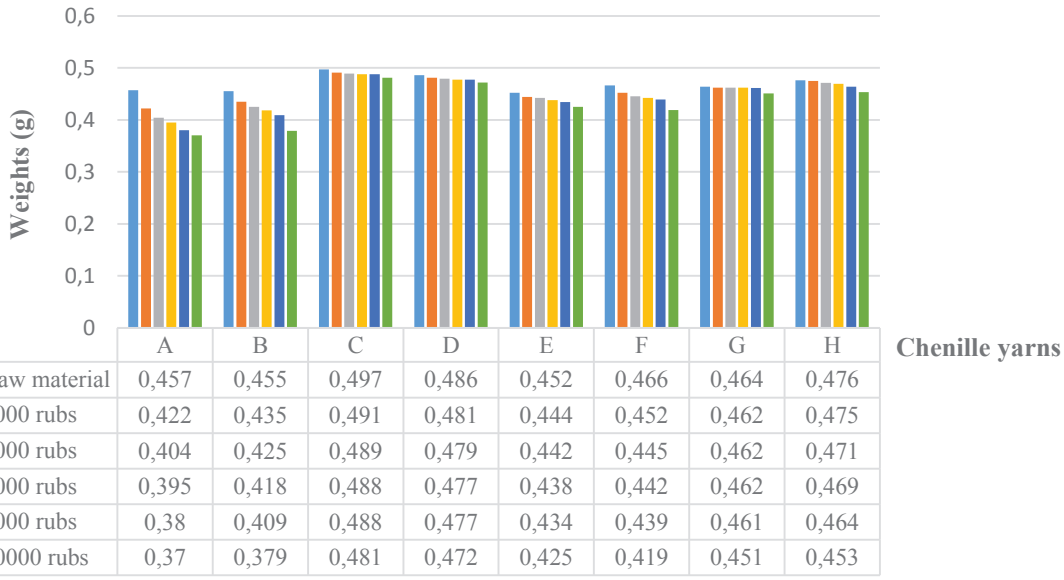
As can be seen from the Table 3, C coded chenille yarn has shown highest breaking strength and F coded sample has the lowest breaking strength. This may indicate that at the twist level of 900 T/m; finer yarn with low pile length has highest breaking strength while coarser yarn with high pile length has lowest breaking strength in chenille yarns. It is thought that, as the yarn gets finer it may lock much better lower piles of yarn within the chenille yarn structure, and hence it exhibits much stronger yarns than both coarser and higher piles of chenille yarns. On the other hand, at the twist level of 900 T/m; finer yarn with high pile length has the highest friction values (D coded sample) and the lowest friction value obtained at the E coded sample where the chenille yarn is coarser and has low pile length. This may indicate that, both the finer the yarn and the higher the pile length is much better to achieve friction properties for the PES chenille yarns.



	A	B	C	D	E	F	G	H
Raw material	0,457	0,455	0,497	0,486	0,452	0,466	0,464	0,476
3000 rubs	0,422	0,435	0,491	0,481	0,444	0,452	0,462	0,475
4000 rubs	0,404	0,425	0,489	0,479	0,442	0,445	0,462	0,471
5000 rubs	0,395	0,418	0,488	0,477	0,438	0,442	0,462	0,469
6000 rubs	0,38	0,409	0,488	0,477	0,434	0,439	0,461	0,464
10000 rubs	0,37	0,379	0,481	0,472	0,425	0,419	0,451	0,453

Chenille yarns

Figure 4: Abrasion resistance of the chenille fabrics

From the Figure 4, it can be determined that fabrics coded C, D, G and H has shown better abrasion resistance than the rest of the chenille fabrics. The most weight loss was obtained at the sample A which has lower twist level and pile lengths than the other chenille fabrics; this implies that yarns with low twist levels (i.e. 830 T/m) are difficult to held low pile lengths (i.e. 1mm) together by the two ends of twisted yarn known as core.

Regarding to C, D, E and F samples, which have twist level of 900T/m, pile lengths of 1 and 1.5 mm and two yarn counts (Nm 5 and Nm4) , it was observed that finer yarns do present better performance on the abrasion resistance than the coarser yarns.

Some of these abraded fabrics can be seen at the below Figures 5-8.



Figure 5. Sample A at 1000 rubs

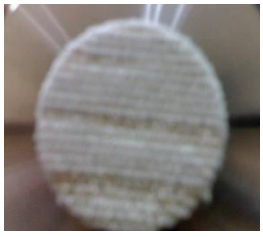


Figure 6. Sample D at 1000 rubs

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Figure 7. Sample F at 1000 rubs

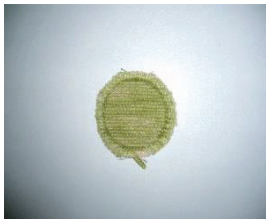

Figure 8. Sample G at 1000 rubs

The appearance of these fabric surfaces show that the chenille yarns are vulnerable to rubbing according to abrasion resistance tests.

Conclusion

The overall results show there is an inclination to an increase in the pile loss values with the decrease in the twist level of chenille yarns. This is because of the fibers in the pile yarns with low twist level may be easily pulled out from between core yarns. In the chenille yarns with higher twist values may contribute better abrasion resistance on the produced upholstery fabrics; it is thought that higher twist in the yarn can maintain the roundness of the chenille yarns and therefore it may also contribute a good coherency.

At the 10000 rubs, with both higher twist levels (900-950 T/m) and long pile lengths (i.e. 1.5 mm) better abrasion resistance was obtained than the rest of the samples of the upholstery fabrics.

The appearance of the upholstery fabrics also reveals that chenille yarns are vulnerable to rubbing. We therefore can conclude that upholstery chenille fabric performances may improve with increasing twist level, pile lengths and yarn counts (finer yarns). Hence, upholstery fabrics made from these chenille yarns can present a good frictional behavior between pile and core yarns which these two can contribute enhanced properties on the produced yarns and chenille fabrics.

Acknowledgements

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TS 245 EN ISO 2062, Textiles-Yarns from packages- Determination of single-end breaking force and elongation at break.

THE EFFECT OF CORPORATE SOCIAL RESPONSIBILITY ACTIVITIES ON CONSUMER AFFECTIVE SATISFACTION IN HEALTHCARE INSTITUTIONS

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Intensively increasing consumer conscious and enhancing social marketing approach have increased consumer expectations except institutional marketing activities. Changing consumer expectations lead the businesses to maintain further effort than sales-based communication. Today, many standards brought by globalization and expectations of shareholders from the businesses obligate corporate social responsibility activities for the businesses. It should be taken into consideration that corporate social responsibility mostly identified with the concept of charity, is effective on estimating shareholders and avails for the businesses. The objective of this study is to determine the effect of corporate social responsibility activities of the businesses on consumer affective satisfaction and the study was conducted among consumers come to the healthcare institutions as patient and attendant.

Keywords: Corporate Social Responsibility, Affective Satisfaction, Social Marketing

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THE EFFECT OF ROAD ROUGHNESS ON THE HALF VEHICLE MODEL AT DIFFERENT SPEEDS

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Abstract: In this study, equations of motion have been obtained through different methods used in mathematical model of system based on car physical models. To determine system behavior in variable road inputs, half car and seat mounted half car models have been constituted. Using the method of Lagrange which is one of the mathematical modeling method responses to system's all physical models, mathematical models have been established. SIMULINK modeling program worked in MATLAB package has been used for computer solutions of system. Simulations have been made to the response to half car model hard road roughness and seat mounted half car model the to the road roughness at different speeds. As a result of made simulations, transmitted vibrations to seat and driver have been obtained.

Keywords: Half-car, Simulink, Lagrange, Road Roughness, Ride Comfort

Introduction

While important of motor vehicles in our life is known to all, effect of human health is not known exactly. Vehicles, beyond the damage to people due to accident, there may also be some effect on human health outside accident. For this purpose, a lot of scientist has made study about what can be this damage and they have published these studies.

In this study, using MATLAB and Simulink programs semi vehicle and seat entrained semi vehicle models have been constituted from equations obtained using Lagrange method. In created models to simulate, bump input has been given in step and model of seat entrained semi vehicle in addition to other models, vibrations which has been given of the same bump input on seat and chassis in different speeds have been obtained

Modeling and Solutions

Primarily, equation of motion has been taken for analytical solutions of suspension systems. Equation of motion has been derived by Lagrange method. The motion equation are given below according to figure 1.

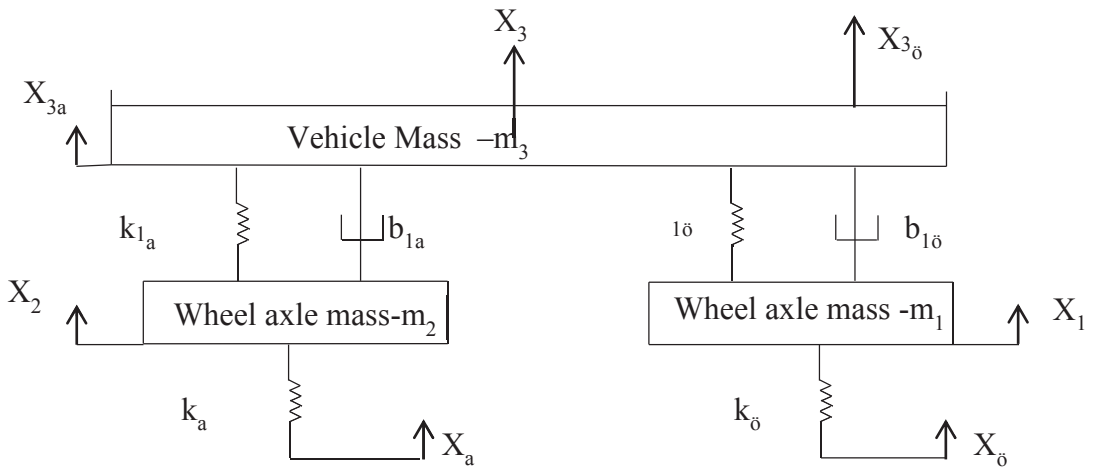

Figure 1. Semi Vehicle Model

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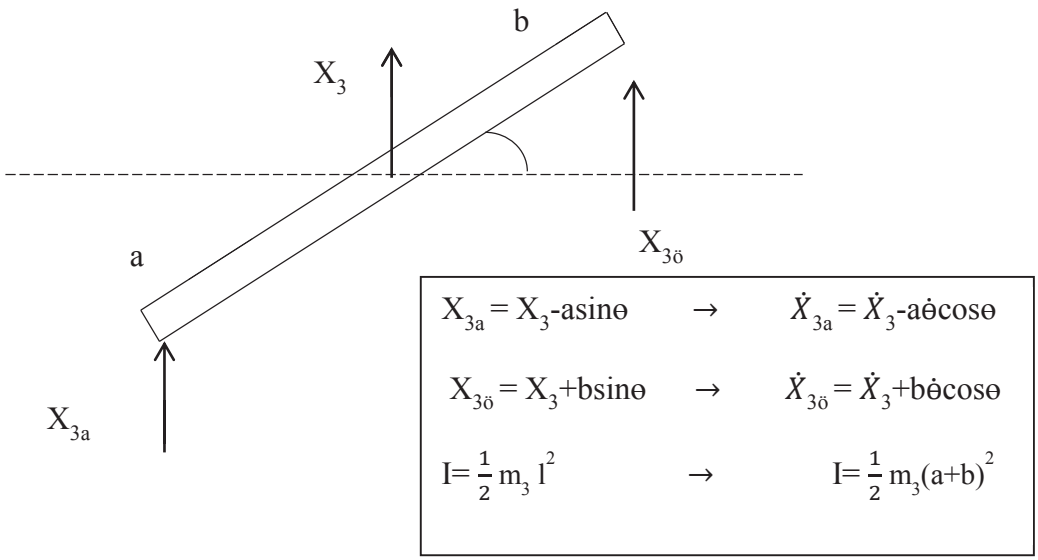

Figure 2. Motion of Inertia

$$\ddot{x}_1 = (b_{1ö}(\dot{x}_3 + b\dot{\theta} - \dot{x}_1) + k_{ö}(x_{ö} - x_1) + k_{1ö}(x_3 + b - x_1))\frac{1}{m_1} \quad (1)$$

$$\ddot{x}_2 = (b_{1a}(\dot{x}_2 + \dot{\theta}a - \dot{x}_3) + k_a(x_a - x_2) + k_{1a}(x_3 - a - x_2))\frac{1}{m_2} \quad (2)$$

$$\ddot{x}_3 = (k_{1ö}(x_1 - b - x_3) + k_{1a}(x_2 + a - x_3) + b_{1ö}(\dot{x}_1 - b\dot{\theta} - \dot{x}_3) + b_{1a}(\dot{x}_2 + \dot{\theta}a - \dot{x}_3))\frac{1}{m_3} \quad (3)$$

$$\ddot{\theta} = (b_{1ö}b(\dot{x}_1 - b\dot{\theta} - \dot{x}_3) + b_{1a}a(\dot{x}_3 - \dot{\theta}a - \dot{x}_2) + k_{1ö}b(x_1 - b - x_3) + k_{1a}a(x_3 - a - x_2))\frac{1}{I} \quad (4)$$

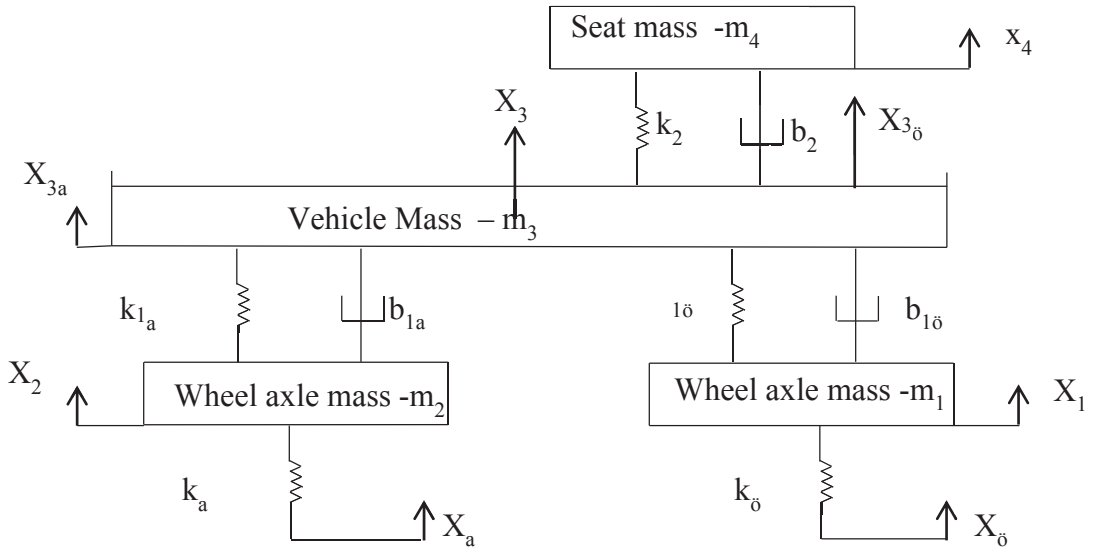

Figure 3. Seat Entrained Semi Vehicle Model

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The inertia movement that occurs when the car brakes or accelerates is shown in figure 2. Seat entered semi vehicle model is shown in figure 3.

$$\ddot{x}_1 = (b_{1\ddot{o}}(\dot{x}_3 + b\dot{\theta}cos\theta - \dot{x}_1) + k_{\ddot{o}}(x_{\ddot{o}} - x_1) + k_{1\ddot{o}}(x_3 + bsin\theta - x_1))\frac{1}{m_1} \quad (5)$$

$$\ddot{x}_2 = (b_{1a}(\dot{x}_3 + \dot{\theta}acos\theta - \dot{x}_2) + k_a(x_a - x_2) + k_{1a}(x_3 - asin\theta - x_2))\frac{1}{m_2} \quad (6)$$

$$\begin{aligned}\ddot{x}_3 = (&k_{1\ddot{o}}(x_1 - bsin\theta - x_3) + k_{1a}(x_2 + asin\theta - x_3) + k_2(x_4 - bsin\theta - x_3)\\ &+ b_{1\ddot{o}}(\dot{x}_1 - b\dot{\theta}cos\theta - \dot{x}_3) + b_{1a}(\dot{x}_2 + \dot{\theta}acos\theta - \dot{x}_3)\\ &+ b_2(\dot{x}_4 - \dot{\theta}bcos\theta - \dot{x}_3))\frac{1}{m_3}\end{aligned} \quad (7)$$

$$\ddot{x}_4 = (b_2(\dot{x}_3 + \dot{\theta}bcos\theta - \dot{x}_4) + k_2(x_3 + bsin\theta - x_4))\frac{1}{m_4} \quad (8)$$

$$\begin{aligned}\ddot{\theta} = (&b_{1\ddot{o}}bcos\theta(\dot{x}_1 - b\dot{\theta}cos\theta - \dot{x}_3) + b_{1a}acos\theta(\dot{x}_3 - \dot{\theta}acos\theta - \dot{x}_2)\\ &+ b_2bcos\theta(\dot{x}_4 - \dot{\theta}bcos\theta - \dot{x}_3) + k_{1\ddot{o}}bcos\theta(x_1 - bsin\theta - x_3)\\ &+ k_{1a}acos\theta(x_3 - asin\theta + x_2) + k_2bcos\theta(x_4 - bsin\theta - x_3))\frac{1}{I}\end{aligned} \quad (9)$$

Case to effect the simultaneous on two wheels was examined in semi vehicle simulation applied bump model. However, this simulation just can be viable in theory. In practice, the first vehicle's leading wheel would enter bumps; rear wheel depending on the speed would enter after a certain time. In figure 4, figure 5 and figure 6, simulation of seat entrained semi vehicle model exposed to h=0.1m bumps is made at different speeds.

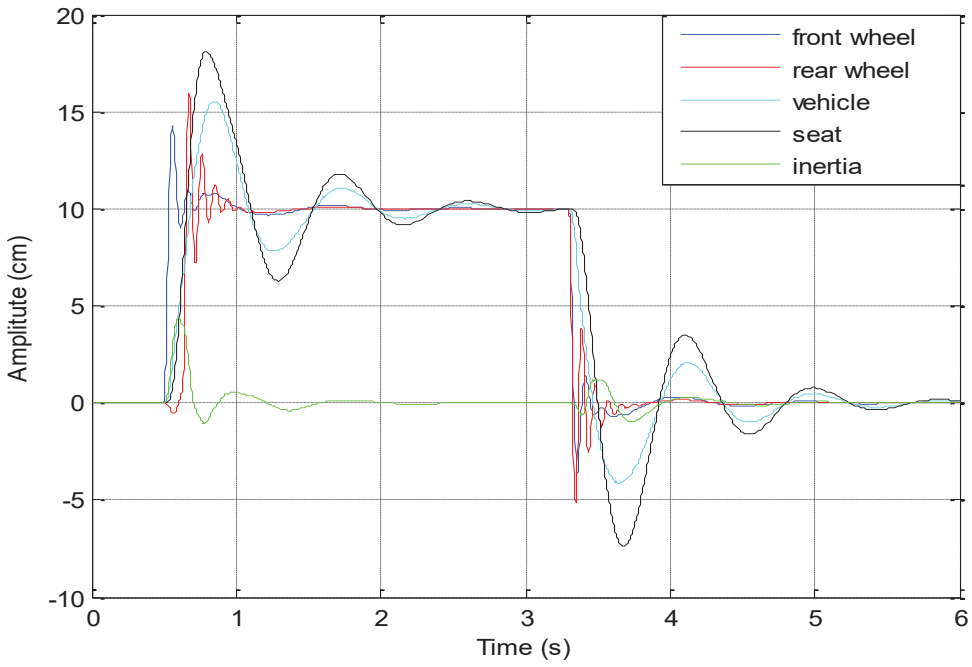

Figure 4. Step input Position-Time Graph For V= 75,6 km/h ve h=0.10m

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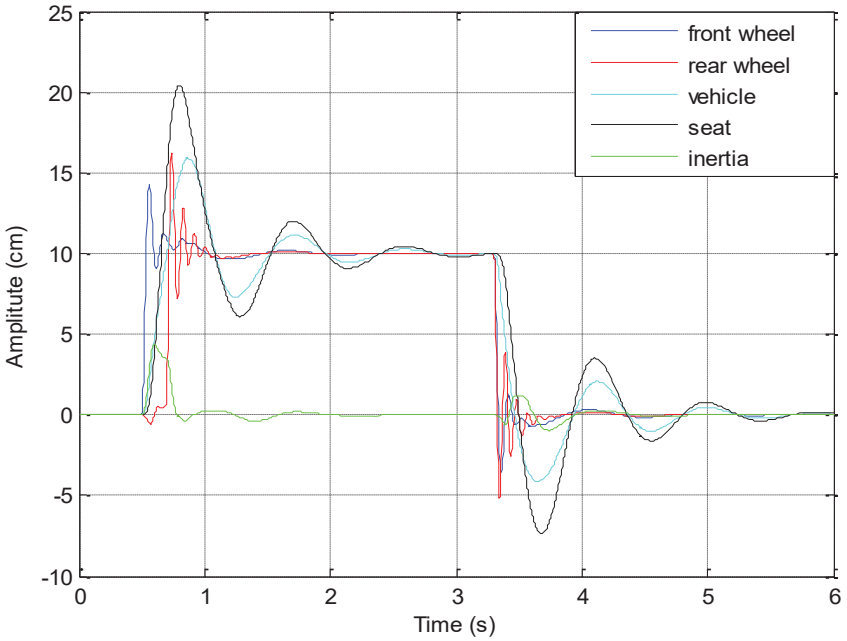

Figure 5. Step input Position-Time Graph For V= 50,4 km/h ve h=0.10m

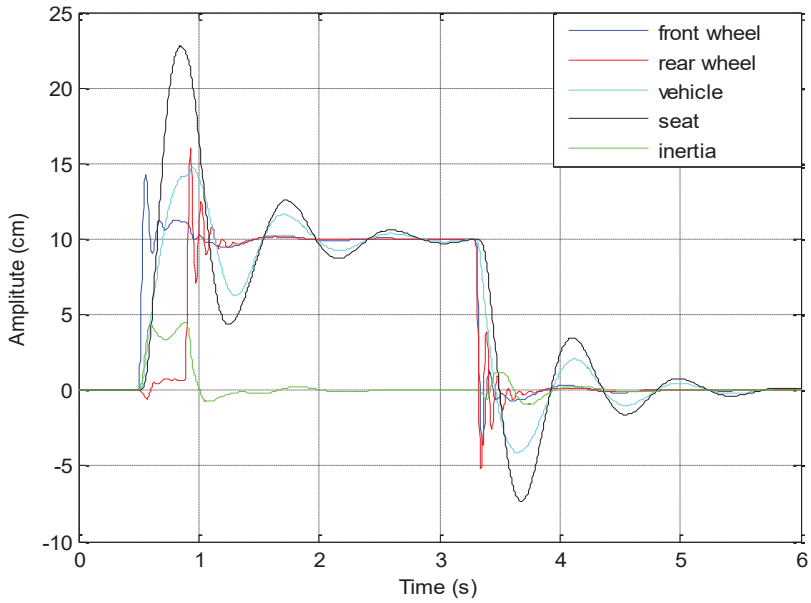

Figure 6. Step input Position-Time Graph For V= 25,2 km/h ve h=0.10m

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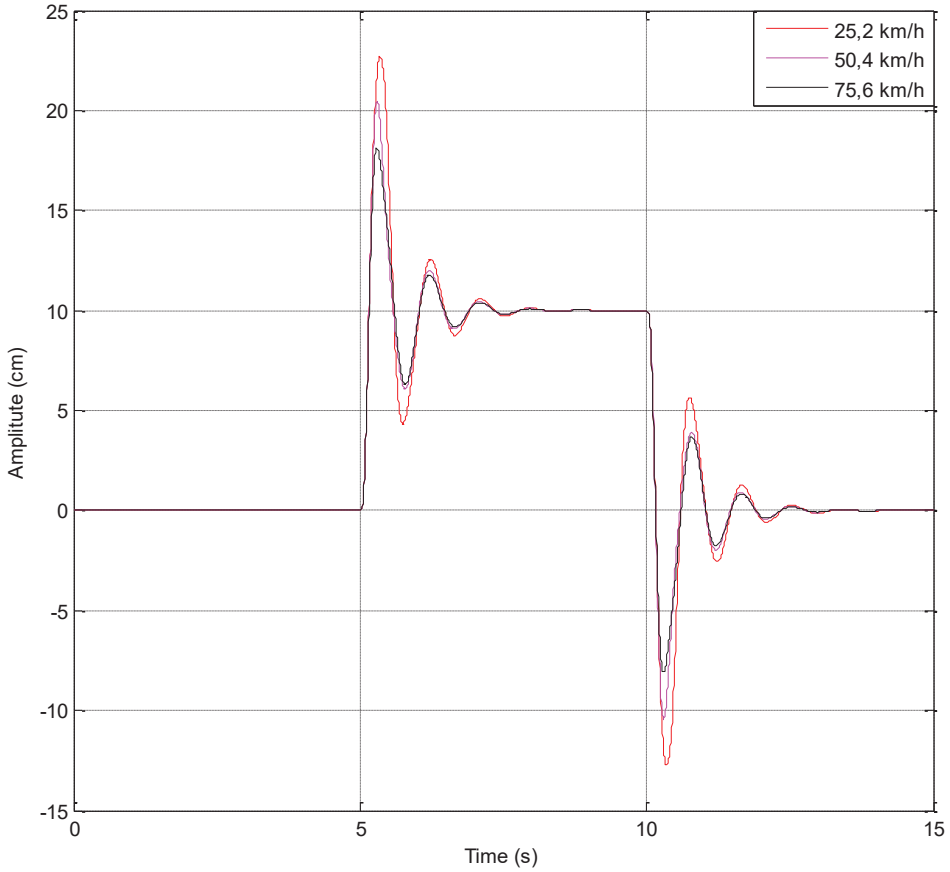

Figure 7. Seat Entrained semi-vehicle model at different speeds time dependent displacement graph

Results and Discussions

As a result of analysis, semi vehicle and seat entered semi vehicle models, motion of inertia is less about %27 in with seat models.

In this study, semi-vehicle model, phase difference occurring in the front and rear wheels depend on vehicle axle length and speed staking the route entry has been applied and effect of speed on system has been tried to scrutinize. According to the simulation results, it is noted that changing the location of the seat decreases with increasing speed but the front and rear suspension with increased displacement.

Conclusion

The results of this analysis, the value of these positions that vary depending on the system parameters have been shown to occur inevitably in the passive suspension system. This study conducted has a basis for analysis through passive suspension system of full vehicle and seat entrained full vehicle models. It was observed that vehicle comfort of a semi-active or active suspension can be improved by controlling the dynamic comfort systems and condition of comfort can be improved in limited circumstances in the passive suspension system with fixed-valued parameters.

In next studies, it is recommended that Conducting research about suspension characteristics and the structure will be developed implementation on a real vehicle for improvement of vehicle dynamics and safer driving at high speeds.

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THE EVALUATION OF TURKEY'S TRANSPORTATION POLICY UNDER THE NATIONAL DEVELOPMENT PLANS

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Abstract: Transportation sector is one of the most fundamental sector supporting the economic and social development in the contemporary societies. Today, due to the planning of different transportation modes is not productive separately, it is agreed that different transportation modes need to be planned as combined and coordinated structure based on integrated approach. The highway cargo and passenger transportations have the largest percentage in Turkey. Accordingly, the social, economic and ecological problems have been observed caused by single-mode transportation planning for many years. By the reason of Turkey located on the point where three continents converged, the country has geopolitical position. The transportation networks need to be determined by planning contemporary and environmentally friendly both national and international transportation corridors included. The transportation planning at the both national and international level has been intended to provide within the frame of the sustainable policies in Turkey. Therefore, the significant investments in transportation sector have been made in recent years.
In this study, the transportation policies from 1963 when the national development plans (NDP) began to be prepared to now are examined and evaluated. Then, it is analyzed how the policies related to transportation sector show an alteration and what is the factors affected the alteration in this process including all the NDPs in Turkey.

Keywords: Transportation, Transportation Policies, National Development Plan (NDP)

Introduction

In Turkey, the planning era has begun institutionally and constitutionally with Turkish Constitution of 1961. In the scope of ‘‘Social and Economic Rights and Duties’’, it is stated that ‘‘It is the duty of the State to encourage economic, social and cultural development by democratic processes and for this purpose to enhance national savings to give priority to those investments which promote public welfare, and to draw up development projects.’’ According to this article, the assignment of preparing national development plan has given to the institutional player of state. By founding State Planning Organization, it was targeted the financial, social and cultural development base on a plan could be provided. The NDPs and the programs related them comprise both macro and micro aims belonging to socio-economic sectors.

In this paper, it is comparatively examined the decisions taken in the planning era and current situation of the transportation sector that is determined by NDP in Turkey. Within this framework, firstly the development plans are evaluated in order according to the conditions of each plan period. Within the scope of each period, it is classified that the transportation policies and macro/micro aims in terms of all transportation subsectors (highway, railway, airway and seaway). In the sequel of this evaluation, it is discussed the transportation policies taken part in NDPs that is carried out according to the developments in practices. As the result of study, the NDPs are comparatively evaluated in the general framework.

Findings

The first three NDPs had been aimed in the long-term strategies including the objectives as a long-term targets for all sectors aimed at the first 15 years’ achievement. This period was including The First NDP (1963-1967), The Second NDP (1968-1972) and The Third NDP (1973-1977).

By the reason of characteristic feature of transportation sector among all sectors, the qualitative and quantitative developments in this sector are pretty important for improving the quality of life and functioning of the other sectors. To the extent permitted by national economy, transportation policies in The First NDP base on this vision. Due to the sectoral developments are basis for the long term development, investments of the fundamental sectors such as transportation, energy, education are given priority in the NDPs. The main objective of the policies of these sectors is to provide adequate production in terms of time and place, because of the importing the products belonging to these sectors isn’t possible. Besides, it is determined that these sectors were planned to enable other

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sectors to provide targeted developments.

When the situation of the transportation sector in 1963 examined within the basic framework in terms of the subsectors, it is seen that physical standard was ineffectiveness and carrying system remained limited with main road network in highway. However, it had come first in terms of permanent facilities, line length and carrying capacity. In railway, due to the construction technique was quite outdated, ineffectiveness of physical standard could be observed clearly. Seaway came first in terms of vehicles, therefore the ports where all the products imported or exported provided 62,6 % of the total cargo handling. In airway, there were 26 functioning airports (two of them are international) included military ones. When the proposed investments for improving the sector are examined, it can be deduced that raising the standards of sector considered significant for perspective of the developing country. To provide targeted annual average of Gross National Product in the plan period, transportation sector achieved 13,7 % of all the investments including public and private investments.

Transportation policies in The First NDP designed to achieve long-term targets can be cited have a monopoly on the works for all transportation subsectors in order to get sectoral efficiency, utilize the current capacity by the optimal way by taking into consideration of the national economy, enhance of the services and reducing the costs between city centers and rural settlements, reduce the costs and use the railway or seaway for the remote distances. In addition, establish the organization of short-distance vehicle that is feeder of these transports. From a number of similarities between The First NDP and The Second NDP, it can be deduced Turkey's conditions had remained incapable to set the determination objectives in five years period. So, the policies of each period has been prepared for improving the condition of transportation sector in Turkey.

It had been planned that application process for EU membership which began with European Community Association Agreement signed on 12 September 1963, has existed legally since 1 December 1964 would come to the conclusion in 1995 and join the customs union. The NDPs from 1973 when The Third NDP entered into force to now have been planned to have the strategies for the objective to get EU standards. Therefore, the 15 years' achievement adopted in 1962 had not been completed in the direction of determined target, because of the decision for preparing Third one and subsequent NDPs to that according to the principles of the EU. In the process of harmonization with EU, all the transportation policies also ones regarding sub-sectors and infrastructure need to be harmonized as well.

When the rates of implementation of the policies are evaluated, it has been seen that most political objectives are taken place again in subsequent plan due to Turkey's conditions of plan period are insufficient to implement macro aims in terms of technological, economic, etc. aspects. As a main indicator of this condition it can be stated the development in accordance with the expectation and policies couldn't be provided and the monopoly of highway passenger and cargo transportation has been continued during the planning era, however the rational objectives and principles taking place in the First NDP such as having a monopoly of transportation policies which were previously carried out under no system; in order to ensure transportation activities in the framework of economic boundaries, seaway and railway transport will be encouraged for remote transports; by working off the unfair competition among subsectors, using the vehicles effectively for the benefit of national economy have been seen in the subsequent NDPs too. The economic structure and traffic density of Turkey has been begun to shape with basic lines since 1960s. Giving priority to highway transportation is the main policy in this period, so the developments of other transportation options has remained limited. Besides, there is no policy for increasing in the length of the existing railway network (Table 1, Table 2). The State has been granted the highway infrastructure investments in increasingly growing amounts over the years in comparison with the railway despite increasing of petrol costs.

In the Seventh NDP, as the reason of this situation given above, it is stated that there were no Transportation Master Plan suitable with the investments of the other sectors. Because of that, the developments of the sector has been influenced negatively. The works about the Transportation Master Plan Strategy aiming to solve these problems that began in 1996 were completed in 2005.

In the scope of the privatization programs, Build Operate Transfer (BOT) model taken place first in the Seventh NDP is implemented to realize the investments and develop the inspection mechanisms.

Within the EU harmonization process, it is seen that the certain principles regarding environment have been taken place since the Third NDP. In this process, the transportation policies suitable with the EU acquis is given importance in the Sixth NDP for the first time. It has been targeted the transportation infrastructure suitable with the environmental issues since the Seventh NDP, therefore the environmental issues has been taken place in the transportation policies. Besides, Environmental Impact Assessment Process (EIA) taken place in the Fifth NDP for the first time, has been implemented for the transportation investments since the seventh NDP.

Since the Eighth NDP, the policies for providing the opportunities related advantages of Turkey's geographic location has been prepared. it is stated that in the NDPs, by determining international transport network to provide

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to trough transport arteries between Europe and Asia, to combine transportation enhances all the type of transports, to integrate the TEN-T (Trans Europe Transportation Networks) of EU with Turkey, to empower the projects of arteries among Caucasian, Central Asia and Middle East Countries and Turkey. In this scope, it is expected that the gained status of ‘‘International Transportation Through Road’’ will accelerate the development.

The Ninth NDP was prepared with the vision of “Turkey, a country of information society, growing in stability, sharing more equitably, globally competitive and fully completed her coherence with the European Union” as well as within the framework of the Long Term Strategy (2001-2023). After General Directorate of Highways and Under secretariat for Maritime Affairs became the sub unit of the Ministry of Transport and Communication, the institutes regarding transportation in Turkey have been gathered under a single roof in 2007.

When the Tenth Development Plan covering the 2014-2018 period examined, it is seen that priority is given to transportation systems that provide energy efficiency, use of clean fuel and environment friendly vehicles. It is emphasized that efforts to connect international and domestic production and consumption centers by improving the transportation infrastructure and to integrate transportation modes to each other have been continued during the Plan period. In this context, projects that strengthen the connections to the Trans-European Transport Networks (TEN-T), Caucasia and Middle East have been realized to a significant extent, construction of dual-carriage ways have been continued, high-speed railways have started operation, two main container ports have been given priority, and the number of domestic and international passengers and frequency of flights in the aviation sector have been increased.

As the primary targets in Regional Development of this plan, along the north-south corridors, transportation infrastructure connecting metropolitan cities, production centers and tourism cities will be reinforced. Regional airline operation between the cities which have appropriate infrastructure will be encouraged in order to increase accessibility of these cities and to reduce incurred expenses in connecting flights over Ankara and İstanbul. Connections of ports to Central and Eastern Anatolia and the GAP region will be strengthened. Besides, strengthening links between production and service centers and ports, organizing production more efficiently, improving and extending railroad infrastructure for freight shipment, increasing interaction among regions and enhancing accessibility especially along the north-south corridors by considering attraction centers and growth poles, maintain their significance. It is taken place that Logistics Master Plan integrated with transportation modes and corridors, logistics centers and other logistics activities will be prepared and put into practice. Within this framework, transport corridor maps showing transport alternatives of Turkey will be prepared so as to be used as a guide for selection of logistics center locations. The developments and targets in logistic and transportation is given at table 3.

Table 1. Developments in transportation sector in terms of passenger transport

Domestic Lines	**Passenger Transport (million pass-km)**						
	Highway		Railway		Seaway		Airway
	Interurban	Innercity	Interurban	Innercity	Interurban	Innercity	Interurban
1963	19369	1184	3005	626	213	965	124
1967	36100	1045	3639	710	178	1025	203
1972	47365	1325	2911	1300	387	1600	512
1977	82141	-	2362	-	241	-	1073,4
1983	76864 (S)	-	3024	-	98	-	650
1988	93237	-	3082	-	189	-	1012
1994	127948	-	3881	-	50	-	2278
1999	189882	-	4233	-	34	-	3371
2006	188000	-	-	-	62	-	-
2012	259000	-	-	-	131	-	-
2013	276000	-	-	-	151	-	-
2018	321000	-	-	-	232	-	-

(S) The data of the state in the sector only

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Table 2. Developments in transport sector in terms of freight transport

Domestic Lines	Freight Transport (million tones-km)				
	Highway	Railway	Seaway		Airway
	Interurban	Interurban	Interurban	Innercity	Interurban
1963	6717	4111	1889	65	1,1
1967	12500	6201	3420	80	2,4
1972	17714	6739	2948	42	2,4
1977	35100	10215	4397,2	-	83,9
1983	41812	6123	2930	-	57
1988	55225	6005	9730	-	100
1994	86382	8050	595 (S)	-	213
1999	155254	8160	8200	-	356
2006	177000	9600	3900	-	-
2012	216000	10900	7200	-	-
2013	232000	124000	8100	-	-

(S) The data of the state in the sector only

Table 3. The developments and targets in logistic and transportation

	The developments and targets in logistic and transportation	2006	2012	2013	2018	Annual Change Approx. (2014-2018)
HIGHWAY	Traffic (billion vehicle-km)	65	94	98	119	4
	Passenger transportation (billion passenger-km)	188	259	276	321	3,1
	Freight transportation (billion tones-km)	177	216	232	294	4,9
	Lenght of Roads (km-1000 km^2)	82	83	84	87	0,7
	Intensity of highways networks (km/1000 km^2)	2,60	2,88	2,85	5,11	12,1
RAILWAY	Freight transportation (billion net tones-km)	9,6	10,9	12,4	22,5	12,7
	The percentage of railway in freight transportation (%)	5,1	4,8	5,1	7,1	6,8
SEAWAY	Container (million TEU)	3,9	7,2	8,1	13,8	11,2
	Cargo handling (million tones)	248	388	418	615	8,0
	Merchant Marine Fleet with Turkish flag (million DWT)	7,3	10,3	11,0	14,0	4,9
AIRWAY	Number of passenger (million passenger)	62	131	151	232	9,0

Conclusion

The national development plan on a territorial scale is the socio-economic plan leading spatial plans. Actually, it is expected that national development plans provide to develop the sectors affected by development of countries. The context of development plans and process of preparation and application change from country to country. Level of development of countries, geographical location and expectation of public affect the sectoral plan decisions. The fundamental planning criteria determined by the environmental and ecological issues depending on the recent global approach has influenced context of plans. Besides, the usage and protection of the local resources for determining the targets of economic sectors is the one of the determinative issues especially for the developing

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countries.

In this paper, it is examined the transportation policies in national development plans. When especially the context of the latest three plans is taken into consideration, policies are tried to prepare in accordance with the issues stated above. It can be set a good example that the sizable transportation investments in all transportation modes planned for the main transportation networks connected the continents. Since the planning era began in 1961, one of the most critical approach is reducing the share of railway transportation which has an important share of transportation and logistics every passing year until 1990s. As a result of highway transportation is highly demanded, environmental and economic problems has accompanied this preference. However, the environmentally friendly transportation options are emphasized in each plans, it is not applied in practice as stated in the plans. When the plans are taken into consideration, it is seen that two issues come into prominence. Firstly, the plans need to be ongoing structure; the policies need to be consistently prepared according to the fundamental criteria based on environmental, economic and national issues. The other important issue is, the institutional, constitutional and directorial issues need to be empowered in accordance with the decisions on policies stated in plans.

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THE EXAMPLES OF SUSTAINABLE LOCAL DEVELOPMENT IN TURKEY: SEFERİHİSAR AND AKYAKA

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Abstract: Spatial and sociological structure of today's cities affects urbanization process in interaction with their dynamics. From past to present this interaction could not be brought under control with certain principles, one of the most important causes of this situation is the formation of large cities loosing their sociological, cultural and natural values and identity.

It can be expressed that the population density in cities consists of the social structure and spatial land use through the transformation of urbanization in Turkey. According to the 2012 census data, approximately 45% of the population living in cities is located in the largest five cities. In fact, the only way out of this vicious circle can be overcome by ensuring the availability of local resources, actively and steadily. For this purpose, especially in recent years, rural and local development concepts are discussed broadly. In addition, the implementation of alternative models of local development and management opportunities are being searched every passing day.

In this study, it is examined that the concept of Cittaslow (slow city) among local development models and changes in Seferihisar and Akyaka after participating in the Cittaslow Union and evaluating the contribution of this new status to the sustainable local development.

Key Words: Cittaslow, Seferihisar, Sustainable development

Introduction

Local development is based on a development approach by mobilizing local resources for local development of economic, political, social, cultural and environmental dimensions of sustainability, whereby involving all local actors in decision-making, from a bottom-upwards approach. To ensure the sustainability of local development, environmental factors have to be more predominant over social and economic factors (Pecquer, 1989; Meadows, 1998; IUCN, 2001; Kuhonta et.al., 2013).
Controlling the population growth in urban areas is one of the most basic precautions in terms of environmental issues especially in developing countries, with the effect of increasing industrial and economic activities. In Turkey, urbanization processes were developed to meet the basic needs of growing population in big cities like İstanbul, İzmir, Ankara, Adana, Mersin, Diyarbakır. Therefore, economic concerns of the population in local scale should be covered with the increasing availability of small settlement's resource potentials in accordance with the principles of sustainability. In recent years, "Local development models" often come up basically aiming at these objectives. However, "sustainable local development models" are gaining more and more importance day by day including the conservation of cultural, social and natural identification of the elements with economic development in rural areas even in smaller cities (Briassoulis, 2001; Meadows, 2002: IUCN, 2006; Hassink and Schieber, 2008; Say et.al, 2015).

The most important decision makers in local development within the local governments are the stakeholders because they are predominantly the decision makers and practitioners. Alternative management models developed for local governments stand as an important tool in the advancement of this process. In Italy in the 1990s, Citta slow concept sake to protect natural and cultural identity values which began in small towns due to the pressure of tourism (Parkins and Craig, 2006; Elovich, 2012; Cittaslow International Network, 2015).

In this study, Cittaslow concept was assessed as a model for sustainable local development which was announced for the first time in Turkey with the participation of Seferihisar in Cittaslow Union and it is aimed at presenting the Cittaslow practices in Turkey with respect to this concept.

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Material and Method

Given the importance of this movement in recent years, two districts in Turkey were examined which are Seferihisar district of İzmir being the first to join the Cittaslow Union and Akyaka district of Muğla which later joined the Union. In this study, both districts were compared and evaluated (Figure 1).

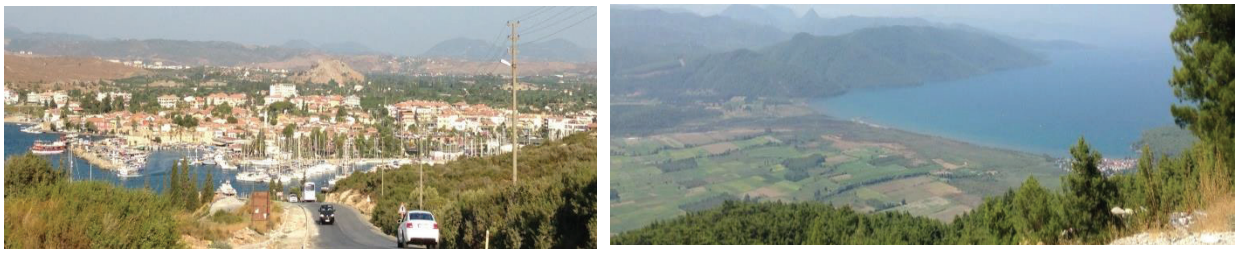

Figure 1. İzmir-Seferihisar Muğla-Akyaka

Cittaslow criteria, projects conducted by governments in Seferihisar and Akyaka, projects conducted by different institutions, organizations in Seferihisar and Akyaka, interview and meeting outcomes made with organizations and voluntary organizations in the fields of research area were used as materials of study.

The method used in this study, is generally composed of 3 stages. Firstly the theorical framework of local development has been subjected. In the second stage, Cittaslow philosophy investigated as a local development model. Then analysis of activities realized and planned to be launched in Seferihisar and Akyaka. In conclusion, Cittaslow consept contributions to the local development process of Seferihisar and Akyaka are evaluated.

Results and Discussion

Cittaslow, the Turkish expression “sakinşehir” concept is considered as a new alternative local development approach. This concept constitutes the basis of the homogenization of flavours and "slow food" movement which aims to be far from a “fast food” movement. Slow food concept has been developed to ensure viability of all original aspects of the city with changing prepared food habits which is a symbol of contemporary urban life culture.

Slow food movement emerged after the "slow" philosophy in 1999. The pioneers of this movement are the mayors of Greve, Orvieto, Bra and Positano's towns of Italy. The word “Cittaslow” originates from the words "Citta" and "Slow" meaning city in Italian and slow in English respectively. This movement started and International Cittaslow Association was established [1].The emergence of this concept in establishing the Cittaslow Union is about the negative effects of globalization on cities. Urban cities focus on consumption rather than production as well as becoming perculiar cities instead of maintaining their originality as a result of an economy based globalization movement. Parts of the city in different geographies increasingly resemble one another as indicators of the reflection of globalization. Structures produced by same technology, building materials and similar designs similarize cities of the world and destroy local identities determined by the local specificity. Uniformity is observed not only in urban spaces but also in the form of social life at the end of such a disidentification process.

International Cittaslow network is a union of cities coming together to prevent globalization and the elimination of the standardization of lifestyles of city elements and local identities. Union membership is on voluntary bases of the local governments with specific requirements. For a city to become a member of Cittaslow Association, it must have a service sector with preserved local identity and a population fewer than 50,000 inhabitants. Protecting the natural and cultural fabric, cultural and social traditions and ways of life which enables the maintenance of facilities are also among the main criteria. In addition, all of Cittaslow membership criteria were also published by the Union and the applicant municipalities are required to comply with the criteria in certain proportions.

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City residents in general criteria are grouped under seven headings; environmental policy, infrastructure policy, urban quality technology and facilities, policies about agricultural, touristic, craftsmen and artisans, plans for hospitality, awareness and education, social integration, partnerships. Local governments of slow cities are expected to develop and implement policies under the title of the criteria. The top priorities of these criteria are to improve city's green space, pedestrian and bicycle paths, existing of historical and cultural value with respect to the protection of the local architecture, promotion of local production, the systematic monitoring of pollution and giving priority to the use of renewable energy.

Considering these circumstances in general, it can be expressed that there is an overlap between the priorities and the theoretical framework of a sustainable local development model.

As of 2016, there are a total of 222 slow cities from 30 countries. 10 districts of Turkey (Seferihisar, Akyaka, Gökçeada, Halfeti, Perşembe, Vize, Tarakli, Yalvaç, Yenipazar and Şavşat) are union members (Cittaslow, 2016).

In this study, three factors were identified. The first factor is how the concerned districts can become member districts in the union with respect to their natural and cultural values. Secondly, the benefits of the membership status with respect to the locals and geography and lastly, the evaluation of the development in the districts after joining the union. In this case, two districts (Seferihisar and Akyaka) were discussed. Research trips were organized to the marked districts and series of meetings were held with local authorities on implementing the slow status in the cities.
To fulfill the requirements of slow city status, the local government has to play a role of volunteering and requesting for union membership. However, all sectors of living in the city should demonstrate this willingness when necessary applications operate. Therefore, identifying stakeholders related with slow city is important in terms of representating all individuals located in the city. In this study, examples of stakeholders in slow cities are local government, other government agencies under the jurisdiction of the city, city residents, professional unions and NGOs titles are determined.

At a later stage, planned and actualized projects were examined in Seferihisar and Akyaka and collected under general headings. As a result, the sustainable development, reconstruction and protection of districts have been introduced with the contribution of the criteria which have to comply by Cittaslow member cities.

Seferihisar

Factors responsible for getting Seferihisar's status are summarized as follows:

✓ **Preserved natural elements of city center and environs:** Existing urban fabric, tourism and agriculture can be said as a basic land use types of the research area. Until recent years the protected areas around the city and the use of military security areas have provided controlled development as much as possible. Especially coastal areas have been preserved to a certain extent from the pressures of mass tourism.

✓ **Socio-economic and historical values of the city:**
*The protection and promotion of the lifestyle and food culture especially in the Aegean regions.
*The historical identity elements of the most important ancient city of Teos.
*The architecture of the region

✓ **High market value of local products:** Mandarin which has become a symbol of the city (especially Satsuma genus), the city-specific cheese varieties depending on farming activities, organic products of local people (tarhana, jam, olive oil, olives).

Seferihisar has major restraining factors in terms of compliance with the Cittaslow criteria when compared with other Turkish cities. For example, these districts are located in municipality borders such a great metropolitan city, İzmir and some planned decisions taken by the metropolitan municipality causes a number of difficulties in local applications in the local government. Seferihisar is located on a traffic load transportation network that increases the accessibility in cities like İzmir and Kuşadası, and this situation obstructs the population control in the Seferihisar. The existing urban transportation problem is exacerbated especially in summer day trips in the city.

Despite these limiting factors listed in Seferihisar after switching to slow city status, very important projects completed while some are ongoing. Seferihisar Municipality made or partners 41 projects in order to contribute to the city's development and to complete the criteria which had been put by Cittaslow Union. These projects are quite important in terms of city development with respect to ecology and to complete the criteria which city residents have to comply to. Projects related information collected under the general title and the scope of the project are outlined:

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Improving the quality of life by urban design practices: The first applications made by the municipality is to increase the amount of green space in the city and prepare landscape projects after becoming a member of the Slow Union. In addition, children's playgrounds and squares are targeted to be increased. Figurative sculptures and plastic objects were placed in certain points of the city. Maintenance and repairs were done in the city's public places like schools and mosques in order to increase the comfort of this area. Initiatives have been launched to solve the problems about people with health, education, transport and communication diasabilities which is a major problem even in developed cities.

Solving the transportation problem: There was a significant increase in the number of domestic tourists given the impact of media publicity after becoming a member of the Slow Union. This situation has further increased the already existing problem of transportation and has become the most important problems to be solved in the municipality. Transportation can be expressed as the most compulsive criteria according to the slow city criteria. Priority applications which are made by relevant municipality can be listed as follows; a ring service minibus is provided for basic uses to prevent traffic in the city. In addition, thanks to the bike stations which will be operational in the city soon, citizens can rent a bike when they wish or prefer to use their own bikes which are a healty and economical means of transport.

Transportation is a major problem in Seferihisar located on İzmir-Kuşadası road. Especially in summer, Seferihisar has a traffic load which contrasts its slow city status due to intense pressure from tourists and day visitors. Apart from the transport-related applications which were done by the municipalities, two projects were initiated about this topic after becoming a slow city.

The first of these is EU COST project conducted in partnetship with Çukurova, Ege and Dokuz Eylül Universities (Say et.al., 2015). In the long-term the aim of the project is to evaluate alternative transportation options compatible with slow city criteria of the transport problem's solution in the city. Another project is carried out from a voluntary organization EMBARQ (The WRI Center for Sustainable Transport). In this project, Seferihisar Traffic Analysis was carrid out and some traffic regulations were proposed in a short time to deal with the traffic problem in the city. That EU-funded study is aimed at the investigating transport characteristics of the district's center and supports the adaption process of the "infrastructural" requirements of the slow city.

Protection of local values: Increasing the availability of the protection of existing local value found on the basis of local development. Applications at this stage can be grouped into three namely: the local architecture, local food and local products. One of the effective features of Seferihisar's being slow city is its own local architecture. But the number of local architecture has been decreasing gradually with each passing year within modern urbanization. Especially, "Sığacık development plan for the protection of urban conservation areas" prepared by the municipality of Seferihisar have been implemented for the protection and restoration of historic Kaleiçi homes located in Sığacık neighborhood. In this case, historic homes adhering to these original structures are restored in recent years.

Local food studies have been launched with the establishment of public markets where the selling of organic products is done after becoming a slow city (Figure 2). In this way, local government aims at both contributing to the local economy and making a presentation with sales of special food products in the city.

Satsuma mandarin which has a significant share in local production sector has become one of the city's branded products. Mandarin was used as an identity element during the presentation of the city as city slow. For this reason, mandarin festival is organized every year by the municipality.



Figure 2. Local organic food market inside the walls of historical castle

Supporting the local economy: Local scale businesses supporting has an important place in the development of slow cities. The initial purpose of this work is to ensure the opportunity of selling products which are produced by women who acquired skills from free lessons and courses for their traditional production. In addition, organic

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public markets are being established for selling of organic products produced in rural areas. In recent years, citizens come for organic market shopping from surrounding settlements including İzmir (Figure 3).



Figure 3. Sales of organic and handmade products

Renewable Energy-Nature Conservation: Projects and applications about increasing the use of renewable energy resources are realized not only in Seferihisar, but all across the country will be an example to settlements. Firstly, the city's main streets and open green areas have LED lighting system with solar electricity generation installed. The target of the total electricity consumption of Seferihisar Municipality will be achieved from the "Installation of photovoltaic power plant in the closed market of Seferihisar Municipality as Pilot Project" which will be supported by İzmir Development Agency (İZKA) (Figure 4). The actualisation of this project in Turkey will be the first time an institution will produce the electricity needs with renewable energy.



Figure 4. Renewable energy example from Seferihisar

Wind energy has a significant potential within the renewable energy sources in Seferiihisar. For this purpose, a wind power plant has been decided for Seferihisar. Expropriation procedures related to area of the plant will be launched with the decision received on 02.07.2013 by the Council of Ministers.

In addition to this project supported by the Seferihisar Municipality and commissioned to a private firm "Seferihisar Greenhouse Gas Inventory and Sustainable Energy Action Plan" studies are ongoing. With this study, the calculation of the reduction challenges in fossil fuel consumption and greenhouse gas emissions applications especially in residential areas and transportation sector is intended.

Akyaka

Muğla's Akyaka district has become a second member of the international Cittaslow Union in Turkey. Akyaka has less population than Seferihisar. According to the census conducted in 2012, there are 2487 inhabitants living in the city. The most important features of being a slow city are the natural coastal areas located on Gökova Gulf and despite pressure from the local tourism; the city's local architecture is substantially preserved.

Improvement of life quality by urban design practices: In the city the identity of the elements are mainly used in project designs conducted especially in recent years. The granite natural stone is increasingly used on urban roads as floor covering. The Azmak coastal strip development network application completed in Akyaka and the walking path was opened while the vehicular traffic along azmak was closed. Wooden roof and tiled signs architecture have been installed instead of signage applications in different materials and various sizes create visual pollution in Akyaka (Figure 5). Restoration of certain corporate buildings made such as fishermen cooperative building. Usage of structural arrangements in cafes, restaurants etc. located in open and green spaces in town were made not to create a contrast with the city's architectural qualities.

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Figure 5. General View and Building structure of Akyaka

Transportation problem solving: Transportation is one of the most important problems in Akyaka as well as all the tourist areas. Daily trips, especially weekends constitutes urban traffic which is an adverse effect with the concept of calmness. The priority application of this topic is transportation to the region's most demanding beaches which was done uni-directionally, in order words, in one direction. Another application is the implementation of the prohibition of parking in the city. In addition, municipal buses have new routes and more frequency due to the response of the demands of local people for the reduction of the use of private cars and thereby resolving the problem of transportation of university students and facilitating transport in the region.

Natural Protection: With the establishment of "Akyaka Center for Marine and Coastal Areas Protection" the protection of existing natural beauty is been promoted. Integrated Coastal Zone Management UNDP project carried out during the European Union SMAP has been preserved for protection of Kadın Azmağı which has a great importance to the district.

Besides these activities, GEKAP (Akyaka Recovery Project) has been made for the conservation of nature in order to prevent environmental pollution arising from paper-cardboard, plastic, glass and metal packaging. Wastes are collected and sent for recycling in special bags. The biological treatment plants in Akyaka and Gökova towns became operational (Figure 11). GEKA (South Aegean Development Agency) is an ongoing project for the extraction of the inventory from the Gökova sea bottom which is one of the most important conservation activities in the area. A 700 year old pistacia tree registered as cultural assets has been provided. Another service started for protecting the nature is a waste collection boat which began operation for the collection solid and liquid waste of passenger boats and yachts. A major contribution to the protection of coastal ecosystems is provided with banning of motorized water sports in the region.

Protection of Local Values: To ensure continuity and protection of existing special structures of homes in Akyaka, the construction standard was implemented using the additional revision of the 1:1000 scales Akyaka (Ula) implementation plan. Facilities which serve the tourism sector located in the city are built in similar standards in accordance with the local architectural harmonic examples.

Supporting the local economy: The most important support provided under this heading is the promotion of family pensions. With the information of the entrants to this sector, local food services which are made with local products in local structured guest houses are encouraged. Supporting local production and contributing to local people's livelihood is aimed at establishing public markets.

Conclusions

Demand to be a member of a Cittaslow Union is an indication of willingness to adapt the slow city criteria by local government of the city. Each candidate city is committed to providing full compliance with the present criteria, even if the cities are qualified as having the most existing criteria at the stage of application for membership. Also, due to the dynamic nature of the cities, they are given commitments for the protection and the continuity of their own properties. Therefore, projects are being developed in different areas of the members cities and also changes and development processes are been observed in cities. By becoming a member of International Cittaslow Association cities are facilitated to receive financial support in national and international context as well as becoming brand names and in a political sense put forward name of city governments.

With studies carried out in Seferihisar and Akyaka districts, governments can quickly take the lead in improving the situation and can reveal viable developing projects to overcome the shortcomings under investigation. In these two cities, completed works were done in the shortest possible times and their positive results were achieved

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through the help and activities of local government and public support. Public participation and support of the governments is one of the top priorities in sustainable local development models like the concept of city slow. Residents living in these two cities have emerged with significant local values and support to the government for being slow member cities. In addition, the local people are conscious that they will be profitable with the protection of these values.

The projects carried out within the scope of cittaslow are similar in purpose and content in İzmir-Seferihisar and Muğla-Akyaka because of the similarity in their geography, natural and cultural values. However, some cities that have joined slow city association can create differences in terms of the features and identity elements within their respective cities. For example, Seferihisar situated in the west coast of the Aegean Sea and Halfeti which is located in the east of Turkey may also vary in geography, historical processes and prominent identity values. In addition, they are under the influence of different factors due to the general condition of their location. Therefore, the prioritized problems to be solved are not similar. In this regard, the cittaslow concept is an important tool for nature in order to create their own management models and applications depending on a number of basic criteria.

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THE INVESTIGATION OF AIR, HEAT AND SOUND PERMEABILITY OF PERLITE COATED NONWOVEN FABRICS WITH DIFFERENT WEIGHTS

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Abstract: In this study, polyester (PET) nonwoven fabrics with different weights were coated with perlite stone powder with particle sizes between 210-590 µm. Before coating procedure, water repellency treatment was applied to the samples and then the same amount of polyurethane base coating with perlite stone powder was applied on the nonwoven samples. After coating, the samples were cured at 100°C for 10 minutes. Finally, air, heat, and sound permeability of samples were investigated with regards to the weight of samples. According to the results, the increase in weight of samples caused to improve air permeability and acoustic insulation of samples. Furthermore, the decrease in weight of samples caused to decrease in the thermal conductivity coefficient of samples.

Keywords: Nonwoven, Air Permeability, Thermal Insulation, Acoustic Insulation

Introduction

In the world, energy consumption causes to increase pollution, environmental degradation, and global greenhouse emission. Building, transportation, and agricultural sectors are the most effective sectors to contribute to energy consumption. Furthermore, almost 40% of energy consumption results from the building sector (Pargana et al., 2014).

The growing environmental awareness throughout the world induces to use insulation materials resources in the all sectors (Nguyen et al., 2014). Moreover, high energy consumption, and climate changes obligate to use more sustainable and energy saver materials. Especially, thermal insulation materials play an important role in energy saving. In the buildings, to achieve better thermal insulation with commonly used insulation materials, thicker walls are suggested. However, the use of thicker walls can cause to increase cost and effect architectural restrictions. Consequently, in order to meet the demand of energy efficiency in buildings, it is necessary to develop thermal insulation materials with low thermal conductivity (Patnaik et al., 2015).

In thermal insulation applications, the widely used insulation material in the building industry is glass fiber derived from silica and synthetic fibers based on petroleum resources. Furthermore, demand for the use of sustainable, natural, and biodegradable materials has increased day after day (Patnaik et al., 2015). In the literature, Korjenic et al. investigated the thermal insulation properties of composites reinforced with jute, flax, and hemp. According to the results, the thermal conductivity coefficients of samples are 0.0458-0.0393 W/m K (Korjenic et al., 2011). In the other study, the thermal conductivity coefficients of cotton stalk fibers were investigated. The results show that the thermal conductivity coefficient is correlated with density. The thermal conductivity coefficients of samples are 0.0585 to 0.0815 W/m K, which is close to the expanded perlite (Zhou et al., 2010). Da Rosa et al. produced six insulating boards with the use of rice husk, sunflower stalks, and gypsum as binder. The thermal conductivity coefficients of samples are low values (Da Rosa et al., 2015). In order to gain thermal insulation to buildings, the textile materials are used as construction materials (Briga-Sá et al., 2013; Arumugam et al., 2015; Chen et al., 2015).

Since perlite stone has porous structure and cost-effective, it is used as acoustic and thermal insulation material. Furthermore, perlite stone is natural, biodegradable, ecological, and sustainable material. Because of having such properties, perlite stone is used in thermal insulation, agriculture, and filtration sectors (Kabra et al., 2013). The chemical composition of perlite stone is given in Table 1.

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Table 1. Chemical Composition of Perlite (Raper and Raper, 2014).

Compositions	Quantity (%)
SiO_2	70-75%
Al_2O_3	12-15%
Na_2O	3-4%
K_2O	3-5%
Fe_2O_3	0.5-2%
MgO	0.2-0.7%
CaO	0.5-1.5%

In this study, in order to improve the thermal and acoustic insulation properties of PET nonwovens with different weights, the samples were coated with perlite stone powder. The results show that the weight of samples effects the thermal conductivity, air permeability, and sound absorption properties.

Materials and Methods

Materials

In this study, PET nonwovens with different weight such as 120, 140, 180, and 500 g/m^2 were used for the experiments. In order to improve the thermal and acoustic insulation properties of fabrics, perlite stone powder grinded by using ball mill and sifted to get a particle size between 210-590 µm was used. Perlite stone powder was coated with polyurethane based binder to PET nonwoven fabrics. In order to prepare coating paste, RUCO-COAT PU 1110 (Rudolf Duraner), RUCO-COAT FX 8011 (Rudolf Duraner), and RUCO-COAT TH 821 (Rudolf Duraner) were mixed. The coating chemicals were purchased from Rudolf Duraner Incorporated Company, headquartered in Bursa, Turkey. The properties of coating materials are given in Table 2.

Table 2. The Properties of Coating Materials.

Material Name	Properties of materials
RUCO-COAT PU 1110	Water based aliphatic polyether polyurethane dispersion in anionic form
RUCO-COAT FX 8011	Blocked isocyanate cross-linking agent in anionic structure
RUCO-COAT TH 821	Synthetic thickener acrylate in anionic structure

Water Repellency Finishing Treatment

PET nonwovens were applied with water-repellent finishing by using RUCODRY DFY fluorocarbon based and purchased from Rudolf Duraner Inc. in accordance with padding method in order to impede absorbing of nonwoven fabric of polyurethane based coating material. Then, the samples were dried by using stenter drier (ATAC Lab. Machines GK40E) at 100°C for 5 min.

Coating Procedure

PET nonwoven fabrics were coated with polyurethane and perlite stone powder by the use of ATAC Lab. Machines RKL40 coating machine. After coating process, samples were dried at 80 ºC for 10 minutes by the use of ATAC Lab. Machines GK40E dryer machine.

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Measurement of Thermal Conductivity

Thermal conductivity coefficients of the samples were measured by using P.A.HILTON LTD.H940 instrument according to the TS 4512 Standard (TS 4512 Standard: Determination of heat transfer coefficient of textile materials, 1985). The samples were prepared in 25 mm diameter. Thermal conductivity coefficients of samples were calculated with the following equation (Kılıc and Yigit, 2008),

$$Q = -k.A.\frac{dT}{dx} \qquad (1)$$

where Q is the heat flow (W), A is surface area (m²), x is the thickness of sample (m), T is the temperature difference (K), and k is the thermal conductivity coefficient (W/m K) of sample.

Measurement of Acoustic Insulation

Sound absorption coefficients of materials were measured in accordance with ISO 10534-2 standard (ISO 10534-2 Standard. Acoustics – determination of sound absorption coefficient and impedance in impedance tubes – Part 2: Transfer-function method, 1998) by using a measuring instrument of Brüel & Kjaer Impedance Tube, which is based on two microphone transfer function method.

Measurement of Air Permeability

Air permeability test was carried out under 200 Pa pressure and 20 cm^2 testing area according to DIN53887 test standard (Standard: DIN 53887 Testing of textiles; determination of air permeability of textile fabrics, 1966).

Results and Discussion

Measurement of Thermal Conductivity Coefficients

Thermal conductivity coefficients of samples were calculated with the Fourier equation. Figures 1 and 2 show the thermal conductivity coefficient of samples coated with perlite stone powder.

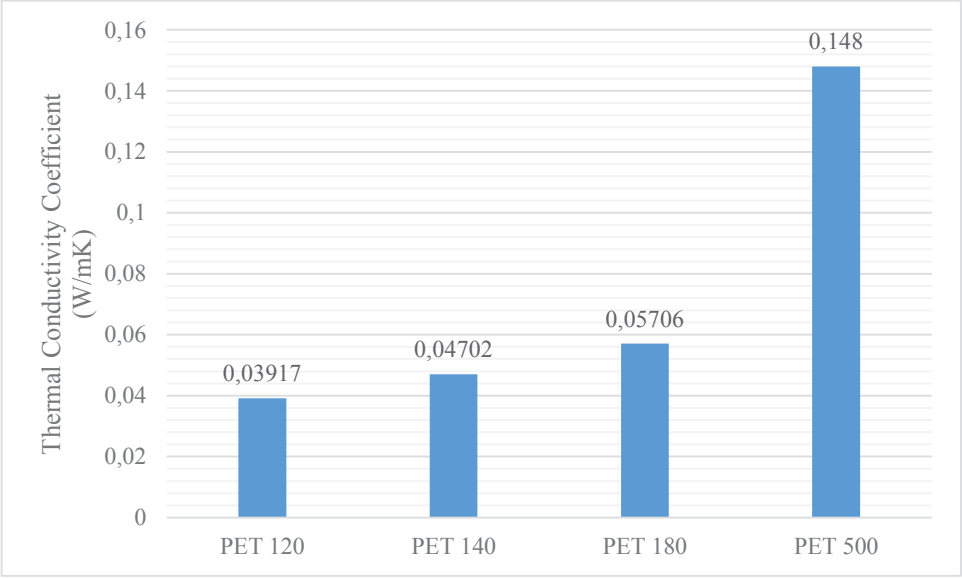

Figure 1. Thermal conductivity coefficients of PET nonwovens.

Thermal insulation and thermal conductivity coefficients are inversely proportional. The meaning is that the material with low thermal conductivity coefficient is ideal for thermal insulation applications. It is seen from Figure 1, PET120 nonwoven sample has better thermal insulation. Because of low thickness of PET120 nonwoven sample, it has better thermal insulation property. Besides, the thickness and the thermal insulation coefficients of the materials are directly proportional. In other words, a decrease in material thickness causes to decrease the thermal insulation coefficient.

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Measurement of Sound Absorption Coefficients

Figure 2 shows the sound measurement results of the nonwovens.

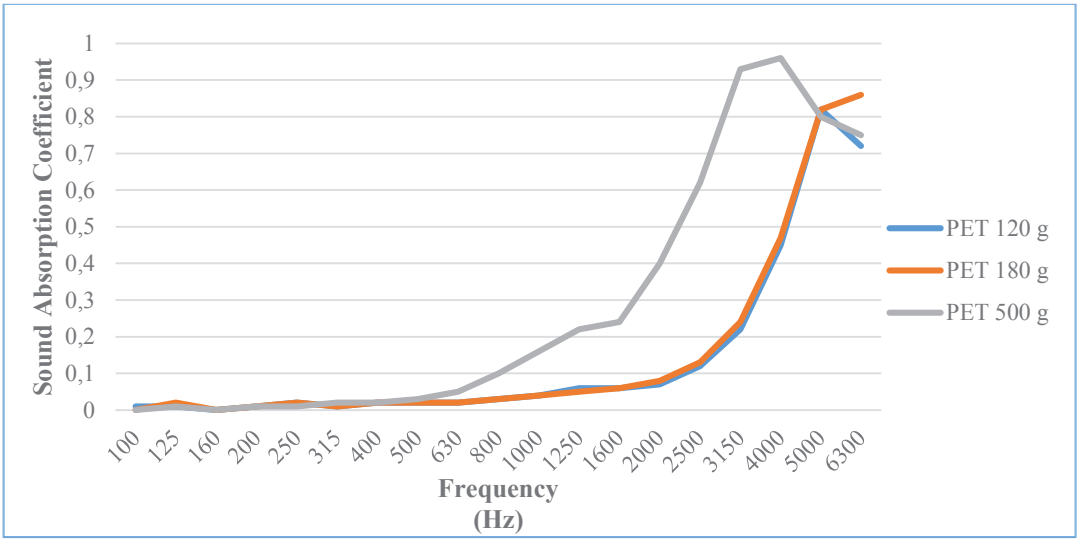

Figure 2. The Sound Absorption Coefficients of PET nonwovens.

According to the results, the sound absorption coefficient increases with the weight of samples. It is considered that increase of material thickness causes to increase in the amount of micro pore within the sample. It is observed that PET500 nonwoven fabric has the best sound absorption property. Furthermore, PET500 nonwoven is the thickest material. The increase in thickness of surface causes to increase the travelled distance of sound waves. As a result, the frictions between sound waves and surface increase and the amount of sound energy converted lost heat energy rises.

Measurement of Air Permeability

The air permeability results of the nonwovens are given in Figure 3.

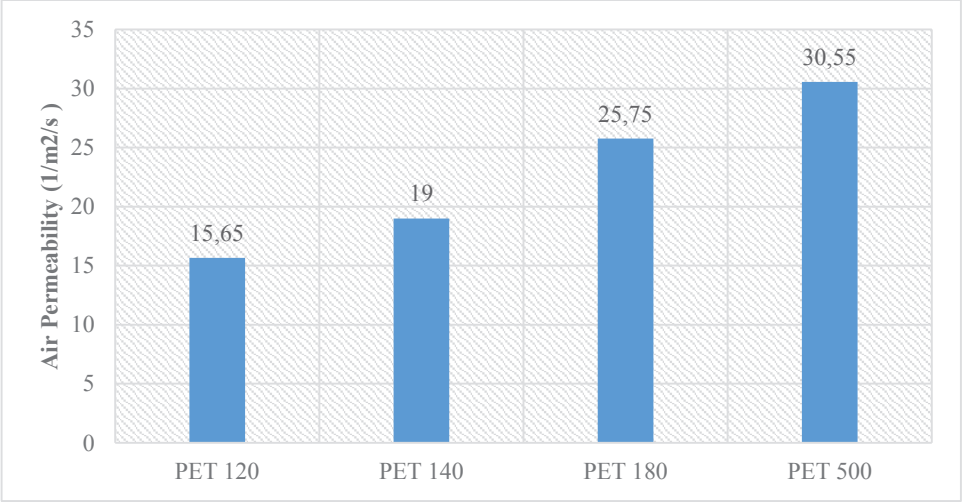

Figure 3. Air Permeability of PET nonwovens.

According to the air permeability results, the increase in weight of samples causes to improve the air permeability of samples. Moreover, it is deemed that the amount of air in PET 500 nonwoven is more than the other samples.

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Conclusion

In this study, the use of PET nonwovens in building textiles was investigated to improve thermal and acoustic insulation. For this purpose, PET nonwovens with different weights were coated with perlite stone powder. After the coating process, the air permeability, thermal and acoustic insulation properties of samples were compared with regards to the weight of samples. According to the results, the increase in weight caused to improve the acoustic insulation and air permeability of samples. Furthermore, the decrease in weight of sample caused to increase in thermal insulation.

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THE INVESTIGATION OF MECHANICAL PROPERTIES OF HYDROXYAPATITE COATING MATERIALS BY USING LACTIC ACID - SODIUM LACTATE BUFFER SYSTEM AND TY6AL4V MATERIAL SURFACE

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Biomaterials used for the treatment of injured tissues and organs by implantation must be compatible with the body in order to perform the required functions.Calcium phosphate based hydroxyapatite, which forms the inorganic structure of bone tissue, is a bioceramic substance used in medical and dentistry. Because of its biocompatibility, it is used in the repair of artificial bones, fractures and broken bones and coating of metallic biomaterials in the construction of various prostheses.The properties of hydroxyapatite also allow the implants to stick to the bone firmly.The Ti6Al4V alloy is used as the base material for the reasons that the biocompatibility is high, the resistance to corrosion is high, and the elasticity modulus is close to the elasticity modulus of the bone.

In this study, a hydroxyapatite coating was applied to the surface of Ti6Al4V material in an artificial body fluid compatible with blood plasma using a lactic acid - sodium lactate buffer system and modeled by the finite element method. Mechanical properties such as tensile analysis, natural frequency, etc. of the coating were investigated in order to determine the resistance against the mechanical effects that the coating applied with the modeling could be exposed to at the places of use.

Keywords: Hydroxyapatit, coating, FEM

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THE INVESTIGATION OF SOCIAL PROBLEM SOLVING ABILITIES OF MOTHERS WITH PHYSICALLY DISABLED CHILDREN BY THE USE OF QUASI-EXPERIMENTAL METHOD

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Abstract: This research is an empirical study aims to develop social problem solving skills of mothers with physical disabilities (cerebral palsy and muscular dystrophy). The study group consist of 30 mothers whose children receive physical treatment in a private rehabilitation center in Kayseri. As a preliminary test, 'Social Problem Solving Inventory Short Form' and general information form were administrated to the study group. Out of 30 participants randomly selected 15 people formed the experiment group and 15 people formed the control group.

Based on the Social Problem Solving Therapy principles, the training program with a psycho-educational content, the cognitive behavioral therapy and including stated and moving games were used in the experimental group for 5 weeks. No training was given to the control group in this process.

When the variables were examined in an integrated way, a significant difference ($p < 0,05$) was observed between the total score of the experiment group after training given to them and their pre-training total score. It can be argued that the education given to the mothers is effective in improving their social problem solving skills.

Key words: Social Problem Solving, Physical Disability, Mother's Education, Rehabilitation Center.

Özet: Bu araştırma fiziksel engele sahip (CP ve kas hastalığı) çocuğu olan annelerin, sosyal problem çözme becerilerini geliştirmeye yönelik deneysel bir çalışmadır. Araştırmanın çalışma grubu, çocukları Kayseri ilinde bulunan, özel bir rehabilitasyon merkezine devam eden 30 anneden oluşmaktadır. Çalışma grubunun tamamına ön test olarak 'Sosyal Problem Çözme Envanteri Kısa Formu' uygulanmıştır. Test uygulanan 30 katılımcıdan rastlantısal olarak seçimle 15 kişi ile deney grubu, diğer 15 kişi ile kontrol grubu oluşturulmuştur.

Sosyal Problem Çözme Terapisi temeline dayanılarak psiko-eğitimsel içerikli, bilişsel davranışçı terapilerin çeşitli yöntem ve teknikleri kullanılarak eğitimsel olarak yapılandırılmış, içeriğinde hareketli ve masa oyunları olan bir eğitim programı hazırlanarak deney grubundaki katılımcılara 5 hafta süresince uygulanmıştır. Bu süreçte kontrol grubuna herhangi bir eğitim verilmemiştir.

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Değişkenler bütünlük içerisinde incelendiğinde deney grubuna verilen eğitim sonrası toplam puanı ile eğitim öncesi toplam puanı arasında olumlu yönde anlamlı farklılık ($p < 0,05$) gözlemlenmiştir. Verilen eğitimin annelerin sosyal problem çözme becerilerini geliştirmede etkin olduğu ifade edilebilir.

Anahtar Kelimeler: Problem, Sosyal Problem Çözme, Fiziksel Engelli, Anne Eğitimi, Rehberlik Merkezi.

INTRODUCTION

As physically handicapped baby enters the family, many problems begin to reflect on the family. Failures in the process of solving problems can cause the balance of the family to be disrupted. Successful resolution of the problems effects the family communication, family unity and psychology of parents and children in a positive way.

Parents of physically disable children have difficulties in daily living. This may cause escaping from society and alienation. Families think that others can not understand them and the ability to communicate with others is deteriorated. Problems such as weakness, insecurity, meaninglessness and value conflicts are at the forefront of families with disabled children and this presents a serious problem for them (Izgar, 2009).

Mothers who are under the obligation to look after the disabled child should be educated for not lowering their quality of life, not catching burnout syndrome and due to the difficulties in life they should be provided with psychological support. Information and support about the treatment and rehabilitation of children with physical disabilities will also reinforce self-confidence of the mother's and it encourages them in looking after their children (Karataş, 2001).

This experimental study was conducted to investigate whether the Social Problem Solving Skills Training has a positive effect on the problem-solving skills of the mothers with physically disabled children and whether this effect is permanent.

Aim of the Study

The overall objective of the study was to determine the problem solving levels of the mothers with physically disabled children and the effects of the Social Problem Solving Training based on the Five-Step Approach Model for Solving Social Problems given to mothers' through group experience, and decrease the mothers' Impulsivity/Carelessness Styleand Avoidance Style Problem Solving Abilities.

Sub-objectives for his general purpose were:

1:Determining the social problem solving styles and problem orientations of the mothers participating in the research.

2: Decreasing the scores of mothers' ineffective Impulsive Careless Style Problem Solving and Avoidance Style Problem Solving and increasing their Rational Problem Solving scores

3: Sustaining the positive problem solving behavior

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Method

The study is a quasi-experimental study with single experimental and control group.

Study Group

Mothers who reside in Kayseri, who has physically disabled children and who send their physically disabled children to a private rehabilitation center for physiotherapy form the study group of the research. In the study, the criteria used to select the experimental and control group was; being literate having a child with physical disability and residing in Kayseri.Taken these criteria as a base 30 voluntary mothers were selected and they were randomly attended into experimental and control group.

Data Collection Instruments

In the study, mothers were given the Personal Information Form and the Social Problem Solving Inventory Short Form (Çekici,2009). The Personal Information Form contained the demographic characteristics and basic family information of the mothers in both groups.
The Social Problem Solving Inventory was developed by D'Zurilla and Nezu (1982) and it was reviewed by D'Zurilla, Nezu and Maydeu-Olivares (1996) and it was adapted into Turkish by Dora (2003). In this study, the researcher used the Social Problem Solving Short Form that was adapted by Çekici (2009)

The Social Problem Solving Inventory Short Form (SPCE-KF) consists of 2 dimensions as Problem Orientation and Problem Solving Styles. Within the Short Form, Problem Orientation has 2 subscales; beingPositive and Negative Orientationstowards the Problem. Problem Solving Styles are divided into 3 sub-scales, being Rational Style Problem Solving, Impulsive/Careless Style Problem Solving, and Avoiding Style Problem Solving.

The lowest score that can be obtained is 0 and the highest score is 100.High score indicates positive social problem solving skillsand low scores indicate negative social problem solving skills (Çekici, 2009).

Application

Personal Information Form and Social Problem Solving Short Form were applied to all of the mothers selected for the study group. Then mothers in the experimental group were given training for 5 weeks with 2-2.5 hours duration. The control group did not receive any treatment. Posttest was administrated to both groups and a follow up measurement was administrated 6 weeks later.

Data Analysis

SPSS 22 statistics packaged software was used to analyze the data. In descriptive statistics analysis of the data, standard deviation, median, the minimum and maximum frequencies and ratio values were used. The distribution of the variables is measured by the Kolmogorov Simirnov Test, which is used to test whether a theoretical population with two different experimental probability distributions comes from the probability distribution. In

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the analysis of the repeated measurements, the Wilcoxon Test developed to test whether the distribution of two variables is the same in experimental studies was used.

Psycho-education Group Training

Mothers participating in this social problem solving skills training were trained for 2 to 2.5 hours on average, once per week for 5 weeks. In this study, no training was given to thecontrol group.

Training program was based on the Problem Solving Therapy (PST; D Zurilla and Goldfried, 1971), which is a systematized approach based on the Cognitive-Behavioral Therapy(CIS) techniques such as ABC teaching, self-monitoring, though stopping, working on the irrational thoughts, cognitive restructuring, giving cognitive and behavioral homeworks, being a model, supportive, directive and indirective interventions, rewarding, humour, exercises based on action and music, table games exercises, small group works were used during the sessions.

Results

Table 1. Mothers' Demographic Characteristics Table

		Experimental G.		Control Grup		p
		n	%	n	%	
Age	26-32	3	20,0%	5	33,3%	p> 0.05
	33-40	5	33,3%	4	26,7%	
	41-47	6	40,0%	3	20,0%	
	48-55	1	6,7%	3	20,0%	
Education	Literate	1	6,7%	1	6,7%	p> 0.05
	Primary sch	10	66,7%	9	60,0%	
	High School	4	26,7%	5	33,3%	
N. of Children	II	6	40,0%	8	53,3%	p> 0.05
	III	5	33,3%	5	33,3%	
	IV	4	26,7%	2	13,3%	
Fathers' education	Primary sch	5	33,3%	7	46,7%	p> 0.05
	Mid. Sch.	3	20,0%	7	46,7%	
	High School	7	46,7%	1	6,7%	
Disabilitiy Children N.	I	12	80,0%	12	80,0%	p> 0.05
	II	3	20,0%	3	20,0%	
Fathers Income	Var	13	86,7%	13	86,7%	p> 0.05
	Yok	2	13,3%	2	13,3%	
Occupation	employed	0	0,0%	0	0,0%	p> 0.05
	unemployed	15	100,0%	15	100,0%	
Family Income	low	1	6,7%	6	40,0%	p> 0.05
	medium	13	86,7%	8	53,3%	
	high	1	6,7%	1	6,7%	
School Attandance	yes	8	53,3%	8	53,3%	p> 0.05
	no	7	46,7%	7	46,7%	

Ki-kare test

As seen on the Table 1., nearly half of the participants of the experimental group (% 40) are at the age range of 41-47. The vast majority of participants of the experimental group (% 66,7) graduated from primary school; 40 % of the experimental group have 2 children, 33,3 % of them have 3 and 26,7 % of them have four children. In the experimental group, 80 % of the mothers have one disabled child and 20 % of them have two disabled children.

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All of the mothers in the experimental group are not working and almost all of them have medium family income. It was also seen that 33 % of the participants of control group are at the 26-32, 26.7 % of them are at the 33-40, 20.0 % of them are 41-47 and 20 % of them are at the 48-55 age range. The vast majority of control group (%66,7) graduated from primary school. None of the participants of the control group are working like experimental group. Forthy percent of participants in control group describe their family income as low, 53.3 of them describe it as medium and 6.7 % of them describe it as high level. In both of two groups, experimental and control, 53 % of the participants' children with disabilities is receiving education and 46 % of them are not receiving regular school education.

Table 2: Experimental Group Pre-Training - Post Training Data – Follow up Data Analysis Table

Sub Scale	Min-Max	Med.	Mean.±s.s.	pre test	post test
Positive Problem Orientation					
Pre-Test	2 - 15	8,0	7,5 ± 4,1		
Post Test	9 - 19	16,0	15,1 ± 2,8	***0,001***	
Follow up test	7 - 20	17,0	15,3 ± 3,8	***0,001***	0,724
Negative Problem Orientation					
Pre test	10 - 16	15,0	14,0 ± 2,2		
Post test	0 - 12	5,0	5,3 ± 3,6	***0,001***	
Follow up test	0 - 14	5,0	5,0 ± 3,3	***0,001***	0,647
Rational Problem Solving					
Pre test	0 - 13	8,0	8,1 ± 3,6		
Post test	6 - 19	13,0	14,0 ± 3,3	***0,001***	
Follow up test	5 - 19	14,0	13,4 ± 3,9	***0,001***	0,329
Careless Impulsive P.S					
Pre test	0 - 17	13,0	10,3 ± 6,1		
Post Test	0 - 11	2,0	3,8 ± 3,7	***0,003***	
Follow up test	0 - 12	5,0	4,9 ± 3,7	***0,006***	0,108
Avoiding Problem Solving					
Pre test	1 - 17	8,0	8,9 ± 5,5		
Post Test	0 - 9	2,0	2,7 ± 2,4	***0,002***	
Follow up test	0 - 8	3,0	3,7 ± 2,9	***0,006***	0,106
Total					
Pre test	32 - 77	40,0	44,6 ± 12,6		
Post Test	56 - 92	79,0	77,3 ± 10,8	***0,001***	
Follow up test	54 - 92	80,0	75,1 ± 12,6	***0,001***	0,255

Wilcoxon test

As seen on the Table 2., the Positive Problem Solving Orientation factor variable had a significant difference in the positive direction ($p < 0,05$) in the post test values.

As for the positive problem solving orientation scores, there is a significant difference ($p < 0,05$) between the follow-up scores and pre-test values, but not a significant difference ($p > 0,05$) between the follow-up and post-test scores.

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For negative problem solving orientation scores, post-trainnig scores decreased significantly ($p < 0,05$) as compared to the pre-test scores.

When the negative problem orientation's follow up score is compared with the pre-test score, a significant difference ($p < 0,05$) is observed but there is not a significant difference ($p > 0,05$) between the follow up and post-test values.

In the rational problem solving factor, it was observed that the post-training score, test values for rational problem solving factor has increased significantly. Follow up scores showed a consistency.Careless Impulsive Problem Solving values also decreased as post test values show and also follow up values show a constancy.Avoiding style problem solving scores were also significantly decreased as post test values have shown. Additionally, follow up values show a constancy of change.

The same pattern was also observed for the total score comparison.

Table 3. Control Group Pre-Training - Post-Monitoring Data Analysis Table

Sub Scale	Min-Max	Median	Ort.±s.s	Eğitim Öncesine Göre Değişim p
Positive Problem Orientation				
Pre Test	2,0-11,0	8,0	7,5±2,6	
Post Test	0,00-10,0	7,0	6,8±3,1	0,068
Negative Problem Orientation				
Pre Test	2,0-19,0	12,0	12,3±5,2	
Post Test	3,0-20,0	12,0	12,8±5,6	0,138
Rational Problem Solving				
Pre Test	2,0-11,0	8,0	6,8±3,3	
Post Test	2,0-11,0	6,0	6,7±3,3	0,539
Careless-Impulsive P.S.				
Pre Test	4,0-18,0	13,0	11,2±5,0	
Post Test	3,0-18,0	11,0	10,5±5,4	0,085
Avoiding Problem Solving				
Pre Test	0,00-20,0	6,0	9,2±7,6	
Post Test	0,00-20,0	6,0	9,3±7,7	0,053
Total				
Pre Test	21,0-52,0	43,0	41,6±8,8	
Post Test	18,0-53,0	42,0	40,4±9,9	0,066
Wilcoxon test				

As seen on the Table 3., control group's pre and post test scores did not revail any significant difference.

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Results and Discussion

To sum up, there is a significant increase in the experimental group's' positive orientationtowards 'problems'and a significant decrease in their negative orientation towards problems. The consistency of the positive effect in the problem solving orientation of the participants is observed in the follow up values.

In the control group, as was predicted there is not any significant positive or negative change in the orientation of the participants who did not receive training. The main obstacle, which makes it difficult for the participants to solve their problems and see their problems rationally, the participants have is their negative feeling situations and negative orientation towards problems. In the process of problem solving, emotions need to be governed because negative feelings make problem solving difficult. Therefore, it is suggested that the individuals should be thought to govern their feelings through intervention programs (D'Zurilla ve Nezu, 2007).

The program was planned to make the participants recognize their negative emotional situations and change them and to develop positive attitudes, activities such as playing various games, written exercises, making experiential sharing by participating in small groups and they were given homework and then they were required to submit these assignments.The post-test values showed that the negative orientations of the mothers against the problem decreased significantly and their positive orientations towards the problem increased respectively.

Also mothers' Ineffective Careless-Impulsive Style Problem Solving and Avoiding Style Problem Solving Skills scores decreased significantly. In the experimental group, it was also observed that the scores of Rational Style Problem Solving skills, which are the positive style problem solving skills of mothers, increased significantly and remained persistent after 6 weeks in follow-up studies. In the final test scores of the control group, it was observed that there was no change or improvement in the negative style problem solving skills of the untrained mothers.

These research results are in accordance with the literature (Çekici 2009, Söylemez 2002, Yıldız 2003, Canel 2007). Therefore results are supported significantly: For example studies by Çekici and Söylemez revealed similar outcomes in their experimental studies.

When the social problem-solving skills development training researches (Heppner and Peterson, 1982; Gommon and Roze, 1991; Chinaveh, 2010) conducted abroad are evaluated, it is seen that the results obtained in these studies are similar to our research findings and support the findings of our study.

The research conducted by Yıldız (2003) was aimed to train the experimental group being mothers of preschool children for problem solving, decision making, conflict resolution and effective communication skills. Results of the study reveal similar results with the present study.

Canel's (2007) study which was done with couple's also revealed similar results same as the present study.Alsoa group of problem solving skills training researches done by numerous researchers (Heppner and Peterson, 1982; Gommon and Roze, 1991; Chinaveh, 2010) revealed similar outcomes.

Suggestions

In general problem solving skills training seems to be effective for different populations. Therefore this sort of training can be suggested for different groups of mothers and fathers such as those having mental, hearing and visually disable offspring.

Another suggestion can be to have training programs for some other negative emotions such as anger, failure in conflict resolution and such.Also similar trainings can be given to husbands,fathers and siblings of disabled children.

A 'trainer education program' can be developed for social problem solving skills for parents,siblings and other related groups.

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THE LINK BETWEEN ORGANIZATIONAL JUSTICE AND WORKPLACE DEVIANCE: A RESEARCH ON PUBLIC INSTITUTIONS

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Abstract: The relations between employees and their organizations play an important role in the development of workplace deviance. Deviant workplace behaviors lead to negative acts both organization and its employees. Organizational justice is also one of the critical variables that are thought to have an effect on employee behavior and it can be useful in reducing workplace deviance. The purpose of this study is to examine the causal relationship between organizational justice and workplace deviance. A total of 192 employees of different public institutions in Turkey participated in current study. Data was analyzed through descriptive statistics, correlation and regression analysis. The results indicated that distributive, procedural and interactional justice significantly and negatively affected interpersonal deviance, however the same variables did not significantly influence on organizational deviance.

Keywords: Organizational Justice, Workplace Deviance, Public Institutions

Introduction

Many researchers have examined different types of bad behaviors in organizations. Different kinds of negative workplace behaviors were described by different authors. Gruys (1999) make a framework for clarification by bringing together these definitions which are related deviant workplace behavior. For instance, Puffer (1987) use to explain the term *noncomplimant behavior*, Hogan and Hogan (1989) define the *organizational delinquency*, Baron and Neuman (1996) use *workplace aggression* to explain negative behavior , O'Leary-Kelly, Griffin and Glew (1996) define *organization-motivated aggression,* Vardi and Wiener (1996) define organizational misbehavior as a *violent behavior*, Giacalone and Greenberg (1997) use another term which is called *antisocial behavior*, Moberg (1997) defines another kind of bad behavior as *organizational vice*, Skarlicki and Folger (1997) use to define adverse reactions as *organizational retaliation behavior*, Sackett and DeVore (2001) define workplace *counterproductive behavior*, Marcus et al. (2002) and Martinko, Gundlach and Douglas (2002) are the ones *counterproductive workplace behavior* that are developed by researchers. In each definition authors make wide range of dimension to explain to their definitions. In the present study, workplace deviance was chosen as defined by Robinson and Bennet (1995).

Employee deviance is defined a voluntary behavior which is violates notable organizational norms and threatens the well-being of as organization (Kaplan, 1975). Workplace deviance is a pervasive and costly problem for organizations (Bennett and Robinson, 2000:349). Examples of deviant behaviors in the workplace include effort, theft, disobedience, physical aggression, and verbal harassment. These detrimental behaviors are studied in various forms such as aggression, anti-social behavior, counterproductive behavior (Holtz and Harold, 2013:2).

Moorman (1991) defined organizational justice as "concerned with the ways in which employees determine if they had been treated fairly in their jobs and the ways in which those determinations influence other work-related variables". According to Niehoff and Moorman (1993), it consists of three dimensions, distributive, procedural

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and interactional justice. Distributional justice concerns the fair or unfair distribution of resources or awards in the organization (Lam, Schaubroeck and Aryee, 2002:1). Procedural justice is the perceptions of employees whether the processes used in resource allocation decisions are fair or not (Poon, 2012:1507). Interactive justice is the perceived fairness of interpersonal treatment (Olkkonen and Lipponen, 2006:204)

Research Method

Participants

The data was collected through questionnaires from 192 employees of different public institutions in Turkey. As shown in Table 1, descriptive statistics for demographic variables related to gender of respondent's show that 43,7% of employees are male, and 56,3% of employees are female. A large majority of participants are aged between 26 and 30 years and this is followed by participants between the ages of 31-35 in this study. When the tenure of the participants were examined, it was seen that 42,2% of the employees worked for 1-5 years (n=81).

Table 1. Demographic Characteristics of the Respondents of this Study

Demographic Variables		N	Percentage (%)
Gender	*Male*	84	43,7
	Female	108	56,3
Age	*26-30*	84	43,8
	31-35	72	37,5
	36-40	21	10,9
	41-45	3	1,6
	46-50	3	1,6
	51 and above	9	4,7
Tenure	*Less than 1 year*	12	6,3
	1-5 years	81	42,2
	6-10 years	72	37,5
	11-15 years	6	3,1
	16-20 years	12	6,3
	21 years and above	9	4,7
	Total	192	100

Measures

The characteristics of the scales which was used in this research are shown in Table 2 below. Distributive (5 items), procedural (6 items) and interactional justice (9 items) were measured with totally 20-items scale which was developed by Niehoff and Moorman (1993). Interpersonal and organizational deviance were measured with totally 19-items scale which was developed by Bennett and Robinson (2000). The scales used in this study were ranged from 1 ('strongly disagree') to 5 ('strongly agree').

Table 2. Characteristics of the scales used in this study

Researchers	Measures	Number of İtem	Likert Type
Niehoff and Moorman (1993)	*Distributive Justice*	*5 items*	*Five-point*
	Procedural Justice	*6 items*	*Five-point*
	Interactional Justice	*9 items*	*Five-point*
Bennett and Robinson (2000)	*Interpersonal Deviance*	*7 items*	*Five-point*
	Organizational Deviance	*12 items*	*Five-point*

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Results and Discussion

Correlation coefficients were calculated to test the power of the relationships between distributive, procedural and interactional justice, interpersonal and organizational deviance. As shown in Table 3, organizational deviance positively relates with interpersonal justice (r=0,50, p<0,01). Organizational deviance negatively and not significantly related with distributive (r=-0,02, p>0,05), procedural (r=-0,01, p>0,05) and interactional justice (r=-0,04, p>0,05). However, interpersonal justice significantly and negatively related with distributive (r=-0,29, p<0,01), procedural (r=-0,32, p<0,01) and interactional justice (r=-0,18, p<0,05).

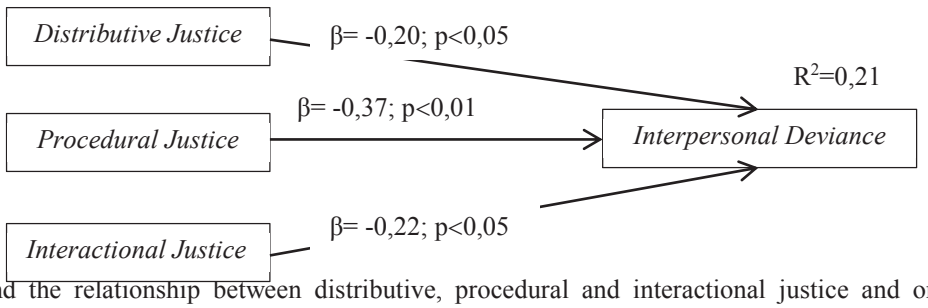
Table 3. Correlation Analysis

Variables	M	SD.	1	2	3	4	5
1.DJ	2,94	0,92	(0,85)				
2.PJ	2,16	0,93	0,60**	(0,92)			
3.IJ	2,80	1,05	0,59**	0,66**	(0,96)		
4.ID	1,87	0,83	-0,29**	-0,32**	-0,18*	(0,80)	
5.OD	1,78	0,66	-0,02	-0,01	-0,04	0,50**	(0,86)

Notes: DJ: *Distributive Justice ;* PJ: *Procedural Justice* ; IJ: *Interactional Justice* ; ID: *Interpersonal Deviance* ; OD: *Organizational Deviance*; Cronbach's Alphas (internal consistency) are in parentheses on the diagonal.; M: Mean; SD.: Standard Deviation; **p<0,01; *p<0,05

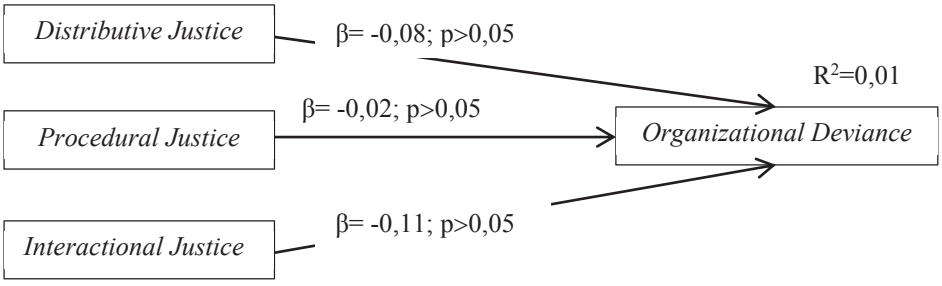
As shown in below Model 1 and Model 2, multiple regression analysis was conducted to understand the effect of distributive, procedural and interactional justice to interpersonal and organizational deviance. The findings indicated that distributive justice (β= -0,20; p<0,05), procedural justice (β= -0,37; p<0,01) and interactional justice (β= -0,22; p<0,05) were significant predictors of interpersonal deviance (R^2=0,21) in Model 1.

MODEL 1



To understand the relationship between distributive, procedural and interactional justice and organizational deviance, multiple regression analysis was performed (Model 2). Thus, findings indicated that distributive justice (β= -0,08; p>0,05), procedural justice (β= -0,02; p>0,05) and interactional justice (β= -0,11; p>0,05) negatively and not significantly effect to organizational deviance (R^2=0,01).

MODEL 2



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Conclusion

The relationship between organizational justice and workplace deviance among 192 employees who work different public institutions in Turkey was examined in this study. The results indicated that distributive, procedural and interactional justice significantly and negatively affected interpersonal deviance, however the same variables did not significantly influence on organizational deviance.

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THE MEDIATING ROLE OF PERCEIVED ORGANIZATIONAL SUPPORT ON THE RELATIONSHIP BETWEEN MANAGER'S ETHICAL BEHAVIOR AND ORGANIZATIONAL IDENTIFICATION: A RESEARCH ON UNIVERSITY ASSISTANTS

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Abstract: The purpose of this study is to discover the effects of research assistants' perception of manager's ethical behaviors on organizational identification as well as the mediation role of perceived organizational support in this process. Relationships between variables were measured and mediation effect of perceived organizational support was determined using structural equation model. This research was carried out on 523 research assistants working universities which are successful in ranking in Turkey according to CWTS Leiden Ranking in 2015. The findings indicated that manager's ethical behaviors had a significant and positive impact on research assistant's perceived organizational support and organizational identification and perceived organizational support had a significant and positive impact on organizational identification. It was also determined that manager's ethical behaviors had impact on organizational identification through the partially mediating role of perceived organizational support.

Keywords: Manager's Ethical Behaviors, Perceived Organizational Support, Organizational Identification, Structural Equation Modeling

Introduction

Perceived organizational support (POS) "*is presented that employees in an organization form global beliefs concerning the extent to which the organization values their contributions and cares about their well-being*" (Eisenberger et al.,1986:501). POS that is considered in the framework of social exchange theory (Blau, 1964). This theory explains the reciprocal exchange of valuable resources between individuals and the formation of the relations of individuals with each other (Chen et al., 2005:458). Thus, individuals can be involved in social exchange with their own organizations or with their colleagues (Cropanzano and Mitchell, 2005: 874-883; Hekman et al., 2009:506). According to the norm of reciprocity, employees who feel more support from their organization continue to work more strongly in their organizations, not leaving their jobs (Armstrong-Stassen and Ursel, 2009:204) and they feel responsible for helping the organization to achieve its goals and their performance will increase (Loi et al.,2014:24; Armeli et al.,1998:288; Wayne et al., 1997:82-83). POS has become prominent issue especially since the nineties and it was found to be associated with organizational citizenship behavior (Moorman et al., 1998:354; Settoon et al., 1996:223; Wayne et al., 1997:99), organizational commitment (Settoon et al., 1996:223) and job performance, job satisfaction and intention to leave (Rhoades and Eisenberger, 2002:709). Employees who believe that supported by the organization will be greater job satisfaction and higher job performance and lower intention to leave (Turgut, 2014:30).

Organizational identification (OI), which is based on social identity theory, is a perception that that the individual feels as if they are part of an organization or belonging to an organization, defining himself as an organization member (Mael and Ashforth, 1992:104). Social identity is recognition of membership in a group or community and the value given to it (Smidts et al., 2001: 1051). In other words, organizational identification which is a specific form of social identity of the individual is related to whether or not belongs to the organization (Ashforth and Mael, 1989:20-23; Van Gils et al., 2015:2-3). Organizational identification that provides positive outcomes within attitudes and behaviors is positively related to job performance and organizational citizenship behavior and negatively associated with turnover intention (Kreiner and Ashforth, 2004:2; Van Knippenberg et al., 2006:687).

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Managerial ethics refers to principles and standards that will help managers to solve dilemmas and conflict of interest that they may face. Managers should adopt principles of conduct which is based on universal values such as being honest, equal, consistent and objective. In this context, it is thought that managerial ethical behavior (MEB) have influence that employees' positive attitudes and behaviors in an organization. The support of the managers, the fair behaviors, the business conditions and the awards which is given to employees can increase the perceived organizational support (Cheng et al.,2013:109).

Within the scope of the literature; Edwards and Pecei (2010), Van Knippenberg and Sleebos (2006) found that there was a significant and positive relationship between POS and OI. Cheng et al. (2013) observed that POS has partial mediated role in the relationship between organizational ethics with job satisfaction. In the same study, Cheng pointed out that POS is fully mediated in the negative relation with the intention to leave and organizational ethics. Walumbwa et al. (2011) found that ethical leadership is positively related to organizational identification. According to these findings obtained from the literature, it is thought that POS has a mediation role in the relation between MEB and OI. Thus, in current study, the effects of manager's ethical behaviors on organizational identification and perceived organizational support; the effect of perceived organizational support on organizational identification and also mediating role of perceived organizational support were analyzed. The relationships between manager's ethical behaviors, perceived organizational support and organizational identification was demonstrated by using structural equation modeling (SEM). Mediating role of perceived organizational support studied in accordance with regression analysis that is referred by Baron and Kenny (1986).

Research Method

In this study, the relationships between manager's ethical behaviors, perceived organizational support and organizational identification was performed on research assistants who work universities which are in the first eleven ranks in Turkey according to CWTS Leiden Ranking (2015) by using structural equation modeling (SEM). Accordingly, questionnaires were prepared and distributed both by hand and e-mail to accessible all research assistants who are working the universities which is in the first eleven according to CWTS Leiden Ranking (2015). It was determined that only 523 questionnaire could be taken into the consideration. This research was performed between March and September 2015 (seven months). The model of research and hypotheses are given below.

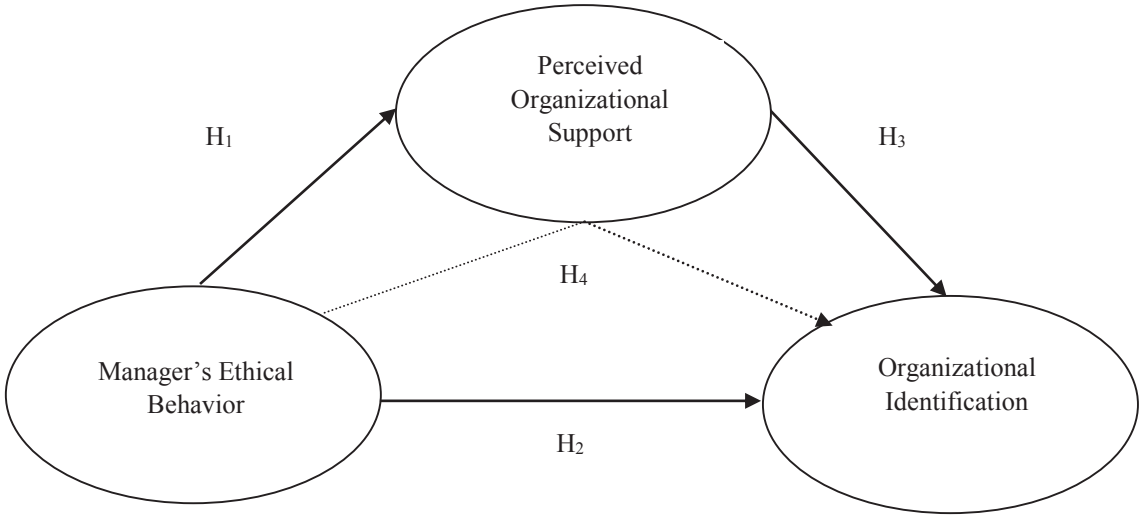

Figure 1: Research Model

H_1: Manager's ethical behavior has a significant and positive impact on perceived organizational support
H_2: Manager's ethical behavior has a significant and positive impact on organizational identification.
H_3: Perceived organizational support has a significant and positive impact on organizational identification.
H_4: Manager's ethical behavior has a significant impact on organizational identification through the mediating role of perceived organizational support.

Perceived Organizational Support was measured using 8-items scale which is originally 36 items and developed and validated by Eisenberger et. al. (1986). The items were rated on a five-point scale (5=strongly agree, 1=strongly disagree). Organizational identification was measured using 6-items developed by Mael and Ashforth (1992). The items were rated on a five-point scale (5=strongly agree, 1=strongly disagree). Manager's ethical behavior was measured using 6-items that is in the factor of relationships with the workforce developed by Berghofer and Schwartz (2008). The items were rated on a five-point scale (5=strongly agree, 1=strongly disagree).

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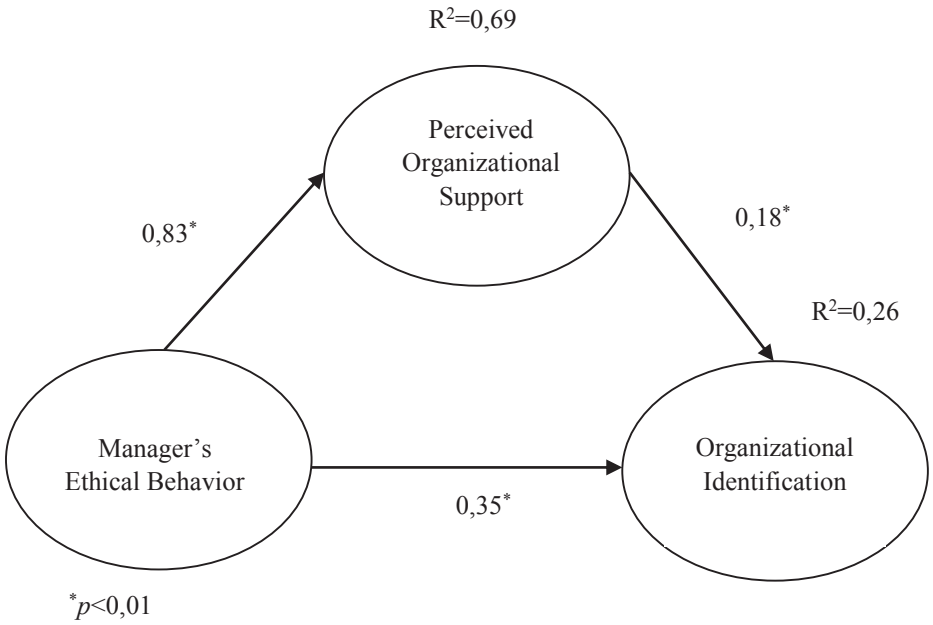
The research was tested with a two stages approach which is consisting of measurement and structural models by using LISREL 8.80 (Scientific Software International). Firstly, the measurement model that is consisting of the variables which are perceived organizational support (8 items), organizational identification (6 items) and manager's ethical behavior (6 items) were tested. According to analysis $\chi 2/df$ (515,49/167=3,08) were acceptable however it is not within the limits of goodness of fit indices. Thus, goodness of fit indices was examined by testing the model again in order to demonstrate better fit of the measurement model depending on the advices of modification indices. This analysis results demonstrate that the measurement model had acceptable fit indices ($\chi 2$=475,96, df=165, $\chi 2/df$=2,88, RMSEA=0,060, RMR=0,066, NFI=0,98, CFI=0,99, NNFI=0,98, GFI=0,92, AGFI=0,90 , IFI=0,99 , RFI=0,97).

The structural model was tested after the verification of the measurement model. The structural regression model had acceptable fit indices ($\chi 2$=475, df=164, $\chi 2/df$=2,89, $\chi 2/df$=2,88, RMSEA= 0,060, RMR=0,066, NFI=0,98, CFI=0,99, NNFI=0,98 GFI=0,92, IFI=0,99 , RFI=0,97). Findings indicate that manager's ethical behavior had a positive and significant effect on perceived organizational support (0,83; p<0,01); manager's ethical behavior had a positive and significant effect on organizational identification (0,35; p<0,01); perceived organizational support had a positive and significant effect on organizational identification (0,18; p<0,01). This supports hypotheses 1, 2 and 3. And manager's ethical behavior had a significant impact on organizational identification through the ***partially mediating role*** of perceived organizational support. So a hypothesis 4 was partially supported.



Conclusion

This research demonstrate that manager's ethical behaviors have a significant and positive impact on research assistant's perceived organizational support and organizational identification and perceived organizational support has a significant and positive impact on organizational identification and also manager's ethical behaviors have impact on organizational identification through the partially mediating role of perceived organizational support in accordance with regression analysis that is referred by Baron and Kenny (1986).

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THE ROLE OF "ARCHITECTURAL ACOUSTIC COURSE" IN ARCHITECTURAL EDUCATION IN TURKEY

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A number of arrangements have to be made to create a physical environment suitable to its function. One of these adjustments is acoustic comfort. The impact of acoustic comfort on design is increasing as scientific and technological advances arrive. In this respect, it is important to educate students about architectural acoustics. Being skilled and knowledgeable in architectural acoustics will prevent design complications during the application and provide user satisfaction by maintaining a high level of acoustic comfort. Syllabi from architectural departments at universities in Turkey were studied and results were evaluated. In the light of shortcomings which were detected during the evaluation, some suggestions were presented.

Keywords: Architecture, architectural education, architectural acoustic, noise.

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THE ROLE OF "HISTORY OF TURKISH GRAPHIC DESIGN" IN DESIGN EDUCATION AT TURKISH UNIVERSITIES AND EXEMPLARY MENTION OF "SAIT MADEN"

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Abstract: Following the alphabet change in Turkey in 1928, Latin alphabet started to be used, initiating a new era in higher education. Especially graphic design education began to develop at the end of 1950's. Prior to this, graphic design had actually started in 1933 at the poster workshop of State Art Academy. Later on, Istanbul State Academy of Fine Arts, which adopted Bauhaus model, was established and first graphic designers started their education. Today, there are still many departments of graphic design which follows Bauhaus discipline. In these departments, history of graphic design is studied within the influence of Europe and America, while Turkish Graphic Designers are not sufficiently mentioned. The role of Turkish Graphic Designers are studied only through the personal efforts of the educational staff. However, these efforts prove to be insufficient in the aspect of the History of Turkish Graphic Design. In this study, the role and the importance of the History of Turkish Graphic Design in Graphic Design Education in Turkey is studied/inspected through the exemplary mention of Sait Maden.

Keywords: Graphic Design, Education in Turkey, Sait Maden

Introduction

Graphic design is a means of visual communication. The most important objective of it is to convey a message. Graphic design was first used in the first half of 20th century, initially for the visual materials which were written, drawn and carved into metal stencils to be duplicated (Becer, 1997). It has become a part of everyday life and a profession. At universities around Turkey, the terms "graphic design" and "graphic designer" were only mentioned after the 1950's. Today, graphic design education is given at undergraduate, post graduate and Ph. D. levels. The subject of this study is how much the Turkish Graphic design history is present inside university education and its necessity.

Materials and Methods

The goals of this study are graphic design education, the importance of Turkish graphic design history and understanding its role in university education. In this qualitative research, the pattern of the study is "case study" and the type is "explanatory case study". For the goal of the research, the method of "document review" was preferred among qualitative data collection tools. At the end of the research, it is concluded that the Turkish graphic design history has an important role in university education and it should be given wider coverage.

The Concept of Graphic Design

Mankind communicates through two methods; audio and visual communication. These two are indispensable in order to survive and continue as species. Our main focus, visual communication, started through illustration and description. The first known descriptions belong to the years between B.C. 25000-20000. In Cueva de las Manos (Figure 1) in Argentina, there are hand prints from the years B.C. 13000 and 9000, which were made of red, black and yellow pigments. Cave pictures also in Lascaux (Figure 2), France belong to B.C. 15000 (Becer, 1997). Hunting and religious rituals tend to be the primary subjects of cave pictures. There is no doubt that there is precedence over these known communication evidences. The milestone in communication is actually the invention of writing. The first roots of the alphabet were created by Phoenicians through a slow process where the pictures were transformed into symbols and figures (Figure 3). Their application of linear signs instead of visual images to refer to words in B.C. 1500 was the first example of the alphabet that we use today (Uçar, 2004).

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Figure 1: Cueva de las Manos, Argentine



Figure 2: Lascaux, France

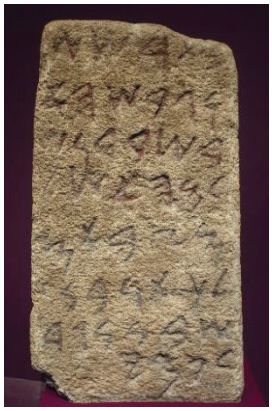

Figure 3: Phoenician writing

The usage of letters along with illustrations marks the actual beginning of graphic design. According to Bektaş (1992), graphic design created a new method of communication by using writing and picture in the same medium in a way that they complement each other. Throughout history, numerous people consisting of wordsmiths, artists and printers have contributed to the creation of graphic design. With the industrial revolution in the 18th century, a massive change came about, which resulted in a transformation to consumer society. However, graphic design owes its prevalence today to art movements in the end of 19th century and at the beginning of 20th century. International art movement and advances in print technology accelerated this change. With the Bauhaus school established in Germany in 1919, the graphic design in Europe was formed. It is safe to assume that this movement is still active today.

In Turkey, however, graphic design started with the first printing press. The first printing house, which was established by Ibrahim Efendi, was the first center of Turkish graphic art. The first cast lead letters and print-blocks which used for duplication were prepared by him. With the proclamation of the republic in Turkey in October 29th 1929 and after the change of alphabet in November 1st 1928, Latin letters were introduced (Figure 4). After a slow transition period, artists such as, Ihap Hulisi Görey, Münif Fehim, Ali Suavi managed to speed up Turkish graphic

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art, which resulted in the graphic arts as we know today. We can say that, graphic education in Turkey started in 1933 at the academy of Fine Arts, led by Mithat Özer, in a small poster studio (Baydar, 2006).

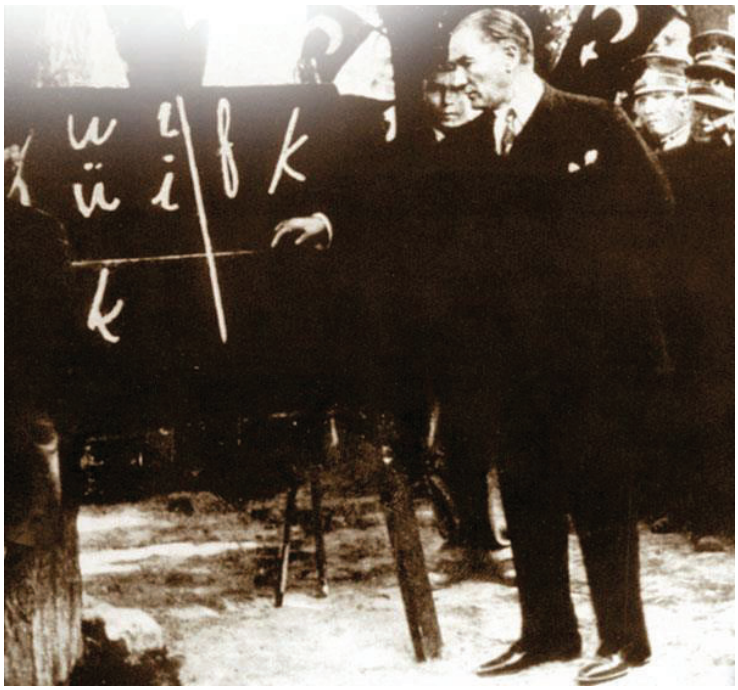

Figure 4: The Leader of Turks; Atatürk

After 1956, this poster studio was designated at The Department of Graphic Arts. Designers like Mengü Ertel and Yurdaer Altıntaş who graduated from the academy in that period started to mention the concept of "graphic arts" and referred to "graphic designer" as a profession. Their exhibitions proved that the field became more professional, which shows that the problems it brings about were also discussed. The designs in this period, traditional culture and background were combined with modern interpretations and the artists were attending exhibitions and contests abroad. Furthermore, the influence of German and Polish artists were apparent on the graphic design art of 1960's. After 1960's, publishing and printing works gained momentum. These developments can also be seen in book cover designs. Designers like Sait Maden and Erkal Yavi contributed to form an aesthetic style and taste in this branch. Sait Maden stands out with his perseverance and effort in making graphic design take its place in publishing sector. In this aspect, his efforts in creating the Turkish graphic arts were also notable (Yalur, 2014). "The Association of Graphic Artists", which were established by Yurdaer Altıntaş, Sait Maden and Mengü Ertel with council of minister's decision in 1968, became active for two years until its closure. In 1978, "Grafikerler Meslek Kuruluşu" (Turkish Graphic Designers Association) was established to define and protect professional rights and significantly contributed to its development. After 1980, graphic design in Turkey gained considerable pace in developing.

Turkish Graphic Designers Association (GMK)

In 1978, it was founded in Istanbul as "Grafikerler Meslek Kuruluşu". The foundation was renamed as "Grafik Tasarımcılar Meslek Kuruluşu" in 2016 (Figure 5). The association, which consists of a wide range of members like creative artists from advertising agencies and design studios, academics and students, dedicates itself to the development of graphic design, trying to gather up designers and protect their professional rights. Since its foundation, the association have united designers with professionals from various production platforms. GMK, which creates a wide selection out of the works produced that year and offering rewards for the designers at its annual design exhibition, has been a member of ICO-D (The International Council of Graphic Design Associations) since 1993. GMK, which aims the development, freedom and publicity of graphic design, also seeks to protect the professional rights. GMK is determined to prepare students for their profession with various workshops and by uniting them with professionals at the seminars it organizes (http://gmk.org.tr/about, 2017).

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Figure 5: Turkish Graphic Designers Association (GMK)

Sait Maden (1932 – 2013)

One of the most important characters in the history of Turkish graphic arts is Sait Maden (Figure 6, 7). Born in 1932 in Çorum, where he completed his primary and secondary education, he got training in arts in Istanbul. He began his studies at the Istanbul State Academy of Fine Arts and graduated from Bedri Rahmi Eyüboğlu Studio of the Painting Department in 1955. He is regarded as the pioneer graphic artist who brought the modern understanding of typography to Turkey. He contributed to the history of Turkish graphic arts with his logo (Figure 8) and book cover designs (Figure 9). Along with his contributions, he tried all his life to promote the development of graphic design in Turkey. For some reason, Sait Maden could not finalize his work "Turkish Graphic Arts, From the Beginning until Now" which was the only significant work about the history of Graphic arts in Turkey. Sait Maden actually had two fields of work; graphic arts and literature. As he explained; "What shaped, influenced and supported my art is my poet side. My literature has nurtured my art of picture (Durmaz, 2011).

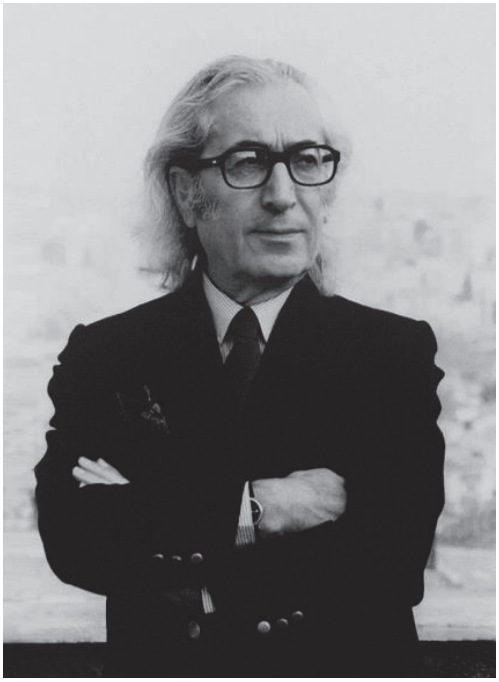

Figure 6: Sait Maden (1932 - 2013)

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Figure 7: Sait Maden Self-Portrait



Figure 8: Book Cover Designs - Sait Maden

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Sait Maden



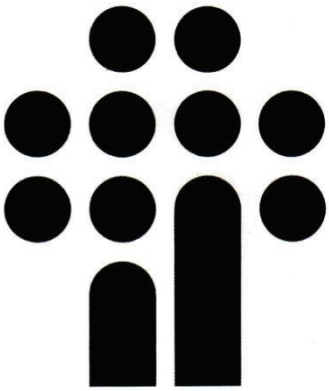
Has Holding (1968)



Milliyet Sanat Logo (1980)



ONK Copyright Agency (1984)



İnklap Kitapevi (1990)

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Logo (1994)



Dünya Şiir Günü (2000)



Kaligraphy (2008)



Kaligraphy (2008)

Figure 9: Logo and Calligraphy Designs - Sait Maden

On an interview in 2008 he said; "Is there a Turkish graphic art like the Polish, Japanese or the Italian graphic art? As I mentioned before: In my first years in the profession, any graphic art work you could find was stolen from the West or random works of self-taught artists. This negative situation has started to change as students with graphic academy education slowly established their presence in the market. After 1960's, and especially after 1970's aesthetic conscious became steadily dominant and employers and companies became more selective. In this respect, I consider myself as one of the two pioneers of the enlightenment. I had comprehended the fact that the profession of graphic design is an occupation of personal creativity, which means producing authentic creations without having any influence except for a taste from the enlightened Ottoman and folk culture, in the first years before I started my profession... It is an appropriate and timely approach for our designers to expand abroad, to have better and richer knowledge and observations. However, we should accept that an idiosyncratic Turkish graphic art design is non-existent. Turkish graphic art is orphaned. Turkish graphic artists don't know how to benefit from miniature craft, how could they? Maybe one or two people can do it today, but there wasn't anyone back in my time. This is a major drawback for us. During globalization, Turkish graphic arts became a copycat... I would like to state that the Turkish economy which has always depended on foreign sources, has created a foreign-dependent graphic design. Industrial bourgeoisie who headed directly for the consumption sector, going against the basic needs of the society, had to import all advertising and marketing strategies as they had imported their standards of judgement. (Durmaz, 2008). Sait Maden did not only contribute to the forming of Turkish graphic design but also exposed the reality of the situation in his interview. Maybe the only academic who studied the history of Turkish graphic design professionally after Sait Maden is Ömer Durmaz (Figure 10). He is also the one who made the interview above with Sait Maden. Ömer Durmaz, who tried professionally to create an archive, is now sharing his collection and impressions in various exhibitions and interviews with academics, students and

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also everyone interested in Turkish graphic arts.



Figure 10: Sait Maden and Ömer Durmaz (05.05.2007) - *Photo by Nurcan Kalaycıoğlu Durmaz*

Departments of Graphic Design in Turkey

As 2017, there are 41 universities in Turkey with Graphic Design undergraduate studies (www.yok.gov.tr). The names of departments may vary although the education is basically very similar. In all these departments mentioned above, the beginning, development and current situation of graphic design is given under the name of "the history of graphic design" with examples mainly from Europe and America. Among all available lecture catalogues of these 41 departments, only 4 of them have separate lectures in History of Turkish Graphic Arts.

- Dokuz Eylül University, Department of Graphic Design
- Akdeniz University, Department of Graphic Design
- Selçuk University, Department of Graphic Design
- İstanbul Arel University, Department of Graphic Design

When we look at the contents of the 14-weeks course; Dokuz Eylül University, Graphic Design Department The History of Graphic Design Course;

1. Week Visual Culture, Visual History, History of Design and Turkey
2. Week İbrahim Müteferrika and the Development of the Press in Ottoman Geography, Printing in the Ottoman Empire
3. Week Early Republican Period and First Steps of Graphic Design
4. Week Graphic Design in Turkey between 1920 and 1930
5. Week Graphic Design in Turkey between 1940 and 1950
6. Week Midterm
7. Week Graphic Design in Turkey between 1960 and 1970
8. Week Graphic Design in Turkey in the 1980s
9. Week Graphic Design in Turkey in the 1990s
10. Week Graphic Design in Turkey between 2000 and 2005
11. Week Graphic Design in Turkey between 2005 and 2010
12. Week Graphic Design in Turkey between 2010-...
13. Week Graphic Design in Turkey between 2010-...
14. Week Final Exam

The 14-weeks program in the graphic design departments of the other 3 universities was not reached.

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Conclusion

Today, knowledge is the most important power. Knowledge is the only in the world that shapes economies. Such a vital concept should be shared and conveyed accurately as it naturally has no value when it is not shared. In this aspect, graphic design, which comprises of all the basic elements of communication and focuses solely on this subject, commits another important task. There are 41 universities in Turkey that train graphic designers. Even if all present technological opportunities are provided to these universities, the fundamentals of design education must be solid. In this respect, history of graphic design is becoming even more important. Design students should definitely learn about the world history of graphic design. However Turkish graphic designers should have more coverage in the graphic design history in departments. There has to be an idiosyncratic design touch indigenous to Turkey without own culture and background to allow Turkish graphic artists to be known around the world and have a say in design. The fact that only 4 departments all around the universities in Turkey lecture "History of Turkish Graphic Design" makes the issue even more important. Having academics aware of the subject who mention Turkish graphic artists in their lectures is not enough. It seems to be a more lasting solution for all graphic design education departments to include History of Turkish Graphic Design in their curricula. A graphic design concept stemming from its own culture with the appropriate education will improve Turkey's level of visual perception and its cultural potential. This will definitely improve our chances in our competition with the world in design.

In this perspective, it is necessary to publish a book, an archive or open a museum about the history of Turkish graphic design for young academics to continue Sait Maden's unfinished work about Turkish graphic art, to present Turkish designers' works to future generations and to let them utilize their works, views and suggestions. As Sadık Karamustafa said; "A graphic design museum is urgently needed in Turkey to collect, display graphic design products and to transfer these to the future. Only such an institution can transfer 'Sait Maden's to future generations (Özpalabıyıklar, 2009). The establishment of a museum whose content will cover the works of many valuable designers such as Mengü Ertel, Yurdaer Altıntaş, Sait Maden, İhap Hulisi Görey, Münif Fehim Özarman, Emin Barın, Firuz Aşkın, must be the first step. Thus, these notable designers will have more light in graphic design education, which will allow graphic designers to graduate with considerable knowledge of design and education history.

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TOZ METALURJISI İLE ÜRETİLEN Ni-P KAPLI SiC_P TAKVİYELİ Al7075 KOMPOZİTLERİN YOĞUNLAŞMA VE SERTLİK ÖZELLİKLERİ

Ulaş MATİK

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Özet: Bu çalışmada, Toz Metalurjisi ile üretilen Al7075-SiC_p kompozitlerin yoğunlaşma ve sertlik özelliklerine Ni-P kaplı takviye partiküllerin etkisi incelendi. Ortalama 80 mikron boyutlu SiC partiküller Sn/Pd aktivasyon işleminden sonra akımsız kaplama yöntemi ile Ni-P kaplandı. Farklı oranlarda (wt.% 5, 10 ve 15) kaplanmış ve kaplanmamış takviye partikül ilaveli Al7075 kompozitler toz metalürjisi yöntem,i ile üretildi. Numuneler tarama elektron mikroskobu (SEM), X-ışını kırınım analizi (XRD) ve enerji dağılımlı X-ışınları spektroskopisi (EDX) ile incelendi. Numunelerin sertliği brinell sertlik ölçüm metodu ile belirlenirken yoğunlukları Arşimet yöntemi ile belirlendi. Numunelerin gözenek oranları teorik ve deneysel yoğunluk değerlerinin karşılaştırılması ile belirlendi. Kaplanmamış SiC takviyeli kompozitlerle karşılaştırıldığında kaplanmış SiC_p takviyesi kompozitlerin yoğunluğunu azaltırken sertliğini nispeten arttırmıştır. Her iki takviye türünde de kompozitteki takviye miktarının artmasına bağlı olarak sertlik değerleri de artış göstermiştir.

Anahtar kelimeler: Al7075, Kompozit, SiC, Akımsız Kaplama, Sertlik, Yoğunlaşma.

DENSIFICATION AND HARDNESS PROPERTIES OF Ni-P COATED SiC_p REINFORCED Al7075 COMPOSITES PRODUCED BY POWDER METALLURGY

Abstract: In this study, effect of Ni-P coated silicon carbide particles (SiC_p) on densification and hardness properties of Al7075-SiC_p composites produced by powder metallurgy was investigated. For this purpose, the SiC_p particles were coated with Ni-P alloy using sodium hypophosphite reducing electroless coating solution after the Sn-Pd activation process. The coated and uncoated SiC_p reinforced Al7075 metal matrix composites (MMC) with SiC weight fractions of 5%, 10% and 15% were fabricated by powder metallurgy method. The samples were examined using scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD). The hardness of the composite specimens was determined by brinell hardness measurement method. The density of samples was determined by the Archimedes method. The porosity ratio in the samples was determined by comparing the theoretical and experimental densities of the samples. the density of the coated SiCp reinforced composites decreases, while increasing the hardness relatively compared to uncoated SiC_p reinforced composites. In both reinforcement types, the hardness of composite is increased due to the increased reinforcement ratio in the composite.

Keywords: Al7075, Composite, SiC, Electroless Coating, Hardness, Densification.

Giriş

Alüminyum matrisli kompozitler mükemmel özelliklerinin yanı sıra yüksek mukavemet/ağırlık oranına sahip olmaları nedeniyle havacılık, otomotiv, mikro elektronik ve askeri uygulamalarda yaygın olarak kullanılmaktadır (Khadem ve ark. 2011). Alüminyum matrisli kompozitler arasında Al7075 alaşımı mükemmel mekanik özelliklere sahiptir. Ayrıca bu alaşımın özellikleri, farklı toz metalürjisi işlemleri kullanarak SiC, Al_2O_3, B_4C ve TiB_2 gibi sert seramik parçacıklarla takviye edilerek iyileştirilebilir (Majzoobi ve ark. 2015). Fakat alüminyum matrisli kompozit üretiminde kötü ıslatılabilirlik, topaklanma ve takviyenin matris içindeki homojen olmayan dağılımı gibi bazı problemler vardır (Ezatpour ve ark. 2016, Ünlü, 2008., Kok, 2005).

Kompozit üretiminde özellikle takviye elemanı ile matris arasındaki ıslatma kabiliyetini arttırmak ve partiküllerin matris içerisinde homojen dağılımını sağlamak amacıyla yüzeyine kaplama işlemi uygulanmış takviye elamanları

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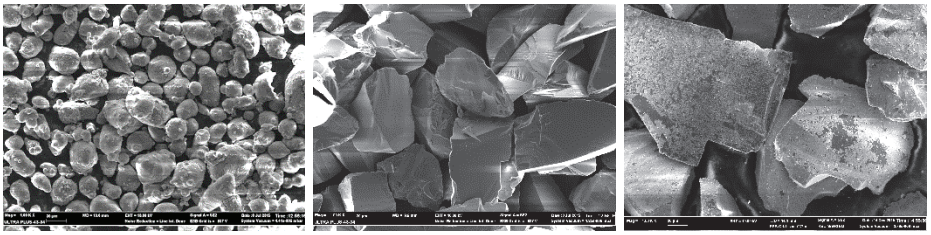
kullanılarak geleneksel toz metalürjisi üretim tekniği ile kompozit üretimi gerçekleştirilmiştir. Bu amaçla farklı oranlarda Ni-P kaplanmış ve kaplanmamış SiC partikül takviyeli Al7075 matrisli kompozitler toz metalürjisi tekniği ile üretilmiştir. Kompozitlerin mukavemetini arttırmak amacıyla T6 ısıl işlemi uygulanmış numunelere yoğunluk ve sertlik testleri uygulanarak kaplama işleminin kompozitin yoğunlaşma ve sertlik özelliklerine etkisi incelenmiştir.

Materyal ve Metot

Kompozitlerin üretiminde matris malzemesi olarak kimyasal kompozisyonu Tablo 1'de verilen ön alaşımlı Al7075 tozları ile takviye elemanı olarak 82 µm ortalama partikül boyutuna sahip akımsız Ni-P kaplanmış ve kaplanmamış SiC partikülleri kullanıldı (Şekil 1). Ni-P kaplanmış SiC partiküllerini elde etme amacıyla detayları aşağıda verilen yüzey aktivasyon ve akımsız kaplama işlemleri uygulanmıştır. Akımsız Ni-P kaplama banyosunun kimyasal kompozisyonu ve çalışma parametreleri Tablo 2'de verilmiştir.

Tablo 1: Al7075 alaşımının kimyasal kompozisyonu

Elementler	Zn	Mg	Si	Cu	Cr	Mn	Fe	Zr	Na	P	S	Cl	K	Al
% Ağırlık	4,78	1,84	0,24	1,45	0,25	0,26	0,23	0,023	0,32	0,03	0,04	0,28	0,05	Kalan



Şekil 1. Kompozit üretiminde kullanılan tozların SEM görüntüleri a) Al7075, b) SiC ve c) Ni-P kaplı SiC

SiC_p için yüzey aktivasyon ve kaplama prosedürü:

i) SiCp asetonla yıkanması,
ii) 2,65 g/l $SnCl_2$ ve 10 ml/l HCl içerikli sulu çözeltiye 30 dakika süreyle maruz bırakılan SiC partiküllerinin yüzey hassasiyetinin sağlanması,
iii) 0,14 g/l $PdCl_2$ ve 10 ml/l HCl sulu çözeltisine 30 dakika süreyle maruz bırakılan SiC partiküllerinin yüzey aktivasyon işleminin gerçekleştirilmesi.

Table 2: Akımsız Ni-P kaplama banyosunun kimyasal kompozisyonu ve çalışma parametreleri

Kimyasal kompozisyon ve çalışma parametreleri	
$NiCl_2 \cdot 6H_2O$	35 g/l
$NaH_2PO_2 \cdot H_2O$	10 g/l
$HOC(COONa)(CH_2COONa)_2 \cdot 2H_2O$	65 g/l
NH_4Cl	50 g/l
NH_4OH	pH ayarlayıcı
pH	9
Sıcaklık	80 °C
Karıştırma hızı	400 rpm
Süre	30 min

Kompozit numuneleri elde etmek amacıyla Al7075 alaşım tozlarına ağırlıkça %5, %10 ve %15 SiC ilave edildi. Homojen bir karışım elde etmek amacıyla tozlar üç eksenli karıştırıcıda (Turbula T2F) 45 dakika süreyle

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karıştırıldı. Karışım tozlar 600 MPa basınç altında tek eksenli olarak preslenerek Ø12x12 mm boyutlarında silindirik kompaktlar elde edildi. Ham kompaktlar 600 °C'de argon atmosferi altında 30 dakika süreyse sinterleme işlemine tabi tutuldu. Al7075 alaşım ve kompozit numunelerin mekanik özelliklerini iyileştirmek amacıyla sinterleme işlemi sonrası standart T6 ısıl işlemi uygulandı. T6 ısıl işlemi, 480 °C'de 2 saat bekletilerek çözeltiye alınan numunelere su verme ve ardından 120 °C'de 24 saat bekletilerek gerçekleştirildi.

Numunelerin yoğunlukları Arşimet prensibine göre belirlendi. Bu amaçla yüksek hassasiyetli (± 0,1 mg) terazi kullanılarak yoğunluk ölçümleri gerçekleştirildi. Numunelerin teorik yoğunlukları ve gözenek oranları sırasıyla Eş.1 ve Eş.2'ye göre hesaplandı.

$$\rho = \frac{(M_{AA7075} + M_{SiC})}{(V_{AA7075} + V_{SiC})} \quad (1)$$

ρ: Yoğunluk (g/cm^3), M: kütle (g), V: hacim (cm^3)

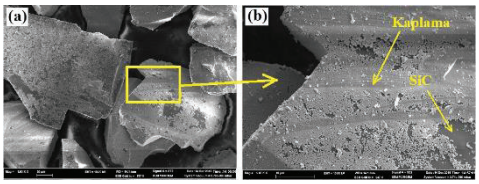
$$\%\phi = \left(1 - \frac{\rho_s}{\rho_t}\right) \cdot 100 \quad (2)$$

ϕ: Gözenek oranı, ρ_s: deneysel yoğunluk (g/cm^3), ρ_t: teorik yoğunluk (g/cm^3)

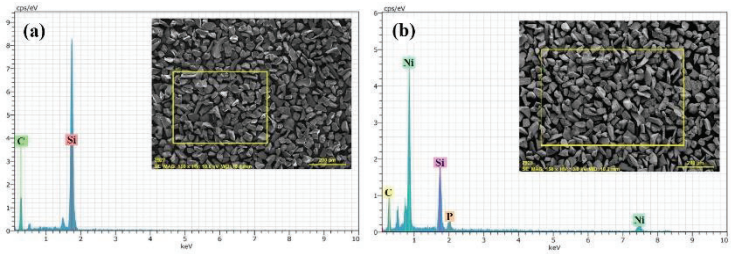
Sertlik değerleri Brinell sertlik olarak HBW 2.5x31,25 standardında ve QNESS Q250M makro sertlik ölçüm cihazı kullanılarak tespit edildi. Ayrıca numuneler Nikon MA200 optik mikroskop, EDX destekli Carl Zeiss ULTRA PLUS FESEM tarama elektron mikroskobu ve Rigaku Ultra IV XRD cihazı kullanılarak incelendi ve karakterize edildi.

Sonuçlar ve Tartışma

Kaplama işlemleri sonrası SiC SEM görüntüleri ve EDX analizleri Şekil 1 ve 2'de verilmiştir. Homojen olmamakla birlikte partikül yüzeylerinin büyük oranda kaplandığı ve yaklaşık 1 µm kaplama kalınlığının elde edildiği tespit edildi. Analiz sonuçları da SiC partiküllerin büyük oranda kaplandığını gösterirken, partiküller üzerinde kaplanmayan bölgelerin de olduğu partiküllere ait EDX analizindeki Si ve C piklerinin varlığı ile doğrulamaktadır.

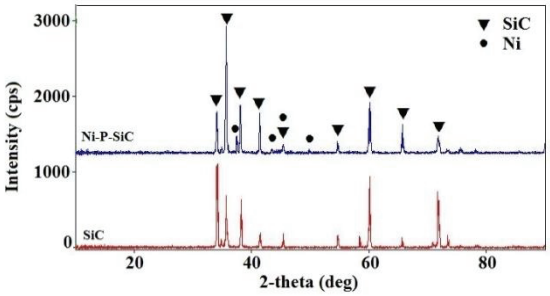


Şekil 1. Kaplanmış SiC_p SEM görüntüleri (a) x1000, (b) x5000



Şekil 2. SiC partiküllerin SEM görüntüleri ve EDX analizleri (a) kaplanmamış, (b) kaplanmış SiC.

Ni-P kaplanmış ve kaplanmamış partiküllere ait XRD analizinde de (Şekil 3) nikele ait pikler belirgin bir şekilde tespit edilirken SiC pik şiddetlerinde değişmeler gözlenmiştir.



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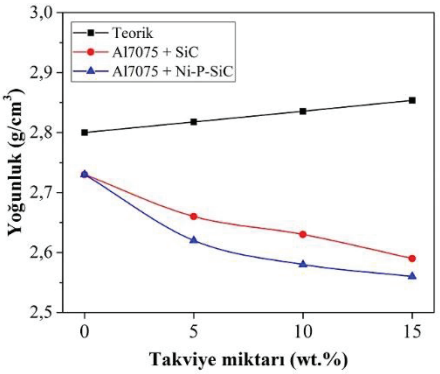
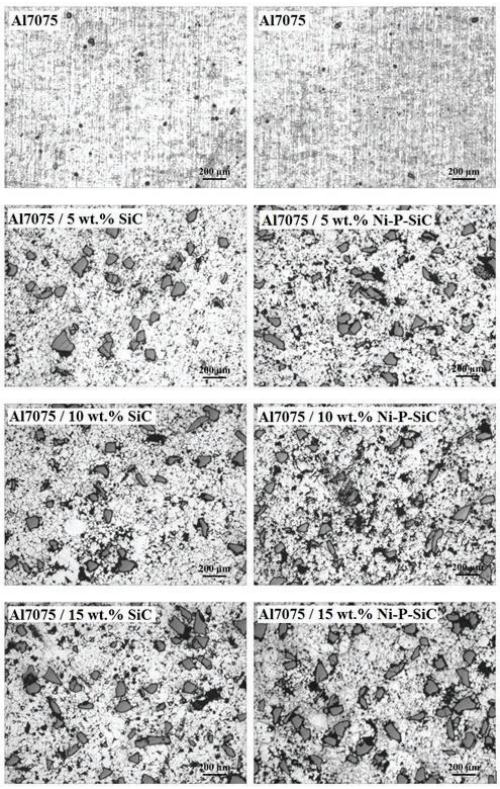
Şekil 3. Kaplanmış ve kaplanmamış SiC partiküllerin XRD analizi.

Al7075 alaşım ve kompozit numunelerde takviye miktarına bağlı yoğunluk değişimleri Şekil 4'te verilmiştir. Teorik yoğunluk grafiğiyle karşılaştırıldığında her iki takviye türünde de artan takviye miktarına bağlı olarak yoğunluk değerlerinde azalma meydana gelmiştir. Partikül takviye edilmemiş numunelerde gözenek miktarı % 2,5 sevilerinde iken artan takviye miktarıyla birlikte gözenek miktarı %9-10 seviyelerine kadar çıkmaktadır. Alaşım ve kompozit numunelere ait mikroyapı görüntülerinde de matris yapıda gözeneklerin ve takviye elemanlarındaki topaklanmaların takviye miktarında ki artışa bağlı olarak arttığı açıkça görülmektedir (Şekil 5). Ancak yoğunluktaki bu azalma Ni-P kaplanmış takviye elemanlarının kullanıldığı kompozitlerde nispeten daha fazla meydana gelmiştir. Kompozitlerde geleneksel toz metalürjisi üretim tekniği ile yapılan üretimlerde ikincil fazın ilavesi presleme sırasında tozların akışını zorlaştırması ve ikincil fazın topaklanması gözenek artışına, dolayısıyla da kompozitin yoğunluğunun düşmesine sebebiyet vermektedir. Kompozit numunelerde yoğunlukta meydana gelen azalma ya da diğer bir ifadeyle gözenek artışı Ni-P kaplanmış takviye elamanlarının kullanıldığı numunelerde nispeten daha yüksek değerlerde tespit edilmiştir. Bu durum ise kaplamanın partiküllerin yüzey özelliklerini değiştirmesine bağlı olarak, presleme esnasında matris ile takviye arasında kontak oluşumuna sebebiyet vererek tozların akışını zorlaştırması ile açıklanmaktadır.



Şekil 4. Takviye içeriğine bağlı yoğunluk değişimi



Şekil 5. Al7075 alaşım ve kompozit numunelerin mikroyapısı.

Al7075 alaşım ve kompozit numunelerde partikül takviye miktarına bağlı sertlik değişimlerine bakıldığında (Şekil

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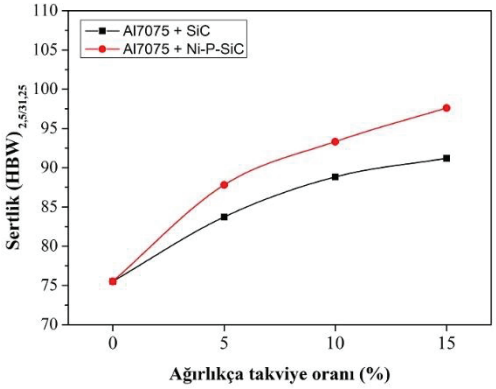
6) artan takviye miktarı ile birlikte sert ikincil fazın sertlik artışına neden olduğu açıkça görülmektedir. Ancak kompozit numunelerdeki bu artış Ni-P kaplanmış takviye elamanlarının kullanıldığı kompozitlerde nispeten daha fazla meydana gelmiştir. Gözenek oranı arttıkça ya da diğer bir ifade ile kompozit yoğunluğu azaldıkça sertliğin daha düşük değerlerde elde edileceği beklentisine karşın Ni-P kaplanmış numunelerde sertlik daha yüksek değerlerde elde edilmiştir. Bu sonuç, SiC partiküller üzerine uygulanan Ni-P kaplamanın iyi bir ara yüzey oluşturduğunu göstermektedir.



Şekil 6. Takviye içeriğine bağlı sertlik değişimi

Sonuçlar

SiC ile takviye edilmiş Al7075 matrisli kompozitlerde matris-takviye ara yüzey özelliklerini geliştirmek amacıyla yapılan çalışma da akımsız kaplama yöntemi ile Ni-P kaplanmış ve kaplanmamış SiC partiküller ile takviye edilmiş kompozitler geleneksel toz metalürjisi üretim tekliği ile üretilmiştir. Üretilen kompozitlere çeşitli test ve analizler uygulanarak kompozitlerin yoğunluk ve sertlik özellikleri incelenmiş elde edilen veriler ve ileriye yönelik çalışmalar için öneriler aşağıda özetlenmiştir.

Al7075 alaşım matrisli kompozitler geleneksel toz metalürjisi üretim tekniği ile üretilebilmesine karşın uygulanan üretim parametreleri hem alaşım hem de kompozit numunelerde tam yoğunluk veya yüksek yoğunluğun elde edilmesinde yeterli olmamıştır. Matris yapıya ilave edilen takviye elamanları matris yapıda gözenek oluşumuna sebebiyet vererek yoğunlukta azalmaya neden olmuştur. Bu düşüş Ni-P kaplanmış takviye elamanları ile üretilen kompozitlerde nispeten daha yüksek seviyede görülmüştür. Üretilen kompozitlerde takviye miktarının artmasına bağlı olarak sertlik değerlerinde artış meydana gelirken en yüksek sertlik değerleri Ni-P kaplı takviye elemanlarının kullanıldığı kompozitlerde elde edilmiştir. Bu sonuç uygulanan kaplama işleminin matris-takviye ara yüzeyini olumlu yönde etkilediğini ortaya koymaktadır. Ancak üretilen kompozitlerde kaplama işleminin başarısını ortaya koymak adına eğme ve çekme testlerinin yanı sıra kapsamlı bir ara yüzey incelemesinin yapılması gerekli görülmektedir. Ayrıca farklı kaplama işlemleri ile matrisle daha uyumlu ve ıslatma kabiliyeti daha yüksek farklı metal veya alaşım kaplamalar uygulanabilir. Bununla birlikte, takviye üzerindeki kaplamaya zarar vermeyecek şekilde yüksek yoğunluklu kompozitlerin üretilmesine imkân tanıyacak ve takviye-matris ara yüzey ıslatma kabiliyetini olumlu yönde etkileyecek üretim teknikleri ile daha başarılı sonuçlar alınabileceği düşünülmektedir.

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TÜRK KÜLTÜRÜNDEKİ BATIL İNANIŞLAR VE SEMBOLİK BESİNLER

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Özet: Gerekleri ve koşulları bakımından tümüyle ya da kısmen eksik olan ibadet ve uygulamaların geçersizliğine batıl denilmektedir. Türk kültüründe yüzyıllar öncesinden kaynaklanan çok değişik batıl inançların etkisi olmuş ve günümüze kadar da süregelmiştir. Bir kısmı dinsel bir kısmı da dinsel kaynaklı olmayan bu inançlar günlük yaşamı da etkilemiştir. Cumhuriyetle birlikte eğitim düzeyinin artmasıyla bu batıl inançların bazılarının etkisi azalırken, bazıları hala etkisini ve önemini sürdürmektedir. Yapılan bu çalışmada, Türk kültüründe varlığını sürdüren doğum ve çocuk ile ilgili geleneklerin uygulanmasındaki batıl inanışlar ve uygulanmalarındaki sembolik besinler ele alınmıştır. Konu ile ilgili yazılı kaynaklar derlenerek ve kaynak kişilerle yüz yüze görüşülerek bu uygulamalar değerlendirilmiştir.

Anahtar Kelimeler: Batıl inanış, doğum ve çocuk ile ilgili gelenekler, sembolik besinler.

SYMBOLIC FOODS IN THE SUPERSTITIONS BELIEFS IN THE TURKISH CULTURE

Abstract: Invalidity of worship and practices that are completely or partly deficient in view of their necessities and circumstances are called superstitions. In Turkish culture, there has been many effects of superstitions which comes from centuries and contiues till today. These believes, some of them are religious or not, affect daily life. While the effects of some superstitions decreasing with republic, some of them still have their effects and importance. Symbolic nutrients in the superstitions and practices related with birth and child have been studied in this study. Practices were evaluated by gathering written sources related with the subject and meeting face to face with people.

Keywords: Superstitions, related with traditional child and birth practices, symbolic foods

Giriş

Batıl, gerekleri ve koşulları bakımından tümüyle ya da kısmen eksik olan ibadet ve uygulamaların geçersizliğini ifade etmektedir (Anonim[a] 1987). İnanç ise, kişi ya da toplumca, bir düşüncenin, bir olgunun bir nesnenin bir varlığın gerçek olduğunun kabul edilmesidir. İlk çağlardan beri her toplumda insanlar gerçeklik payı olmayan, korkuları, çaresizlikleri, eski gelenekleri gereği genellikle doğa üstü olaylara inanmışlar. Bu inançlar daha sonraları batıl inançlar olarak isimlendirilmiştir. Bu tür inanışların negatif ya da pozitif etkisine maruz kaldığı düşüncesiyle kişiler daha içten bir şekilde bağlanmışlar ve bu inançlar günlük hayatın içerisinde yer almıştır. İlkel insandan günümüze kadar inanışlar insanların yaşamlarını etkilemiş onlara yön vermiştir. Her toplumda, eski inanç sistemlerinin mirası olan inanışlar yaşanılan çağın koşullarına uydurularak yeni biçim, yeni içerik ve yeni anlatılışla yer bulmuş somut bir anlatım biçimi kazanmıştır.

Anadolu'da yaygın olan batıl inançlarda öğretiler söz konusu olabilmektedir. Öyle ya da böyle geçmişten günümüze insanlar garip şeylerde şansı veya şansızlığı bulmuşlar. Bir kısmı dinden kaynaklanan bir kısmı da dinsel kaynaklı olmayan batıl inançlar günlük yaşamı da etkilemiştir. Kişiler bazı olay ve objelerin kötü veya iyi kaderi getirdiğine inanarak günlük yaşantılarını bu çerçevede şekillendirmişlerdir. Tarihsel süreç içinde

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Anadolu'da göçler, fetih dalgaları yaşanmış, çeşitli uygarlıklar hüküm sürmüştür. Bunun sonucunda, temelde aynı kültür kaynaklarından beslenmelerine rağmen, bazen her yörenin diğer bölgelerle aynı, bazen de kendine özgü farklı inanışlar gelişmiştir. Adet ve inanışlar, halkın günlük hayatının her kesiminde ve hayatının her döneminde kendisini hissettiren büyük bir yaptırım gücüne sahip olmuştur. Cumhuriyetle birlikte eğitim düzeyinin artmasıyla yaşanan hızlı kültürel değişim ve gelişim bu inançların etkisinin azalmasına neden olmuş ancak hala geçerliliğini koruyan batıl inançlarda bulunmaktadır (Artun 1998).

Yapılan bu çalışma ile Orta Anadolu'da varlığını sürdüren doğum ve çocuk ile ilgili geleneklerin uygulanmasındaki batıl inançlar ve bu inançların uygulamalarındaki sembolik besinler ele alınmıştır. Batıl inançların etkisi bölgede hemen hemen tüm alanlarda görülmekle beraber doğum ve çocukla ilgili daha yaygın olarak görülmektedir. Bu nedenle çalışmada doğum ve çocukla ilgili batıl inançlar ele alınmıştır. yazılı kaynaklar derlenerek, bölgede doğup büyüyen ve hala o bölgede yaşamını sürdüren kaynak kişilerle yüz yüze görüşülerek gerçekleştirilmiştir. Ayrıca konu ile ilgili ikincil veriler kullanılarak çeşitli kaynaklardan taramalar yapılmıştır.

Doğum ve Çocuk İle İlgili Batıl İnançlar ve Sembolik Besinler

Günümüzde türbelere, yatırlara, ziyaret yerlerine giderek adak adama Orta Anadolu'da da hala yaygın bir uygulamadır. Adak ve ziyaretler İslam Dinine ters düştüğü için din tarafından yasaklanmış olmasına rağmen, Allah rızası için yapılması, etkisini sürdürmesinin temel nedenidir. Çocuğu olmayan kadınlar da bu tür ziyaret yerlerine giderek çocukları olmasına yönelik dualar ederler. Örneğin; Ankara'da en çok Hacı Bayram Veli Türbesine, Çankırı'da Şeyh Mehdi yatırına giderek çocuğu olması yönünde dualar ederek adak adanır. Şanlıer'in (1995) yapmış olduğu çalışmada da çocuk olması için ziyaret ve adağın yaptığını belirtenlerin sayısı yüksektir. Zekeriya sofrası adağı bölgede önemini yitirmekle beraber zaman zaman yapılmaktadır. Zekeriya sofrası adağında; sofra ramazan ayından bir önceki ay olan Şaban ayında kurulmaktadır. Adağa katılanlar hiç konuşmadan adağa başlarlar. Önce iki rekat namaz kılınır, sonra akşamla yatsı arasında yer sofrası kurulur. Sofraya mum dikilir ve bu süreye kadar konuşma yasağı devam eder. Namazdan sonra Kur'an'ın 19. Suresi olan Meryem suresini ve halk arasında Zekeriya suresi denilen Kaha suresini okurlar *dileğim olursa gelecek yıl Şaban ayında Zekeriya sofrası yapacağım* derler. Sofrada kırkbir çeşit yiyecek bulundurulur ve genelde kadınlar ile erkekler bir araya gelmezler (Anonim[a] 1981; Anonim[b] 1981; Erdoğan[a] 2015; Şanlıer 1995).

Nevşehir'de töresel değerlerin oluşumunda dinsel yapının önemli yeri vardır. İslam inançlarının en yaygın yorumlarından Bektaşilik'in ilk uygulamaları yörede başlamış ve Hacıbektaş ilçesi Bektaşilik'in merkezi olarak önem kazanmıştır. Bektaşilik uygulamalarından adak, günümüzde de yaygın biçimde sürdürülmektedir. Bu yüzden hamile kalmak için; yatırlara, türbelere özellikle de Hacı Bektaş-ı Veli ve Balım Sultan Türbelerine giderek adak adama, kurban kesme en yaygın uygulamalar arasındadır. Bunun yanısıra baharat macunu kaynatılarak içilmesi de sıklıkla başvurulan yöntemlerdendir (Anonim[c] 1981). Yozgat'ta Görpeli Türbesi'nde çocuğu olmayan ve çocuğu yaşamayan kadınlar tarafından adaklar adanır (Anonim[d] 1996). Kırıkkale'de Tokuş Baba ve Şeyh Sami en sık ziyaret edilen türbelerdir ve kadınlar bu türbelere giderek çocukları olması için adaklar adarlar. Adak kurbanlarını Tokuş Baba Türbesi'nde keserek bırakırlar. Bu türbede ocak tencere vb. yemek pişirme araçları da bulunmaktadır ve daha sonra türbeyi ziyaret edenler bu kurban etlerini pişirerek tüketmektedirler (Anonim[e] 1995, Demir et al., 1997) .

Doğum öncesi ve sonrasında çeşitli geleneksel kalıplar uygulanmaktadır ve uygulamalarda bazı besin maddeleri ön plana çıkmaktadır. Örneğin; sütü gelmeyen lohusa kadının kocası gün ağarırken iki simit alıp kimseye görünmeden köy çeşmesine gider. Simidin birini çeşmeye bırakır öbürünü aldığı suyla eve getirir. Dönerken arkasına bakmaz, kimseyle konuşmaz. Lohusa kadın bu suyu içip simidi yerse sütünün geleceğine inanılır. Bunun gibi diğer inançlardan bazıları da şunlardır:

-Doğum kolay olsun diye, şifa tasına *Fatma Ana Eli* (anastatika hierochuntica) adı verilen ottan konur ve suyu gebeye içirilir.

-Doğum gecikirse, kadın kömüş (manda) yularının altından geçirilir (kömüş bir yılda doğurduğundan, gebe kadın kömüş sütünden içmişse doğumu gecikebilir).

-Lohusalar, elmacık olmamak (prolapsus uteri-rahim sarkması) için elma yemezler.

-Lohusaya sıcak ekmek götürülürse, lohusa evinden kömür, sirke, sarımsak, soğan, kül, ateş çıkarılırsa lohusa kırk basmasına (kara basması) uğrar.

-Bebeğin ilk kez götürüldüğü yerde, bolluk olsun diye yüzüne un sürülür.

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-Cinlerin beşikteki çocukları çalıp yerlerine kendi çocuklarını koyduklarına inanılır. *Aydas* adı verilen bu çocuklar büyüyemezler.

Bunların tedavisi için üç yol ağzına ocak kurulur, üzerine bir tencere konur ve çocuk da tencerenin üzerine oturtulur (Anonim[b] 1981; Erdoğan[a] 2010).

Çankırı yöresinde sütü gelmeyen kadınların boynuna süt taşları takılırdı. Bir çobana ekmek ve soğan verilir. Çobanın akşama dek dağarcığında taşıdığı ekmek ve soğan akşam olunca lohusaya yedirilir (Anonim[c] 1981).

Eskişehir'de gebelikle ilgili inanmalarda çocuğun cinsiyetine ilişkin olanların önemli bir yeri vardır. Az çok değişikliklerle tüm yörelerde görülen bu inanışlara şu örnekler verilebilir: Şap ateşte eritilir. Soğuduğunda aldığı biçimlere bakılır. Sivrilik bebeğin erkek olacağına, çukurluk ya da yassılık kız olacağına yorulur. Gebenin karnı sivrileşirse, tatlıya düşkün olursa doğacak çocuğun erkek; karnı yaygınlaşırsa, ete ve ekşiye düşkün olursa kız olacağına inanılır.

Lohusaya ilk gün *gözün aydına* gidilir. Doğumdan üç gün sonra ikinci ziyaretler başlar. Bu kez yazma, yağlık, nazarlık, altın vb. armağanlar götürülür. Gelenlere karanfil ve kırmızı şekerle yapılmış lohusa şerbeti sunulur. Bebeğin kırkıncı gününde kırk banyosu yaptırılır. Kırk suyu önce çocuğa, sonra anneye dökülür (Anonim[f] 1981).

Kayseri'de lohusayı ve çocuğu nazardan, kötü etkilerden korumak için de çeşitli uygulamalara rastlanmaktadır. Lohusanın 40'ı çıkana kadar yanında Kur'an bulundurulur. Şeytan lohusaya görünüp, onu korkutursa sütünün çekileceğine inanılır. Nazar, albasması, 40 karışması gibi inançlar ve bunlara ilişkin, geleneksel önlemler de varlığını korumaktadır. Albasmasına uğrayan lohusanın karşısına siyah saç asılır. Saçın üstüne de ciğer takılır. Hastalığın çocuğa geçmemesi için, alnına sarı bez bağlanır. Doğumdan sonra gelişemeyen çocukların 40 basmasına uğradığına inanılırdı. Kırk evden un toplanıp helva ya da ekmek yapılıp, yol ortasına konulur, çocuk da içinden geçirilirdi (Anonim[g] 1981; Baykaldı 2015; Ercan 2010).

Eskişehir'de çocuk doğar doğmaz, göbeği bağlanır ve kesilir. İnce tuzla tuzlanır. Bu yapılmazsa, büyüdüğünde bedeninin kokacağına inanılır. Sonra bir leğende bol suyla yıkanır. Suda bir altın bulundurulur. Lohusaya bu gün kavurma bulamacı (un çorbası) yedirilir. Ara sıra da helva verilir. Ziyarete gelenlere yedi gün sıcak, baharlı lohusa şerbeti sunulur. Gelenler, çeşitli armağanlar getirir.

Konuşamayan çocukların, dil altı kesilirdi. Kurbanın dili yakılır, külü çocuğun yemeğine katılır. Kanaryanın içtiği sudan içirilir. Çabuk konuşan çocuğa bir parça ekmek çiğnetilir. Bu ekmek konuşmayan çocuğa yedirilir (Anonim[f] 1981).

Kırşehir'de çok çocukluluk yaygındır. Aileler erkek çocuğa ayrı bir önem verirler. Bu nedenle gelin eve girer girmez kucağına erkek çocuk verilir. Sancılar başlayınca gebeye şerbet içirilir. Doğumdan 3 ezan geçtikten sonra bebek gürbüz olsun diye, ailede en iştahlı birinin yardımıyla emzirilir. Aynı amaçla çocuğun boynuna tereyağı sürülür. Yıkanıp kundaklanan bebeğin baş ucuna nazar değmesin diye yastığının yanına sarımsak, soğan ve yumurta konur (Özdemir 2015).

Konya'da yöre kültürü büyük ölçüde dinsel öğelerden oluşmaktadır. Kent, Ortaçağ'dan başlayarak dinsel bir merkez durumundadır. Mevlevilik'e ilişkin etkinlikler de günümüzde dinsel yapının güçlü dayanaklarından birini oluşturmaktadır. Emir Ahir ve Zeyneddin Başara türbeleri süt türbesi olarak bilinmektedir. Sütü yetmeyen analar buralara giderek adaklar adamakta, kurban kesmektedir. Yörede erkek çocuğa ayrı bir önem verilir. Doğum öncesinde cinsiyetin anlaşılması için kelle pişirilir. Kelle ikiye ayrılır, içi kuru (etsiz) çıkarsa erkek, etli çıkarsa kız doğacağına inanılır. Gebenin koynundan kahve çekirdeği atılarak da cinsiyet anlaşılmaya çalışılır. Çekirdek yere düştüğünde tümsek yanının üste gelmesi erkek, yarık yanının üste gelmesi kız doğacağına yorulur.

Aynı günlerde doğan çocuklardan biri gelişir, öbürü zayıf kalırsa bu 40'ların karıştığına yorulur. Zayıf çocuk, 40'ı karışan çocuğun evinin çevresinde dolaştırılır, giysilerinden biri alınarak giydirilir. Bunlardan bir sonuç alınamazsa yemeğinden alınır. Son bir çözüm olarak da, 40'ı basan çocuğun evine götürülerek birlikte yemek yedirilir.

İlk dişin çıkmasından sonra diş bulguru kaynatma geleneği Konya'da da yaygındır. Ana, döküntü (çerez) düzer, çevresine kaynatılmış bulguru koyar, ortasına da çocuğu oturtur. Başından avuçla bulgur atılır. Mumlar yakılarak, *gelen dişleri kolay, ömrü uzun olsun* dileğinde bulunulur. Çağrılan konuklar *diş hediyesi* verirler (Anonim[g] 1981).

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Niğde'de sancılar arttığında doğumu kolaylaştırmak için gebeye şerbet içirilir. Doğumdan sonra göbek bağı kesilir, temiz bir beze sarılır ve çocuğun yastığının altına bırakılır. Yirmi gün burada saklanır. Sonra bir yumurta kırılıp akı alınır, kabuğuyla 40 kez su alınır 40 taş sayılır. Bunlarla simgesel kırk hamamı yaptırıldıktan sonra göbek bağı, taşlar ve yumurta kabuğu bir araya gömülür. (Anonim[g] 1981).

Yozgat'ta çocuk kırk gün dışarı çıkarılmaz. Çocuğu olan eve çiğ et girmez. Menstrurasyon dönemindeki (hasta kadın tabir edilir) kadınlar, yeni çocuğu olan eve gitmezler. Al basmasın diye anne kocasının ceketini kendi üzerine örter (Kapusuzoğlu, 1997; Şahingöz 2015).

Nevşehir'de toplumsal değerlere göre çocuk özelliklede erkek çocuk, kadının aile içinde saygınlığını artırıcı bir etkendir. Gebeye *doğurucu* ya da *üstü yüklü* denir. Doğum öncesinde de gebenin davranışları ve yedikleriyle çocuğun bedeni arasında ilişkiler kurulur. Yediklerinden, kimi davranış ve olgulardan çocuğun cinsiyetine, özelliklerine ilişkin yorumlar yapılır. Aş erme sürecinde sebze yemesi, sakatattan kaçınması önerilir. Bunlardan en yaygın olanı gebenin karadut yedikten ya da kahve içtikten sonraki davranışlarına ilişkindir. Yaygın inanca göre, gebenin elini vücudunun belli bir yerine dokundurursa çocuğunda vücudunun o bölgesinde leke olacağına inanılır. Sancılar kasıktan başlar, memesi kararırsa kız; yüzü çillenir, memesi kahverengi bir renk alırsa, erkek doğuracağına yorulurdu.

Zamanı geldiği halde konuşamayan çocuğu ayın ilk çarşambasında annesi bir çuvala koyup sırtlar ve yedi evi dolaşırdı. Gittiği yerlerde *vıh, o ne ki (kız) sırtındaki* diye sorarlar, o da *bir çuval söz* yanıtını verirdi. Ev sahipleri çocuğa şeker, bulgur, pirinç, meyve gibi yiyecekler hediye ederler ve bundan sonra çocuğun konuşacağına inanılırdı (Anonim[h] 1981).

Kayseri'de merkezlerde sünnet düğünü yapılır. Çocuk genellikle 5-6 yaşını geçmeden sünnet ettirilir. Kirvelik bir gelenek olarak uygulanmakla birlikte köklü bir kurum değildir. Köylerde ilkbaharda gezici sünnetçiler dolaşır, sünnet çağına gelenler topluca sünnet ettirilir. Sünnet çocuğunun bulunduğu evin önünde davul zurna çalınır, oyunlar oynanır. Yumurta atılır, çocukların başının üstünde yorgan ve sini çevrilir. Sünnet yapılırken de kapıda sünnet şekeri dağıtılır (Anonim[c] 1981). Ankara'da erkek çocuklar on iki yaşına varmadan önce sünnet edilir. Genellikle çarşamba, perşembe ya da pazar günleri yapılır. Tek çocuk sünnet edilmez varsa kardeşiyle yoksa öksüz, yoksul bir çocukla sünnet edilirdi. Sünnet çocuğunun arpa, buğday serpilir; böylece çok çocuğu olacağına inanılırdı. Sünnet sırasında yaşlı kadınlar sünnetin kolay olması için oklava çevirirlerdi (Anonim[b] 1981; Erdoğan[a,b] 2015) .

Sonuç ve Öneriler

Batıl inançlar doğum, sünnet gibi çocuk ile ilgili kültürel unsurlarımızın uygulanmasında, kültürel zenginliğimize renk katarken bazıları Anadolu'yu olumsuz etkilemiştir. Geçmişten günümüze yaşanan hızlı değişim ve gelişmeler bir kısım uygulamalardan vazgeçilmesini sağlarken, geleneklerimize bağlı olma özelliğimizden dolayı bugün, az da olsa yöresel uygulamalar hala varlığını sürdürmektedir ve devam ettirilmeye çalışılmaktadır.

Bu yöresel uygulamalarda özellikle kurban adama ve buna bağlı olarak et, iyi şans ve nazardan korunmak için yumurta, ekmek, tuz gibi temel besin maddeleri sembolik besinler olarak ön plana çıkmaktadır. Bolluk ve bereket olması düşüncesiyle arpa, buğday, pirinç gibi küçük taneli tahıllar sıklıkla kullanılmaktadır.

Batıl inançlar ve benzeri başka geleneksel uygulamalar Anadolu'nun diğer bölgelerinde de varlığını sürdürmektedir ve kültürel zenginliğe renk katması bakımından, sonraki nesillere de aktarılmalıdır. Ancak kişilerin sağlığını, hayatını olumsuz etkileyebilecek uygulamalardan da vazgeçilmelidir. Bu kültürel zenginliklerin sonraki nesillere aktarımına yardımcı olmak amacıyla Anadolu'nun diğer bölgelerinin de ele alındığı yöresel çalışmalar planlanabilir.

Teşekkür

Çalışmaya ait her türlü bilgi ve belgelerin derlenmesine destek olan kaynak kişilere teşekkür ederim.

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TÜRKİYE'DE İKLİM DEĞİŞİKLİĞİNİN BİYOLOJİK ÇEŞİTLİLİK VE EKOSİSTEM HİZMETLERİ ÜZERİNDEKİ ETKİLERİNİN BELİRLENMESİ VE İZLENMESİ İÇİN YÜRÜTÜLEN KURUMSAL ÇALIŞMALAR

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İklim değişikliğinin etkilerine yönelik plan ve politikalar geliştirmek ekosistemlerin korunması ve dönüşümü açısından ele alınması gereken önemli konuların başında gelmektedir. Bu konuda Türkiye'de yapılan çalışmalar incelendiğinde, Ulusal İklim Değişikliği Uyum Stratejisi ve Eylem Planı ile Türkiye'de iklim değişikliğinden etkilenebilirlik alanlarının belirlendiği, konuya dair teknik ve bilimsel çalışmaların desteklendiği ve katılımcı süreçleri içeren beş konu başlığının öne çıktığı ifade edilebilir. Bunlar; Su Kaynakları Yönetimi, Tarım ve Gıda Güvencesi, Ekosistem Hizmetleri, Biyolojik Çeşitlilik ve Ormancılık, Doğal Afet Risk Yönetimi ve İnsan Sağlığı olarak sıralanabilir.

Türkiye'de, 2000'li yıllardan sonra iklim değişikliğinin etkilerini azaltmak üzere Ekosistem hizmetleri, biyolojik çeşitlilik ve ormancılık alanlarında uluslararası taahhütlerin de etkisi ile kurumsal çalışmalar kapsamında bir dizi strateji belgesi, politika, program ve eylem planı hazırlanmıştır. Bunların en önemlileri, Çölleşmeyle Mücadele Eylem Planı, Biyolojik Çeşitlilik Stratejisi ve Eylem Planı, Ağaçlandırma ve Erozyon Kontrolü Seferberliği Eylem Planı ile Orman Genel Müdürlüğü Stratejik Planı'dır. Yine Ulusal Kalkınma Planlarında ve kamu kurumlarının kendi çalışma konuları kapsamında farklı planlamalar yapılmıştır. Bu çalışmanın amacı, yapılan bu planlar eşliğinde Türkiye'de yürütülen kurumsal çalışmaların Biyoçeşitlilik ve Ekosistem Hizmetleri bağlamında hedef ve etkinliklerinin değerlendirilmesi amaçlanmıştır.

Keywords: Biyoçeşitlilik, Ekosistem Hizmetleri, İklim Değişikliği

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TÜRKİYE'DE NEOKLASİK BÜYÜME MODELİ ÇERÇEVESİNDE EKONOMİK BÜYÜMENİN BİLEŞENLERİ VE İÇ BORÇ STOKUNUN EKONOMİK BÜYÜMEYE OLAN ETKİSİNİN ANALİZİ

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Özet: Çalışmanın amacı; ülkelerin gelişmişlik seviyelerinin bir göstergesi olarak ele alınabilecek olan ekonomik büyümenin günümüzdeki öneminin ağırlık kazanması, konjonktürel koşulların değişmesi ile anlam ve değerinin artması, ekonomik büyümeye etki eden unsurların farklılaşmasıdır. Maliye literatüründe de önemli bir yere sahip olan ekonomik büyüme üzerinde çeşitli çalışmalar yapılmaktadır. Ekonomik büyüme hakkında literatürde yer alan farklı iktisadi ekollerin görüşleri, yapılan çalışmaları, niteliksel açıdan zenginleştirmektedir. Bu da literatüre katkı sağlamakta ve ekonomiler arasında karşılaştırma yapılmasına yardımcı olmaktadır. Çalışmada, Türkiye'de iç borç stokunun ekonomik büyüme üzerindeki etkisi, Neoklasik Büyüme Modelinden yararlanılarak 1980-2016 dönemi için Solow Kalıntısını da içeren bir model aracılığıyla Engle-Granger Eşbütünleşme Testi ile analiz edilmektedir. Ayrıca modele bir ekonomideki kamu harcamaları ve alt bileşenlerinin üzerinde bir kısıt oluşturmasından dolayı iç borç stoku değişkeni eklenmiştir. Böylece model, Geleneksel Neoklasik Büyüme Modelinden farklılaşmıştır. Çalışmadaki ampirik bulgular, uzun dönemde kişi başı çıktı büyümesi, toplam faktör verimliliği, kişi başı sermaye büyümesi ve iç borç stokunun birlikte hareket ettiğini ortaya koymaktadır. Toplam faktör verimliliği ve kişi başı sermaye büyümesinin, kişi başı çıktı büyümesi üzerinde pozitif etkiye sahip olduğu tespit edildiğinden Türkiye'de 1980-2016 döneminde Neoklasik Büyüme Modeli doğrulanmaktadır. İç borç stokunun kişi başı çıktı büyümesi üzerindeki negatif etkisi ise, iç borçlanmanın ekonomik büyümeyi azaltıcı yönde olduğunu ifade etmektedir.

Anahtar Kelimeler: İç Borç Stoku, Neoklasik Ekonomik Büyüme, Solow Büyüme Modeli, Engle-Granger Eşbütünleşme Testi, Türkiye.

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TÜRKİYE'DE YENİLENEBİLİR ENERJİLERİN GELİŞİM SÜRECİ

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Alternatif enerji kaynakları olarak da bilinen yenilenebilir enerji kaynakları hem küresel enerji talebinin hem de Türkiye'nin enerji talebinin karşılanmasında önemli bir yere sahiptir. Hidrolik enerji hariç tutulduğunda 90'lı yıllardan itibaren batılı ülkelerin öncülüğünde güneş ve rüzgâr enerji kurulu güçlerinde ciddi artışlar yaşanmıştır. Türkiye'de bu durum 2005'ten itibaren (YEKDEM teşvikleri ile) görülmüştür.

Yenilenebilir kaynaklar içinde hidrolik enerjinin geçmişi diğerlerine göre daha öncelere dayanmaktadır. Öyle ki hidrolik enerjiden küresel bağlamda elektrik üretiminde 135 yılı aşkın bir süredir (ilk olarak ABD) faydalanılmaktadır. Türkiye'de de hidrolik enerji yenilenebilirler içinde ilk önce devreye giren ve en fazla kurulu güce sahip olan kaynaktır. Osmanlı Devleti döneminde 1902 yılında Tarsus'ta kurulan ilk hidrolik enerji santralinden günümüze kadar hidrolik enerji kurulu gücü önemli oranda artış göstermiş, 2016 TEİAŞ verilerine göre 26,681 MW kurulu güç kapasitesine ulaşarak toplam kurulu gücün %35'ine sahip olmuştur.

1973 dünya petrol krizinden sonra güneş, rüzgar ve jeotermal enerjilerin yatırım boyutları artmış ve dünya enerji sistemine eklemlenmeye başlamışlardır. Türkiye ise Denizli-Kızıldere'de[1] bulunan jeotermal enerji sahasından elektrik üretimini ilk kez 1984 yılında gerçekleştirerek hidrolik enerji harici yenilenebilir bir enerji kaynağını portföyüne almıştır. 1998 yılında ise Çeşme-Alaçatı'da kurulan rüzgâr türbinleri yenilenebilir kaynaklara olan farklı bir yatırım örneği olmuştur. 2005 yılına kadar jeotermal ve rüzgâr enerjisi çerçevesinde gerçekleşen yatırımlar bu dönemden sonra diğer yenilenebilir kaynakları da içine almaya başlamıştır. Bu durumu ortaya çıkaran en önemli unsur ise şüphesiz Türkiye'nin yenilenebilir enerji potansiyeli ve politikasıdır.

Buna göre çalışmada, Türkiye'de yenilenebilir enerji kaynaklarının geçmişten günümüze nasıl bir gelişim yaşadığı irdelenecek ayrıca yüksek düzeyde alternatif enerji kaynak potansiyeline sahip Türkiye'nin konuyla ilgili politikaları tartışılacaktır. Eldeki çalışma, Karabük Üniversitesi Bilimsel Araştırma Projeleri (BAP) Koordinatörlüğü tarafından desteklenmektedir.

Keywords: Enerji, alternatif enerji, yenilenebilir enerji, enerji politikası

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[1] O dönem Kızıldere (Buharkent) idari olarak Denizli iline bağlıydı.

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TÜRKİYE'NİN BATISINDA YETİŞEN FERULAGO W. KOCH (UMBELLIFERAE) CİNSİ TÜRLERİNİN TOHUM YAPILARININ KARŞILAŞTIRILMASI

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Çiçekli durumda ayırt etmenin olanaksız olduğu *Ferulago humilis* ve *Ferulago macrosciadia* türlerinin tek ayırt edici özelliği meyve şeklidir. Ancak meyve şekli bakımından aynı yerden toplanmış örneklerde bile, farklılık görülmektedir. Bu çalışmada, *Ferulago* cinsine ait 10 türün meyve şekilleri ve meyve yüzey özellikleri taramalı elektron mikroskobu (SEM) kullanılarak belirlenmiştir. SEM kullanılarak belirlenen 16 özellik bakımından varyasyon göstermediği saptanmıştır. *F. aucheri*' nin stomanın uzunluğu ve genişliği bakımından diğer türlerden farklılık saptanmıştır. *F. trachycarpa* meyvesinin dorsal rib ve lateral kanat üzeri seyrek çizgili ve üçgenimsi tüylerle kaplıdır. Stomalar yuvarlak veya elips şeklindedir.

Keywords: Anahtar kelimeler: Ferulago cinsi, filogeni, kladistik analiz, meyve yüzeyi, Umbelliferae, taramalı elektron mikroskopi

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TÜRKİYE'NİN COĞRAFİ FARKLILIKLARI VE GASTRONOMİK ÇEŞİTLİLİĞİN BÖLGESEL TURİZMİN GELİŞTİRİLMESİNDEKİ

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Özet: Modern insanla gelişen beşeri zevklere bağlı olarak yemek, günümüzde sadece karın doyurma amacı olmaktan daha fazlasını ifade eden bir kavrama dönüşmüştür. Buna bağlı olarak turizm faaliyetleri içerisinde gastronomi kavramı turizm destinasyonlarında çeşitlilik yaratmada önemli bir unsur haline gelmiştir. Türkiye gastronomi turizmi kapsamında değerlendirildiğinde yörelere bağlı olarak çok farklı gastronomik ürünlerin olduğu gözlenmiştir. İbn-i Haldun'nun toprağın verimine göre insanların vücut yapılarında farklılık gözlendiğine dair görüşüne benzer biçimde, Türkiye'deki gastronomik ürünler de yörelerin dağ yapıları, toprak yapıları, yağış farkları ve iklim çeşitlerine gibi coğrafi farklılıklara göre değişiklik göstermektedir. Yapılan bu derleme çalışması ile bölgesel farklılıkların gastronomik ürünlerde meydana getirdiği çeşitliliği, Türkiye gastronomi turizmine sağlayacağı katkıyı ve yerel kalkınmaya etkilerinin belirlenmesi amaçlanmıştır.
Elde edilen bulgular, Türkiye'nin turizm potansiyelinin geliştirilmesinde gastronomi turizmi ile önemli bir turizm faaliyeti oluşturulabileceğini göstermiştir. Turizm faaliyetlerinde yörelerin iklim çeşitliliği sonucu ortaya çıkan gastronomik değer taşıyan ürünlerin belirlenmesi, Türkiye turizminin bölgesel kalkınmasını pozitif yönde etkileyecektir. Gastronomi faaliyetleri Türkiye'nin bilinirliğinin arttırılmasında önemli katkılar sağlayacaktır.
Anahtar Kelimeler: Gastronomi turizmi, yöresel ürünler, coğrafi farklılıklar, yerel kalkınma.

Giriş

Güzel yemek ve pişirme sanatı olarak tanımlanan gastronomi, niş turizm ürünlerinin gelişiminde ve niş destinasyonların ortaya çıkması açısından önemli bir konumdadır. Bir diğer tanımlama ise şuna vurgu yapmaktadır; gastronomi kültürün bir parçasıdır ve yemekle kültür arasındaki bağlantıyı inceleyen bir çalışma olarak tanımlamaktadır (Kivela ve Crots, 2006). "Gastronomi" kavramının ilk telaffuz edilişi ise 1800'lü yıllara kadar uzanmaktadır. "Gastronomi" kelimesi ilk olarak 200 yıl önce Fransa'da Jacques Berchoux (1801) tarafından yayımlanan bir şiirin ismi olarak kullanılmıştır. Kelime, Eski Yunan'da mide anlamında kullanılan "gastros" ve kural anlamında kullanılan "nomos" kelimelerinin birleşmesinden oluşmuştur (Serçek ve Serçek, 2015).

Gastronomi üzerine yapılan ilk önemli çalışma Fransız avukat J.A. Brillat Savarin tarafından 1825 yılında La physiologie du gout'da yayımlanan ve ingilizceye The Physiology of Taste olarak geçen, Tadın Fizyolojisi'dir. Duyularla besin, yiyecek ve içecek tüketimi arasındaki bilimsel ilişki hakkında daha sonraki çalışmalara yol açan Savarin (Kivela ve Crots, 2006), çağdaş gastronominin tanımlamasında; yemeği hazırlama, üretme ve sunum kadar, yansıtmacı ve mükemmel yeme-pişirme düşüncesinin de olduğunu belirtmektedir (Kaya ve Yurtseven, 2010: 58).

Gastronomi ve turizm arasındaki ilişkiyi ise bazı yazarlar kültür turizmi içinde değerlendirmektedir. Gastronomi turistler açısından bir çekim unsuru olan, değerli bileşenler oluşturan, kültürel ürünler ile gelenekseli harmanlayan, mimari, sanat, müzeler, etkinlikler gibi kültürde büyük öneme sahip bir turizm çeşididir (Zengin vd., 2014). Yemeklerin popüleritesinin ve buna bağlı seyahatlerin artması, yemek ve turizm arasındaki ilişkiyi, bir turist çekiciliği olarak yemek unsurunun önemine ilişkin çalışmaların sayısını arttırmıştır (Richards, 2002; Cohen ve Avieli, 2004; Bessire, 1998).

Turistlerin seyahat motivasyonları incelendiğinde gastronomi ve turizm arasındaki ilişki doğrulanır niteliktedir. Turistik harcamalarda yiyecek-içecek harcamaları kayda değer bir orandadır (Zengin vd., 2014). Turistler için, beslenme ihtiyacının memnuniyeti gastronomik deneyimi oluşturmaktadır. Yemeklerin imajı kültürel kimliklerinin pazarlanması olarak turizm destinasyonları için kullanılmakta ve yemek, turizm destinasyonlarının sürdürülebilirliği için özgün bir potansiyel oluşturmaktadır (Durand, 2003).

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Yemek ve kültür kavramını birleştiren gastronomi, turizm pazarlamasında avantaj sağlayan yeni bir turizm alanının gelişmesine katkı sağlamıştır. Türkiye'nin sahip olduğu coğrafik ve iklimsel çeşitlilik ile birçok kültüre ev sahipliği yapması sonucunda oluşan kültürel etkileşim ile mutfak kültürü de çeşitlilik kazanmıştır (Aksoy ve Sezgi, 2015). Gastronomi üzerine yapılan çalışmaların yoğunlukla memnuniyet ve motivasyonların belirlenmesi üzerine olması gastronominin daha yeni gelişen bir bilim dalı olduğunu göstermektedir.

Bu noktada gastronomi alanında yapılacak her çalışmanın; gastronomi ve gastronomi turizminin daha net anlaşılması adına kazanım olacağı söylenebilir (Zengin vd., 2014). Bu bağlamda yapılan bu derleme çalışmasının amacı, bölgelere göre değişen coğrafi farklılıkların gastronomik ürünlerde meydana getirdiği çeşitliliğin ortaya konulması, bu yöresel ürünlerin Türkiye'nin gastronomi turizmine sağlayacağı katkıyı ve yerel kalkınmaya etkilerinin belirlenmesidir.

Destinasyon Pazarlamasında Yerel Mutfağın Yeri

Gastronomi turizminin kökleri tarım, kültür ve turizme uzanmaktadır. Bu üç temel alan, gastronomi turizminin bölgesel çekicilik ve deneyim unsuru olarak pazarlanmasına ve konumlandırılmasına fırsat sağlamaktadır. Tarım, ürün, kültür, tarihi ve otantiklik sunarken turizm ise alt yapıyı ve hizmetleri sağlamaktadır. Tüm bu unsurlar gastronomi turizmi çatısı altında bir araya gelmektedir. Yemek, bir toplumun kendisini ve yaşama tarzını ifade şeklidir. Bu tanım ile kültür, gastronomi turizminin göz ardı edilemez önemli bir parçasıdır (Du Rand ve Heath, 2006: 208).

Yerel yemek kültürü bir destinasyonun sahip olduğu en değerli çekiciliklerden biridir. Yerel mutfaklar, destinasyonun soyut mirasının bir dışavurumu olmaktadır. Yerel ürünleri tüketen turistler, otantik kültürel bir deneyim yaşamaktadırlar (Okumuş vd., 2007). Hatta bazen bu otantik lezzetin başka bir yerde deneyimlenmesi fırsatı bulunmadığından, yapılan turistik gezinin tek ya da öncelikli amacı yöresel yemek kültürü ile tanışmak olmaktadır (Çevik ve Saçılık, 2011). Bu durumda da o yöreye ait yöresel mutfağın destinasyon pazarlamasında kullanımı büyük önem taşımaktadır (Henderson, 2009).

Destinasyon pazarlamasının esas amacı, insanlarda olumlu, kalıcı bir imaj bırakmak ve yörenin markalaşmasını sağlamaktır. Bu markalaşma herhangi bir nedenle gerçekleşebilmektedir. Ancak artarak büyüyen yerel yemeklere olan ilgi ile ön plana çıkan unsurlardan biri destinasyonların gastronomik unsurlarıyla markalaşmasıdır. Destinasyon markalaşmasında, yörenin marka kimliğinin yanı sıra farklı alternatiflerle yörenin çekiciliğinin arttırılması amaçlanmaktadır. Bu nedenle de yemek kültürünün, gastronomik değerlerin destinasyonları tercih edecek misafirlere monotonluktan kurtulma imkânı sağlamaktadır (Serçek ve Serçek, 2015).

Alonso ve Liu'nin (2011) yaptıkları çalışmada yöresel mutfakların, turizm destinasyonlarının sahip oldukları profilleri yükseltmekte olduğunu ve destinasyonların kalkınmalarına destek olmak için yeni fırsatlar sunmakta olduğunu belirtmişlerdir. Yöresel mutfakları kullanarak destinasyonlar, kendini potansiyel müşterilerinin gözünde farklılaştırabilmektedir. Ancak bunu yaparken potansiyel müşterilerin ihtiyaçları ve beklentileri yerel yönetimler tarafından göz önünde bulundurulmalıdır (Şengül ve Türkay, 2016).

Turizmde sürdürülebilirliğinin sağlanabilmesi için çeşitli alternatifler söz konusudur. Bölgelerin destinasyon bazında pazarlanması, hatta özel ilgi turizmi adı altında spesifik boyutlarda turizm faaliyetleri birçok ülke için büyük önem taşımaktadır. Bu noktada "gastronomi turizmi" birçok turizm çeşidi ile entegre edilebileceği gibi tek başına da bir turizm çeşidi olarak karşımıza çıkmaktadır (Şahin ve Ünver, 2015). Dünya Turizm Örgütü'nün 2012 yılında yayınladığı küresel yiyecek turizmi raporunda; yöresel yiyecekler ile içeceklerin turistler için destinasyon seçiminde henüz temel motivasyon kaynağı olmasa da, destinasyon kararı vermede yükselen düzeyde etki ürettiklerine dikkat çekilmiştir. Ayrıca yöresel mutfağın turistlerin tatil kalitelerini arttırabilmek için önemli bir etken olduğu da vurgulanmıştır (World Tourism Organization, 2012).

Bu anlamda destinasyonların, mimari, iklim, fiyat ve diğer özellikleri ile birbirine benzer olduğu durumlarda gastronomik zenginlikleri bir ürün farklılaştırma aracı olarak kullanan ülkeler, turizm alanında bir adım önce olacakları görülmektedir. Bu durumda da Türkiye'nin sahip olduğu gastronomik zenginlikler göz önüne alındığında, henüz tam olarak kullanılamayan çok önemli bir gastronomi turizmi potansiyelinin var olduğu dile getirilebilir (Şahin ve Ünver, 2015).

Coğrafi Farklılıkların Yerel Mutfağa Etkisi.

Türkiye genel olarak dağlık bir arazi yapısına sahiptir. Türkiye'de arazilerin %55.9'u 1000 m'nin üstünde yükseltiye ve %62.5'i %15.0'ten daha fazla eğime sahiptir. Türkiye Karadeniz üzerinden ve kuzeyden gelen hakim rüzgârların ve bunların getirdiği deniz etkisinin altındadır. Ancak deniz etkisi, kuzeydeki ve güneydeki sıra

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dağların denize bakan yamaçlarında kalmaktadır. Bu nedenle Türkiye'nin iklim özellikleri ile yeryüzü şekli özellikleri arasında sıkı bir bağ vardır.

Türkiye'nin arazi yapısı ile buna bağlı olarak değişen iklim özellikleri farklı coğrafi bölgelerin, bunların içinde de mikro klimaların oluşumunu mümkün kılmıştır. Türkiye'de arazi kullanımı ile coğrafi bölgelerin arazi yapısı ve iklim özellikleri arasında uyumlu bir ilişki söz konusudur. Böylece Türkiye'nin nemli bölgelerinde ormancılık, yüksek dağlık ve kurak bölgelerinde hayvancılık ve her bölgesinde bitkisel üretim yapılabilmektedir. Bu özellik Türkiye'ye farklı ekolojik bölgelerde, o bölgelere özel tarımsal ürünleri üretme imkânı vermektedir.

Türkiye'de sıcaklık, kıyılarda enlem farkına, iç kesimlerde ise denizden uzaklık, yükselti, yer şekilleri gibi faktörlere bağlı olarak değişir. Günlük ve yıllık sıcaklık farkları kıyı bölgelerimizde az, iç bölgelerde fazladır. En az yıllık fark Doğu Karadeniz kıyılarında görülür (15 - 16°C). En çok yıllık fark ise, Kuzeydoğu Anadolu'dadır (Erzurum'da 27°C, Kars'ta 29°C, Ağrı'da 31 °C). Türkiye, genel olarak, Akdeniz ikliminin etkisi altındadır. Bu bağlamda, Türkiye genelinde yazlar kurak, kışlar yağışlı geçer. Bununla beraber, birbirlerinden belirgin farklarla ayrılabilen üç ana iklim tipi görülür. Bunlar, Karadeniz ve Akdeniz iklimleri ile karasal iklimdir.

Türkiye'de, yıllık ortalama yağış bakımından, bölgeler arasında büyük farklılıklar vardır. Bazı bölgelerde ortalama yağış 2500 mm'yi bulurken, bazı bölgelerde 250 mm'nin altına inmektedir. Türkiye'de yağışın dağılışı incelendiğinde şu özellikler görülür:

- Türkiye'de fazla yağış alan yerler (1000 mm. den fazla), Doğu ve Batı Karadeniz bölümleri ile bazı Batı ve Doğu Anadolu dağlarıdır. En fazla yağış alan yer Rize çevresidir (2400 mm. den fazla).
- Türkiye'de orta derecede yağış alan yerler (500 mm -1000 mm arası), Akdeniz, Ege, Marmara, Orta Karadeniz, Doğu Anadolu ve İç Anadolu'nun kuzey kesimleridir.
- Türkiye'de az yağış alan yerler (500 mm'nin altında), İç Anadolu, Güneydoğu Anadolu ve yer yer Doğu Anadolu'nun çukur yerleridir. En az yağış alan yer, Tuz Gölü çevresi ile Iğdır Ovası civarıdır (250 mm'nin altında).

Yağışın mevsimlere dağılımı bakımından bölgeler arasında önemli farklılıklar görülür. Karadeniz Bölgesi her mevsim yağışlıdır. Bunun dışında kalan bölgelerde kurak ve yağışlı dönemlere rastlanır. Kurak dönem genellikle yaz mevsimine, yağışlı dönem ise kış mevsimine rastlamaktadır (Yavuz, 2005: 10-11).

1-Karadeniz Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Bölgede her mevsim yağış görülmesi, yaz kuraklığı isteyen (buğday, arpa, yulaf, çavdar, mercimek, pamuk) ürünlerin yetişmesini engellemektedir. Bölgenin kıyı kesiminde tahılın yerini mısır almıştır. Kış mevsiminde Doğu Karadeniz'de kış ılıklığı fındık, çay, turunçgil, zeytin gibi ürünlerin yetişmesini kolaylaştırmaktadır. İç bölgelerde yağış azlığı orman örtüsünün azlığına, tahıl ve şekerpancarı gibi ürünlerin öne çıkmasına yol açmaktadır. Bölgede çalışan nüfusun %70'i geçimini tarımdan sağlamaktadır. En verimli tarım arazileri kuzeye bakan yamaçlarında bulunmaktadır (Şengül, 2015).

Tarım Ürünleri

Fındık: Trabzon, Giresun ve Ordu başlıca üretim alanlarıdır. Türkiye toplam üretiminin % 85'i bölgeden karşılanır.

Çay: Giresun'dan Gürcistan'a kadar olan kıyı şeridinde yetiştirilir. Rize çevresinde yoğunlaşır. Türkiye toplam çay üretiminin %100'ü bu bölgeden karşılanır. Tabii ekim alanı en dar olan ürünlerimizdendir.

Tütün: Daha çok Orta Karadeniz Bölümü'nde (Samsun, Amasya ve Tokat çevresi) yetiştirilir. Ayrıca Batı Karadeniz'de Düzce dolaylarında da üretimi yapılır. Türkiye toplam tütün üretiminin %13'ü bölgeden karşılanır.

Mısır: Bütün kıyı boyunca yetiştirilir.

Elma: Bölgede Amasya başta olmak üzere Kastamonu ve Tokat çevresinde yetiştirilir.

Şekerpancarı: Amasya, Tokat, Kastamonu çevresinde tarımı yapılmaktadır.

Keten-kenevir: Kastamonu başta olmak üzere Sinop, Zonguldak çevresinde tarımı gelişmiştir.

Soya Fasulyesi: Ordu- Giresun çevresinde tarımı yapılmaktadır.

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Zeytin: Soğuktan korunmuş Çoruh vadi oluğunda (Artvin -Yusufeli) tarımı yapılır.

Turunçgiller: Kış ılıklığı sebebiyle Rize çevresinde tarımı yapılır.

Kivi: Son yıllarda Rize ve Trabzon çevresinde tarımı yapılmaya başlamıştır (Anonim (a), 2015).

Genel olarak bakıldığında pratik ve basit bir mutfağa sahip olan Karadeniz Bölgesi, herkesin aklına öncelikle fındık, çay, mısır ve hamsi gelmektedir. Buna karşın Karadeniz Bölgesinde iklim ve yağış oranına bağlı olarak ot yemeklerinin de yaygın bir biçimde görüldüğü bir bölgedir. Karadeniz'de yeşillik hemen hemen her sofrada görülmektedir. Fasulye turşusu kavurması, kaygana, karalahana ve kiraz kavurma bunlara en güzel örneklerdir.

Bölgede ayrıca denizin etkisiyle balık ve diğer deniz ürünleri tüketimi de oldukça fazladır. En fazla tüketilen deniz ürünü ise hamsidir. Evliya Çelebi'nin de zamanında belirttiği gibi hamsinin en az kırk çeşit yemeği yapılmaktadır. Karadeniz mutfağı balıkla anılan bir mutfak kültürüne sahip olsa da bölgede özgün et ürünleri de bulunmaktadır. Bolu ve Kastamonu'dan kuzu büryan ve piran bunlar arasında en önemli örneklerdendir. Ayrıca bütün kuzu dolması Bartın ve Sinop'ta da yapılmaktadır. Akçaabat köftesi, Bayburt tavası, Tokat kebabı, Artvin et kavurması, Samsun köftesi genellikle çarşı yemekleri olarak anılsa da bölgede yaygın olarak tüketilmektedir (Halıcı, 2001).

Birkaç yüzyıl önce bu bölgeye getirilip iklim şartlarına uyum sağlandırılmış olan mısırın da Karadeniz mutfak kültüründe önemli bir yeri vardır. Mısır ve mısır unundan yapılan yiyecekler bu bölge mutfağının vazgeçilmezlerindendir. En çok bilinen mısır lezzeti, Rize'de mıhlama, Trabzon ve çevresinde kuymak diye adlandırılan mısır unlu yemektir. Doğu Karadeniz'de ekmeğin hammaddesi olan geleneksel tahıl, mısırdır. Yörede yetişen ürünlerle şekillenen Karadeniz mutfak kültürü, benzer yemeklere sahip üç ayrı grup oluşturmuştur. Bartın, Bolu, Düzce, Karabük, Kastamonu, Sinop, Zonguldak batı grubunu; Artvin, Giresun, Ordu, Samsun, Rize, Trabzon doğu kıyı grubunu; Amasya, Bayburt, Çorum, Gümüşhane, Tokat doğu iç grubunu oluşturmaktadır. Artvin şehri bir kıyı şehir olmamasına rağmen yemeklerinin benzerliği nedeni ile ***kıyı grubu*** içerisinde yer almaktadır (Şengül, 2015).

2-Marmara Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Türkiye'nin kuzeybatısını oluşturur. Bölge doğuda Adapazarı ovası ile Bilecik'in doğusuna kadar uzanır. Bölgenin güney sınırı Kazdağı'ndan başlayarak Balıkesir ovasını içine alır ve Uludağ'ın güneyinden geçer. Çanakkale açıklarındaki Gökçeada ve Bozcaada bölgede bulunur. Bölge ülkemiz yüzölçümünün %8,5'ine sahiptir. Yüzölçümün büyüklüğü bakımından bölgeler arasında altıncı sıradadır. Bölgenin bölümleri Çatalca – Kocaeli, Ergene, Yıldız Dağları ve Güney Marmara'dır. Türkiye'nin ortalama yükseltisi en az olan bölgesidir. Marmara Bölgesi'nde Akdeniz, Karadeniz ve karasal iklim özelliklerinin hepsi görülür. Bölge yılda ortalama 500 – 700 mm. arasında yağış alır (Anonim (b), 2015).

Bölge yemek kültürü olarak özellikle göçlerin sayesinde büyük bir çeşitliliğe sahiptir. Buna zemin hazırlayan en önemli unsurlardan bir tanesi de iklim ve bölgenin coğrafi konumunun hemen hemen her yönden tarım ve hayvancılığa elverişli olmasıdır (Çakır vd., 2014).

Tarım Ürünleri

Buğday: Trakya'da Ergene Bölümü'nde yoğun olarak yetiştirilen bu bitki İç Anadolu'dan sonra 2. sırada yer almaktadır.

Ayçiçeği: Tohumlarından yağ elde etmek için yetiştirilen bu bitki Türkiye üretiminin % 80 ini karşılamaktadır. Ergene ve Güney Marmara Bölümleri'nde ayçiçeğinin ekimi yoğunlaşmaktadır.

Şekerpancarı: Trakya, Güney Marmara ve Adapazarı ovalarında ekim yapılmaktadır.

Tütün: Bölge, Türkiye üretiminde 3. sırayı almaktadır. Bursa, Balıkesir, Adapazarı'nda ekimi yoğunlaşmaktadır.

Mısır: Bölge, üretimde Karadeniz'den sonra 2. sırayı almaktadır. Adapazarı ve Bursa önemli ekim alanları olarak bilinmektedir.

Pirinç: Meriç ovalarında ekimi yoğunlaşan pirincin Edirne de üretimi ilk sırada yer almaktadır.

Şerbetçi otu: Bira sanayinde tat ve koku verici olarak kullanılan şerbetçi otu Bilecik Yöresi'nde ekimi yapılan bir ot olarak bilinmektedir.

Zeytin: Güney Marmara Bölümü'nde Gemlik ve Mudanya Yöresi'nde üretimi yoğunlaşmaktadır. Bölge, üretimde Ege'den sonra 2. sırayı almaktadır. Bu bölge iri kalitede sofralık zeytin yetiştirmektedir.

Dut: Bölgede ipek böceği yetiştiriciliğine bağlı olarak dutçuluk önem taşımaktadır. Bursa, Balıkesir, Bilecik Yöresi'nde yoğun olarak yetiştirilmektedir.

Meyve: Bursa Yöresi'nde yoğun olarak yetiştirilir. Şeftali, kiraz, çilek, kestane ve üzüm bu ürünlerin başlıcaları arasında yer almaktadır.

Sebze: Bursa ve Adapazarı ovalarında yoğun olarak yetiştirilmektedir. Domates, patates, sarımsak, soğan, patlıcan, kabak, biber başlıcaları arasındadır. (Anonim (a), 2015).

Dağlık bölümlerinde bölgede hayvancılığa dayalı beslenme alışkanlığı görülürken, ova olarak tabir edilen yerleşim yerlerinde tarımsal faaliyetlere dayalı beslenme alışkanlığının ağırlıklı olduğu görülmektedir. Kıyı kesimlerinde ise denize yakın konumundan ötürü balık ve diğer deniz ürünleri tüketiminin ağırlık kazandığı görülmektedir (Çakır vd., 2014).

3-Ege Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Ülkemizin batısında Ege Denizi kıyılarınca uzanan bölge, Marmara Bölgesi, İç Anadolu ve Akdeniz Bölgeleriyle ve Ege Denizi ve Ege Adaları ile komşudur. Kıyıları: Ege Denizinin yerinde eskiden Egeid karası vardı. Bunun çökmesi sonucunda bugünkü adalar meydana geldi. Bölge dağları kıyıya dik uzandığı için kıyı girintili-çıkıntılı Enine Kıyı Tipidir. Kıyıda birçok körfez, koy, yarmada ve buruna rastlanır. Bölgenin asıl Ege Bölümünde graben ovaları sayesinde içlere kadar sokulan Akdeniz İklimi görülür. Bölgenin yurt ekonomisine katkısı daha çok tarım alanındadır. Bölümler arasında iklim ve yeryüzü şekillerinin farklı olmasına bağlı olarak yetiştirilen ürünler arasında da farklılık ve çeşit vardır (Anonim (b), 2015).

Tarım Ürünleri

Tütün: Türkiye tütün üretiminin % 50'sini bu bölge karşılar. Tüm kıyı ovalarında ekimi yapılan ve yurt dışına ihraç edilen tütün en çok Bakırçay Ovası'nda yetiştirilir.
Zeytin: Akdeniz ikliminin tanıtıcı kültür bitkisi olan zeytin en çok Ege Bölgesi'nde yetiştirilir. Türkiye üretiminin % 48'ini Ege Bölgesi sağlar. Edremit – Ayvalık Yöresi başta olmak üzere tüm kıyı kesiminde ve yer yer 100 km içerilere kadar zeytin yetiştirilir.

Üzüm: Türkiye'de üzüm üretiminin % 40'ını sağlayan bölge 1. sırada yer alır. Kurutularak ihraç edilen çekirdeksiz üzümün tamamını Ege Bölgesi üretir. Başta Gediz Ovası olmak üzere Büyük ve Küçük Menderes ovalarında yetiştirilir.
İncir: Kış ılıklığı isteyen ve Akdeniz iklimine uyumlu olan incirin %82'si bu bölgede yetiştirilir. Büyük Menderes, Küçük Menderes ve Gediz ovalarında incir üretimi yoğunlaşır. Kurutularak yurt dışına ihraç edilen incirin en çok yetiştirildiği yer ise Aydın'dır.
Pamuk: Akdeniz iklimine uyumlu olduğundan kıyı ovalarında ekimi yapılır. Büyük Menderes ve Gediz ovalarında üretimi yoğunlaşır. Türkiye üretiminin % 42'sini sağlayan Ege Bölgesi üretimde ilk sırayı alır.
Turunçgiller: Akdeniz iklimine uyumlu olan ve kış ılıklığı isteyen turunçgil üretimi, İzmir'in güneyindeki kıyı ovalarında yapılır. Türkiye üretiminin %10'unu sağlayan bölge, Akdeniz Bölgesi'nden sonra 2. sırayı alır.
Pirinç: Çöküntü ovalarında ekimi yoğunlaşır.
Sebze: Bölgenin sebze üretiminde önemli bir yeri vardır. Domates, biber, patlıcan, patates, salata, kereviz, pırasa, başlıcalarıdır.
Meyve: Bölge kendine özgü meyve üretimi ile diğer bölgelerden ayrılır. İncir, turunçgil ve üzümün yanı sıra elma ve kiraz üretimi de önem taşır. (Anonim (a), 2015).

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Ege, kıyı ve iç kesimler olarak farklılık gösteren bir mutfak kültürüne sahiptir. Kıyı kesimlerinde bulunan İzmir, Aydın, Muğla illerinde Akdeniz tipi beslenme kültürü görülürken iç kesimlere gidildikçe Afyonkarahisar, Kütahya, Manisa, Uşak ve Denizli illerinde bu beslenme tipinden uzaklaşıldığı görülmektedir.

Ege'nin yemek kültürünün temelini zeytinyağı oluşturmaktadır. Etli yemekler, sebzeler, pilavlar, dolmalar tamamen zeytinyağı ile pişirilmektedir. Mutfak kültürünün önemli bir öğesi sayılan yöreye özgü otlardır. Ebegümeci, sarmaşık, şevket-i bostan, gelincik, labada, tarla çakısı, tarla çivisi, su teresi, kuşotu, sinirotu, ısırgan, cibez, turp otu, kenger, hindiba, helvacık, radika, deniz börülcesi, kuşkonmaz, arapsaçı, marata bunların başlıcalarıdır. Ege kıyı mutfağının temsilcisi olan İzmir balık kültürü ile de bölge mutfağını zenginleştirmektedir. Kefal, barbunya, çipura, iskorpit, kalkan, lüfer, levrek gibi balıklar kıyı illerinde oldukça bol tüketilen ve mutfaklarda yer verilen türlerdir. Ayrıca ahtapot, midye, kalamar ve karides de bölge halkı tarafından sevilen deniz ürünleri arasında yer almaktadır. Midye tava ve midye dolma da önemli sokak lezzetleri arasında yer almaktadır. (Şengül, 2015).

4-İç Anadolu Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

İç Anadolu Bölgesi, Anadolu'nun orta kısmında yer alan Türkiye'nin yedi coğrafi bölgesinden biridir. Bu konumu sebebiyle bu bölgeye "Orta Anadolu" da denmektedir. İç Anadolu Bölgesi'nin yüz ölçümü 151.000 km² olup bu alan Türkiye topraklarının %21′ini kaplar. Doğu Anadolu'dan sonra ikinci büyük bölgemizdir. Güneydoğu Anadolu Bölgesi dışında diğer bölgelerin hepsiyle komşudur. Aynı zamanda Türkiye'de "tahıl ambarı" olarak da adlandırılmaktadır (Anonim (a), 2015).

Tarım Ürünleri

Tahıllar: En önemli buğday ve arpa üretim alanı Konya Ovası'dır. Burayı Ankara, Yozgat ve Kayseri takip eder.

Baklagiller: Nohut, fasulye, yeşil mercimek gibi baklagillerin üretimi önemlidir. Bu ürünler üretimde ilk sırayı alır. Konya ve Yozgat mercimek üretiminde birinci sırada gelir.

Patates: Üretiminde bölge ilk sırayı alır. Niğde ve Nevşehir'de üretilir. Buralardaki volkanik arazi patatesin büyümesi açısından çok elverişlidir.

Şekerpancarı: Sulama yapılan yerlerde özellikle Konya, Eskişehir ve Aksaray'daki tarım alanlarının büyük bölümü şekerpancarına ayrılmıştır.

Sebze: Sulamanın yaygın olmayışı sebze tarımını olumsuz etkilemiştir. Sulanabilen yerlerdeki sebze üretimi yetersiz kalmaktadır.

Meyve: Volkanik alanlarda bağcılık gelişmiştir. Kayısı gibi meyve üretimi yaygındır.

Haşhaş: Tohumundan yağ ve kozasından morfin yapımında kullanılan afyon sakızının elde edildiği bir bitkidir. Bu nedenle ekimi devlet kontrolünde yapılır. Türkiye üretiminin %90'ını Ege Bölgesi karşılar. Afyonkarahisar çevresinde ekimi yoğunlaşır.

Tahıllar: Bölgede üretilen tahıl ülke üretiminin % 10'a yakın bölümünü karşılar. Tahıllardan buğday ve arpa, Afyon, Kütahya, Denizli ve Uşak'ta üretilir.

Şekerpancarı: Önemli bir endüstri bitkisi olan şekerpancarı Afyon, Kütahya ve Denizli'de üretilir.

Ayçiçeği: Denizel etkilerin sokulmadığı İç Batı Anadolu'da sulanabilen alanlarda yetişir.

Baklagiller: Uşak, bölgede nohut üretiminin en fazla yapıldığı yerdir. (Anonim (a), 2015).

Bölgenin ülke genelinde tahıl ambarı olarak anılması yöre mutfak kültürünün de bu yönde gelişmesine etki etmiştir. Özellikle buğday ve darı üretimine müsait toprakları nedeniyle ortaya çıkan ürünlerin un yapımında kullanılması, bölgenin hamur işleri konusunda ön plana çıkmasına neden olmuştur. Orta Asya'dan gelen Türklerin

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yanlarında getirdikleri ve tamamen Türk ismi ile de özdeşleşen yoğurt, bulgur, pastırma ve tarhana gibi ürünler İç Anadolu mutfak kültürü için temel bileşenleri oluşturmaktadır.

Bölgenin önemli yöresel lezzetlerine sahip illerinden biri de Kayseri'dir. İlin ismi ile özdeşlemiş ürünler arasında pastırma, sucuk ve mantı başı çekmektedir. Otuza yakın çeşidi ile mantı, yöre mutfağı için özel bir yere sahiptir. (Şengül, 2015).

5-Doğu Anadolu Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Türkiye'nin doğusunu oluşturan bölge, doğudan batıya doğru daralarak adeta bir üçgeni andırır. Bölgenin kuzeybatısında, Gürcistan ve Ermenistan, doğusunda Nahcivan ve İran, güneyinde Güneydoğu Anadolu Bölgesi, Kuzeyinde Karadeniz Bölgesi yer alır. Bölge batıda, Tahtalı Dağları'ndan başlayıp, kuzeyde Kızıldağ'a ulaşan bir sınır ile iç Anadolu Bölgesi'nden ayrılır. Doğu Anadolu Bölgesi, 2000 – 2200 m. ortalama yükseltisi ile en yüksek olan bölgemizdir. Bölgenin yeryüzü şekillerini sıradağlar, geniş plâtolar ve plâtolar arasındaki ovalar oluşturur. Bölgenin iklimine yükselti ve karasallık hakimdir. Sert karasal iklim yaşanır. Kışları uzun, soğuk ve kar yağışlıdır. Don olayı çok görülür. Yazları sıcak, kurak ve kısadır. En fazla yağış ilkbaharda görülür. Bölgenin yüksek ve engebeli olması nedeniyle tarım alanları oldukça azdır. Bunlar daha çok tektonik kökenli oluklar ve platolarda yer alır. Hayvancılık tarıma göre daha çok önemlidir. Nedeni iklim koşullarının olumsuzluğu ve tarım alanlarının azlığıdır (Anonim (b), 2015).

Tarım Ürünleri

Pamuk: Iğdır ve Malatya ovalarında yetiştirilir.

Tütün: Muş, Bitlis ve Malatya'da ekimi yapılır.

Tahıllar: Buğday Malatya, Elazığ, Erzurum-Pasinler ve Horasan ovalarında yetiştirilir. Buğdaya göre daha az sıcaklık isteyen arpa ise Kuzeydoğu Anadolu platolarında yetiştirilir.

Şekerpancarı: Sulanabilen tarım alanlarında yetiştirilir.

Sebze: Lahana ve patates Erzurum-Pasinler ve Horasan ovalarında yetiştirilir.

Meyve: Kayısı yoğun olarak Malatya'da sulanabilen alanlarda, özellikle Fırat ve Tohma kıyılarında yetiştirilir. Ayrıca Malatya, Elazığ ve Erzincan'da dut üretimi yapılır. Akarsu boylarında elma bahçeleri bulunur. (Anonim (a), 2015).

Doğu Anadolu mutfak kültürü kırmızı et, buğday unu, peynir, tereyağı, bölgeye has şifalı olduğuna da inanılan sebzeler ve otlar (ciriş, ısırgan, ispidek, kızamık, parpar vb.), kayısı, üzüm gibi meyveler ile öne çıkmaktadır. Çok uzun süren kışlar ve soğuk, bölge mutfağında kış hazırlıklarına önem verilmesine neden olmuştur (Şengül, 2015).

Hayvancılık ürünleri konusunda öne çıkan bölge mutfağında birçok yoğurtlu lezzet çeşidine rastlanmaktadır. Ayran çorbası, keledoş, yoğurtlu bulgur köftesi gibi dağlardan toplanan değişik kokulu otlar ile tatlandırılan bu yoğurtlu yiyeceklerle bölgenin birçok şehrinde karşılaşılmaktadır. Başka bir hayvansal ürün olan peynir çeşitlerinden Van'da baharın başında dağlardan toplanan sirmo ve mendü adlı otlarla hazırlanan Van otlu peyniri ve Erzincan yöresine has tulum peyniri (Halıcı, 2009) ülke çapında tanınan ve oldukça fazla tüketilen ürünler olarak karşımıza çıkmaktadır. Özel günlerde ise bölgede etli kuru baklagiller, yahniler, yoğurtlu çorbalar, kete, pişi ve kadayıf yapılmaktadır.

Bölgenin kendine özgü sert toprağı ve yaşam tarzı peynirlerin büyüklüklerini, biçimlerini, renklerini ve dokularını etkilemektedir. Doğu Anadolu peynir çeşitlerinden bahsederken Kars kaşar peyniri, Kars'ta yapılan karın kaymağı peyniri ve Kars gravyeri ilk akla gelen peynir çeşitleridir. Bunun dışında, Muş'ta yapılan Varto keçi peyniri, Ardahan'da üretilen İkizdere keçi peyniri ve küflü peynir, Bingöl'de yapılan salamura peynir, Bitlis küp peyniri, Doğu Anadolu Bölgesi'nin Van'ın ismi ile özdeşleşmiş ama birçok şehrinde yapılan otlu peyniri, Erzurum civil peyniri ve Erzincan tulum peynirinden de bahsetmek gerekmektedir (Şengül, 2015).

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6-Akdeniz Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Bölge yurdumuzun güneyinde, Akdeniz boyunca bir şerit halinde uzanır. Komşuları Ege, İç Anadolu, Doğu Anadolu ve Güney Doğu Anadolu Bölgeleri, Suriye, Kıbrıs Adası ve Akdeniz ile komşudur. Bölge yurdumuzun güneyinde, Akdeniz boyunca bir şerit halinde uzanır. Bölgenin Akdeniz yamaçlarında Akdeniz İklimi ve Maki Bitki Topluluğu görülür. Yazları sıcak ve kurak, kışları ılık ve yağışlıdır. Dağların kuzey yamaçlarında ve göller yöresindeyse iklim karasallaşır. Bitki örtüsü de bozkırdır. Bu alanlarda yazları sıcak ve kurak, kışları soğuk ve kar yağışlıdır. Yer yer ormanlara da rastlanır (Anonim (b), 2015).

Tarım Ürünleri

Buğday: Bölgenin hemen her tarafında yetiştirilir. Çukurova'da pamuk ekilmeyen alanlarda da ekilir.

Pirinç: Hatay'da Amik Ovası'nda, K. Maraş çevresinde ve Silifke civarında yetiştirilir.

Pamuk: Başta Çukurova olmak üzere diğer kıyı ovalarında yetiştirilir. Türkiye pamuk üretiminin yaklaşık %33'ü bölgeden karşılanır. Tütün: Göller Yöresi'nde ve Hatay çevresinde yetiştirilir. Gül: Özellikle Isparta ve Burdur çevresinde tarımı yapılır.

Turunçgiller: Kıyı boyunca Finike, Antalya, Alanya, Anamur, Silifke, Mersin ve Dörtyol'da yetiştirilir. Türkiye turunçgil üretiminin yaklaşık %89'u bölgeden karşılanır.

Muz: Alanya ve Anamur çevresinde yetiştirilir. Türkiye'de yetiştirilen muzun tamamı bölgeden karşılanır. **Haşhaş ve şekerpancarı:** Özellikle Göller Yöresi'nin ürünleridir.

Zeytin ve üzüm: Kıyı şeridinde hemen her yerde yetiştirilir. Ancak bölge halkı daha kârlı olan pamuk üretimine önem verdiği için zeytincilik ve bağcılık fazla gelişememiştir (Anonim (a), 2015).

Akdeniz beslenme alışkanlıkları incelendiğinde geleneksel olarak tahıl, zeytinyağı, sebze ve meyve, su ürünleri, süt türevleri, baharat ve üzüm suyuna dayandığı görülebilmektedir. Akdeniz beslenme kültüründe önemli yer tutan zeytin, zeytinyağı ve buğdayın tarihin ilk dönemlerinden itibaren bölgede yetiştiği ve kullanıldığı bilinmektedir. Soğan, sarımsak, pırasa bölgenin en önemli besin maddeleri arasında yerini korurken anavatanın Akdeniz olduğu belirtilen beyaz ve kırmızı pancar, pazı ve bamya bölgeye dışarıdan getirilen patlıcan ve salatalık ile en çok tüketilen sebzeler arasında yer almaktadır. Bölge mutfağında balık kültürünün günümüzde tatil ile özdeşleşen Antalya ve çevresinde daha yaygın olduğu ve mutfak kültürü bakımından doğu bölgelerine yakın olan illerde ise balıktan kırmızı ete doğru bir geçiş olduğu görülmektedir. Bölgede yinede Türk mutfak kültüründe önemli yere sahip et yemekleri de tüketilmektedir. Bulgur, pirinç, tahıllar ve sebzelerle birlikte tüketilen et yemeklerine; içli köfte, elbasan tava, patlıcan kebabı, simit kebabı örnek olarak gösterilebilmektedir.

Akdeniz'in elverişli iklimi sayesinde bölgede oldukça verimli ve lezzetli ürünlerin yetişmesi bölgenin ülke çapında turunçgiller konusunda öne çıkmasını ve turunçgillerle anılmasına neden olmuştur. Çukurova bölgesi ve Antalya yöresi ülkenin en fazla turunçgil üretimi yapılan bölgeleri olma özelliğine sahiptir. Portakal, mandalina, limon ve greyfurt ülke pazarlarına bu bölgelerden getirilerek dağıtılmaktadır (Şengül, 2015).

7-Güneydoğu Anadolu Bölgesindeki Coğrafi Özelliklerin Mutfağa Etkisi

Bölge, ülkemiz topraklarının %8'lik bölümüne sahip olup yüzölçümü bakımından en küçük bölgesidir. Kuzeyinde bir yay biçiminde uzanan Güneydoğu Toroslardan, güneyde Suriye ve Irak sınırına kadar uzanır. Bölge ova ve platolarla kaplıdır. Türkiye'de yaz sıcaklığının ve buharlaşmanın en fazla olduğu bölgedir. Bölgenin ortalama yükseltisi 800-1000 m civarındadır. Bölgede, yazları kurak ve sıcak, kışları ılık ve yağışlı olan tipik Akdeniz ikliminin bozulmuş şekli görülür. Tarım ürünlerinden en çok buğday ekilir. Tarıma uygun olmayan yerler hayvancılıkla geçinir. Genellikle koyun ve keçi beslenir (Anonim (b), 2015).

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Tarım Ürünleri

Buğday: Bölgedeki tarım alanlarının yarısından fazlasında buğday ekilir. En fazla ekim alanına sahip Şanlıurfa'yı Diyarbakır izler.

Arpa: Bölgede yetiştirilen diğer önemli tahıl olan arpa, en fazla Şanlıurfa, Siirt ve Adıyaman'da yetiştirilir.

Pamuk: Bölgede en fazla ekilen endüstri bitkileri arasında yer alan pamuk, halen sulanmakta olan Akçakale ve Gaziantep'te yetiştirilir.

Kırmızı Mercimek: Kuraklığa dayanıklı bir baklagildir. Türkiye üretiminin tamamına yakınını bu bölge sağlar. En çok Şanlıurfa ve Gaziantep'te yetiştirilir.

Susam: Az bir alanda ekimi yapılmaktadır. Ancak üretimi bölge için önem taşır. **Çeltik**: Siverek'te yetiştirilmektedir.

Antep Fıstığı: Bölgenin karakteristik ürünüdür. Üretimin % 90'ı bu bölgede gerçekleşir. **Üzüm**: Özellikle Gaziantep çevresinde bağcılık gelişmiştir. Üretilen üzüm yaş olarak tüketilmesinin yanı sıra pekmez, pestil ya da içki yapımında kullanılır.

Zeytin: Akdeniz ikliminin etkileri görülen Gaziantep yöresinde Kilis ve Islahiye çevresinde yetiştirilir. **Tütün**: Sulama ile birlikte ekim alanları genişlemektedir. Üretimde Adıyaman ve Batman önde gelir. **Sebze**: Sulanabilen alanlarda domates, biber, patlıcan gibi çeşitli sebzeler yetiştirilmektedir. **Meyve**: Bölgenin karpuz üretiminde ayrı bir yeri vardır. Özellikle Diyarbakır çevresinde ağırlığı 20 kg'ı aşan karpuz yetiştirilmektedir (Anonim (a), 2015).

Dünyanın en eski yerleşim merkezlerinden olan bölge buğday, baharat ve özellikle kuzu etinden yapılan yemekleri ile öne çıkmaktadır. Bölgenin en önemli lezzetlerini kebap türleri oluşturmaktadır. Bunun yanı sıra lahmacun da bölge yemek kültüründen büyük şehirlere taşınmış ve oldukça fazla tüketilen bir lezzettir. Baklava, kebap, lahmacun gibi tescillenmiş 391 çeşit yöresel yemeği ile dünyada yöresel mutfakları ile öne çıkmış şehirlerarasında da önemli bir yeri olan Gaziantep ülkemizin yemek merkezleri arasında yer almaktadır. (Şengül, 2015).

Türkiye'nin her yerine yayılan Güney Doğu Anadolu kebapları etlerin, baharatların ve acılı-ekşili karışımların terbiye edilmesi ve kömür ateşinde pişirilmesi ile yapılmaktadır. Yöre mutfağında kebaplar, yahni ve dolmalar meyveli ve sebzeli olarak da pişirilmektedir (Şengül, 2015). Bölgede ünlü olan ve ülke çapında sevilen belli başlı kebap türleri şunlardır: Kemeli tike kebabı, yenidünya kebabı, patlıcan kebabı, yoğurtlu kebap, büryan, haşhaş kebabı, soğanlı kebap, domatesli kebap, alinazik (Güneydoğu Anadolu Rehberi, 2007).

Sonuç ve Öneriler

Coğrafya insanların kişiliklerine, dünyayı algılamalarına etki edebilecek güce sahiptir. İnsanlar yetiştikleri bölgelerin şartlarına uygun yaşam sürdürürler ve doğayla bir etkileşim halinde olurlar. İnsanın yaşamsal faaliyetlerini sürdürebilmesi için temel ihtiyaçları içerisinde olan yemek konusunda da doğa ile uyumlu hareket etmesi gerekmektedir. Bu uyumu turizm alanıyla bağdaştırmak için yapılan bu derleme sonrası turizm faaliyetleri içerisinde gastronomi turizminin Türkiye'de önemli bir değere ve potansiyele sahip olduğu görülmüştür. Üretilen gıda ürünlerinin kalitesi ve çeşitliliği bakımından zengin olan ülkemizdeki bu çeşitlilik, coğrafi farklılıklarla doğrudan etkilidir. Örneğin, İç Anadolu'da yoğun tahıl ve bakliyat yetiştirilmesi iklim ve yağış miktarına bağlı olarak oluşan bir olaydır. Buna bağlı olarak tahıl ağırlıklı yiyecek maddelerinin üretimi de bu ürün yelpazesinin bir sonucudur.

Bu örnekte de görüldüğü gibi Türkiye'de her yörede yetişen ürün, bulunduğu bölgenin yemek çeşitliliğine katkı sağlamaktadır. Turizm odaklı kalkınma hedefinde olan ülkemizin bu çeşitliliğe bağlı yemek haritası oluşturması bu potansiyelden faydalanmada fayda sağlayabilir. Ülke tanıtımlarında bu bölgesel çeşitliliği göz önünde bulunduran Türkiye'nin bir adım öne geçeceği öngörülmektedir. Yerel mutfak kültürünün ve buna bağlı olarak gastronomi turizminin canlandırılması ve iyileştirilmesi bölge kalkınması için önem taşımaktadır. Kaybolmaya başlayan yiyeceklerin üretiminin gerçekleştirilmesi yöre halkı için gelir fırsatı haline getirilebilir, yörenin yerel kimliğine büyük katkı sağlanabilir. Yerel kalkınmada da bu öngörüyle hareket eden yöreler, gastronomi turizminde önemli bir ilerleme sağlayabilir.

Kaynakça

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TÜRKİYE'NİN ENDÜSTRİ 4.0 HAZIRLIK STRATEJİSİNİN ÖNCELİKLERİ

Strategical Priorities of Turkey's Industry 4.0 Readiness

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Bilim ve Teknolojideki son gelişmelerden yola çıkarak, Türkiye'nin Endüstri 4.0'a hazırlık stratejisi için önceliklerin neler olması gerektiği üzerinde durulmaktadır. Sürdürülebilir bir endüstri ve toplumsal gelişme stratejisinin farklı boyutlarını uyumlu bir sentez içinde bütünleştirilmesi zorunlu olmaktadır. Özellikle robotik, yapay zeka ve bilgi toplumunun ağ örgütlenme kalıpları ve bilgi çağının yeni gelişme aşamasındaki süreçlerden hareketle, Endüstri 4.0 uygulamasının stratejik öncelikleri tartışma konusu olmaktadır. Endüstri 4.0 yapılanması içinde yeni toplumsal platformların uyumlu gelişme ihtiyacı özellikle vurgulanmaktadır.

Değinilen stratejik önceliklerden hareketle, temel unsurların Türkiye'de yeterlilik düzeyleri üzerinde durularak Türkiye'nin Endüstri 4.0'a uyum sağlayabilmesi için izlemesi gerekli politikalara dikkat çekilmektedir. Bu bağlamda ulusal, bölgesel, sektörel ve firma düzeylerinde yaşanması gerekli uyum ve yapısal politikalara vurgu yapılmaktadır. Kısaca Türkiye'nin bilgi çağındaki yeni ve sürdürülebilir gelişme stratejisinin öncelikleri analiz ve değerlendirme konusu olmaktadır.

Anahtar kelimeler: Bilgi Toplumu, Ağ Ekonomisi, Vizyon Temelli Strateji, Endüstri 4.0.

Keywords: Networked Economy, Vision Based Strategy, Industry 4.0.

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TYPES OF *DA`WAH* COMMUNICATION USED BY *DA`WAH* WORKERS IN CONVEYING THE MESSAGE OF ISLAM TO THE ABORIGINALS

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Abstract:*Da`wah* communication is the process of conveying information about Islam by a muslim communicator to the recipient in order to achieve a certain objective that is in line with what is outlined in al-Quran and al-Sunnah. In the effort to develop an effective *da`wah* communication, mastering the types of dakwah communication is imperative in ensuring the continuation of its messages. This is an addition to other factors that help contribute
to the success of *da`wah* such as the aspects of preparation, expertise, skills and the mastery of the *da`wah* workers when they engage with the target group. Therefore, this study aims to identify the types of *da`wah* communication used by the *da`wah* workers in order to convey the *da`wah* messages to the target group which is the aboriginal (Orang Asli) community. This qualitative study utilizes the case study design. Eight *da`wah* workers from Penggerak Masyarakat Orang Asli (PMOA) and Panel Dakwah Muallaf (PDM) in Selangor and a research informant are chosen for interviews. The data are organised and coded based on the themes and categories obtained from the complete transcription. Then, the data are analyzed descriptively. The findings show that there are three initial processes used by *da`wah* workers in developing the types of *da`wah* communication. It involves the initiatiation stage, planning as well as the preparation to begin a conversation on a certain topic when communicating with the Orang Asli. In order to ensure effective communication, the *da`wah* worker is not only applying verbal communication, but also non-verbal communication in order to open the channel of communication for da`wah. All the three stages influence the efficacy of the *da`wah* messages presented and give a positive impact towards the Orang Asli community. The implication of this study is on the stakeholders i.e. the organizations that have close relations to the Orang Asli like Jabatan Kemajuan Islam Malaysia (JAKIM), states' religious councils like Majlis Agama Islam Selangor (MAIS) and non-government organizations (NGOs) within the scope of improving the the quality of *da`wah* and indirectly improving the quality of the use of language among *da`wah* workers in communicating the message of *da`wah* to the Orang Asli community.

Key words: *Da`wah*, coomunication, Islam, Aboriginals, Orang Asli

Introduction

In Islam, the term used to introduce and spread the divine message to others is called *da`wah*. The person who undertakes the work of *da`wah* is called as *da`i*. However in this article the term used for *da`i* or caller of Islamic message is *da`wah* workers. According to Sohirin (2008), the work of *da`wah* is focused on calling others into the religion, worship, and offering love to God. Beside that, *da`wah* work is an effort that requires the strife of energy, intellect and material in order to achieve a particular objective. It calls for determination on the part of *da`wah* workers to engage the target audience using a particular method or approach. However *da`wah* work is not an easy job as approved by Syed Abdurrahman (2008) because it deals with the matter of altering the belief and understanding of a human being. Thus this agrees with the meaning of *da`wah* as proposed by al-Bahi al-Khawli (1979) that the *da`wah* movement attempts to lift a person out from an environment and put him into another. This is in line with the view presented by Mohd. Amin Abdul Rahim (2010) who states that *da`wah* work requires for *da`wah* workers who are committed to carry out the effort full time and it is not an easy task. The explanation for this is that the *da`wah* workers must engage with the target group from all kinds of backgrounds i.e. different beliefs, customs and levels of education and thinking. All these according to `Abd Allah Nasih `Ulwan (1985), need for a *da`wah* worker

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who is wholly prepared in terms of knowledge, physical and spiritual. Besides that, the main challenge to an effective *da`wah* work comes from the *da`wah* workers themselves whereby the way they present themselves and the approach that they apply to interact with the target group play a crucial role. Therefore, according to Mohamad Natsir (1978), the best approach is the approach inspired from the Quranic verse (surah al-Nahl 125) that focuses on the approach of *al-hikmah*, *al-maw`izah al-hasanah* and *al-mujadalah bi al-husna*.

Mohd. Amin Abdul Rahim (2010) states that there are six factors that contribute to the acceptance of the target group towards the *da`wah* messages. These factors are the management and administration of *da`wah*, attitude of the recipient of *da`wah*, the conscience of the *da`wah* worker that is not easily influenced, imbalanced emotional state and wrong delivery technique. There are two causes why the target group resists the *da`wah* brought to them and these include the target group's background and their attitude towards the *da`wah*. In the context of the recipient's attitude, a few reasons contribute to the recipient's refusal to accept the *da`wah* and these reasons being the incongruity between the message and the values, the attitude and belief of the recipients as well as apathy and scepticism towards the message brought by the *da`wah* workers. This is because they assume that the messages brought to them do not have anything to do with their needs and interests. Among the consequences of this is that they either take a neutral stand or totally reject the messages if there arises any doubt. Meanwhile, the image presented by the *da`wah* workers will have a bearing on whether the *da`wah* is accepted or rejected. This involves the credibility and expertise of the *da`wah* workers and their competency in delivering the message, their commitments towards the message and the recipients, the sincerity and honesty of the *da`wah* workers in carrying out their duties and also their dynamism and agility when they are on the ground engaging their target audience.

In the context of *da`wah* to Orang Asli, according to Syed Abdurahman (2008) there are three main obstacles that become the cause as to why *da`wah* reaches orang Asli in a sluggish manner. Firstly, the *da`wah* workers themselves are the obstacle, then the obstacle from the target group and finally the obstacle from external entities. From the side of the *da`wah* workers, there is a shortage of capable, talented, skilful and competent *da`wah* workers to carry out the *da`wah* work. This is confirmed by Ramlee (2015) who states that a major part of the problem faced by the *da`wah* workers is related to their skills in conveying the message of *da`wah*. Meanwhile Hood Salleh (1991) adds other problems faced by the *da`wah* workers are they do not equip themselves with the basic information about their career, they lack in motivation in getting acquainted wdith their audience which leads to their lack in eagerness to carry out the *da`wah* work, in addition to that the effort of the missionary workers that does not receive support from the local community especially the Malay community who majority of them do things which are deemed anti-social by the target group (Orang Asli) and finally the missionary workers are ill prepared in terms of character management where they are seen as being arrogant.

Research Methodology

This qualitative study utilizes the case study design. Data collection for this study involves eight research participants and also an informant while semi-structured interview method is used as the research instrument. The research subjects are the *da`wah* workers who are directly involved in the *da`wah* to the Orang Asli community in Selangor, Malaysia from two entities that call themselves Penggerak Masyarakat Orang Asli (PMOA) and Panel Dakwah Muallaf (PDM). In this particular writing, the term used that indicates *da`wah workers* as PK or *Peserta Kajian* (in English we called them as subject matter). Purposive sampling is used in the process of research sample selection. The pilot study is conducted in order to increase the level of reliability of the

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interview questions constructed. Based on Cohen Kappa's estimation it indicates that the level of reliability achieved should be 1.0, that is, it is in the highest wrung of the indicator. The data analysis process is done by organizing the findings according to themes and sections which have been constructed for every question that answers the research objectives.

Types of Communication in *Da`wah*

The process of *da`wah* takes place when the *da`wah* workers communicate with the *da`wah* target group in order to convey the message of *da`wah* (Toto Tasmara, 1997). Thus, *da`wah* workers must use the type of communication that is suitable for a communicator in order to influence and steer the accetance of the message by the the recipient based on what is stipulated in the Islamic rules and regulations. When the *da`wah* workers choose the suitable type of communication that suits the recipients' state, it is a way to ease the process of providing understanding about the message that is to be conveyed (Asep Syamsul 2013). Type of communication used is not restricted to verbal communication only, but also non-verbal. Added to this is usage of the written form and the situational language that can ensure that the *da`wah* message conveyed can be well accepted and understood by the recipients (Zulkefli & S. Salahudin 2016).

As an example, in the context of verbal communication the communication process happens when the *da`wah* workers use a specific language medium to convey the message of *da`wah* to the recipient through verbal medium like public speaking, sermon, dialogue and discussion. This agrees with what is stated in al-Quran (Verse Ibrahim: 4) where Allah says "We sent not a Messenger except (to teach) in the language of his (own) people, in order to make (things) clear to them. Now Allah leaves straying those whom He pleases and guides whom He pleases: and He is Exalted in Power, Full of Wisdom." According to al-Qaradawi (2011) this Quranic verse does not only mention the type and medium of language of the communicator like English and German. It also gives the focus on the function and role of language in verbal communication. As an example, when a person communicates with the public he/ she tends to use the colloquial language in order to suit the public's level of thinking. In relation to that, in order to create the verbal communication guideline, Zulkefli and S.Salahudin (2016) propose that the following ethics that should be taken as a procedure in verbal communications like: the topic of conversation between the communicator and the recipient should be about something that is good and beneficial, the communicator avoids saying things that are not beneficial, he/ she is truthful in his/ her words, he/ she does not expose other people's weaknesses, he/ she does not say bad things and look down on others and finally he/ she observes the ethics when differing in views with others.

Meanwhile situational communication refers to the *da`wah* workers' effort to communicate with the recipients using an approach that is oriented towards expanding and developing the community within a specific sector like economy and education (Zulkefli & S.Salahudin 2016). Through this type of communication, the *da`wah* message is conveyed in a "silent" manner by way of doing good deeds in the form of community activities and also development until they are capable of influencing the target group and it is more effective compared to the message that is conveyed verbally for example through talks and speeches (Kustadi 2013). *Da`wah* workers act as the agent of change for the community in order to help them increase their quality of life in certain fields like in economy. According to Mohd. Yusof Hussain (2009) among the roles and functions of the *da`wah* workers are helping the community to identify their needs deemed suitable, to get the support from the leader and members of community in carrying out the community development project, to help the community carry out the project,

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to provide the necessary expertise to the members of the community, to provide them with the motivation, to become their source of reference to ensure that the project is properly done and to help in making the evaluation of the project planned or the project that is being carried out.

Findings and Discussion

The findings of the study show that when communicating with the Orang Asli Community, the *da`wah* workers from PMOA and PDM mainly use verbal communication that is made up of three levels in their effort to build the rapport with the Orang Asli for *da`wah* purposes. The levels mentioned are referring to the initial process to build the rapport, strategy, topics of conversation that will lead up to the *da`wah* communication with the Orang Asli being formed.

1. The Initial Process in Developing the Communication Form for *Da`wah*

The research finding shows that PK 1 until PK 8 are in agreement that Bahasa Melayu (i.e an official languange used by Malaysian) is the medium of communication used when communicating with Orang Asli. For them, it is the initial step in order to begin the process of communication with Orang Asli. Based on the interview it is found out that the *da`wah* workers use verbal communication in order to establish the line of communication between the them and the Orang Asli. This is the form of verbal communication used by God's Messenger when he was conveying the message of truth to his people as narrated in Al-Quran (Verse Ibrahim: 4).

Jumiya's (2014) study however discovers that the mastery of Bahasa Melayu among Orang Asli is very low and they have difficulties to understand it. Meanwhile, a research finding proves that the Orang Asli community in Selangor are able to communicate and understand Bahasa Melayu in in their daily life. Moreover, a study by Rohani & Noor Hasnur (2014) finds out that Bahasa Melayu and Melayu-Proto (language used by one of Orang Asli group) have similarity in dialect. This is because it is made up of cognate features and phonological system in the language used. This means that the terms used give the same meaning and are easily understood. More clearly, the statement by Muhammad Busu (2016) who says that the usage of terms in the language of, especially, the Orang Asli Temuan community is very similar to the usage in Bahasa Melayu used for the purpose of communication.

Besides using Bahasa Melayu as a medium of interaction, PK 6 also opines that as a person who does *da`wah* work, the "friendly face" skill must be possessed by the *da`wah* worker in order to ease the process of communicating with the Orang Asli. He explains that the "friendly face" skill can be explaines as for instance always giving away a smile, greeting another Muslim with "Assalamualaikum" or greeting with "selamat sejahtera" and "good morning" for the non-Muslims. This effort is an early sign of building a cordial relationship with the Orang Asli community.

The research finding shows that effort shown by the *da`wah* worker is in line with Mc Auley's (1988) statement that facial expression, eyes and body movement can have a big influence in communication. This suggests that the missionary workers must also apply the non-verbal communication process in their effort to build the rapport with the Orang Asli. This is in line with Marlyna Maros & Mohd. Baharim's (2011) research finding that greeting is an early move to develop a communication between two parties. It is also found out from the study that there are two aspects of greeting i.e. verbal greeting and non-verbal greeting. Verbal

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greeting involves communication such as saying hello and non-verbal greeting involves communication with body language like smiling.

Besides the usage of Bahasa Melayu and the "friendly face" skill, the study also shows that there is a similarity in the views of PK 3, PK 5, and PK 8 that is the *da`wah* workers must learn about the background and lifestyle of Orang Asli. This approach is important in order to create a harmonious and friendly surrounding between them and the Orang Asli community. The finding also indicates that there should be effort on the part of the *da`wah* workers to learn about the life of the Orang Asli like the work they do and their daily activities. This shows that they are genuinely interested to get acquianted with the Orang Asli. In fact, the interview with the informant shows that the *da`wah* workers should not create a gap between themselves and the Orang Asli because it is feared it can lead to a negative impact on the *da`wah* process. The following is what the informant says about this:

> "First, first impression means we must have adequate preparation. The preparation when entering the Orang Asli village has to be in terms of mental, emotion and knowledge. Knowledge is the most important... When we communicate with the Orang Asli, it has to be that we already have information and knowledge about them… when we form a gap from the very beginning, we have already failed".

(Informant 1: 2-26)
This includes the aspects of lifestyle, food, occupation, customs and culture of the community. The knowledge about the Orang Asli's background is important in order to help the *da`wah* workers to easily understand the Orang Asli's life in more detail. As an example, Ramlee Abdullah et al.'s (2014) study proves that the jungle is considered like a 'bank' for the Orang Asli where in it is kept the livelihood of the Orang Asli community. In line with this Haliza (2010) also finds that the Orang Asli community observe the ethics when they deal with the mother nature. In the study it is proven that their belief, practice and way of life encourage them to take care of the forest and the environment. Siti Aminah's (2015) study also finds that Orang Asli have a strong belief that the forest is the main source of livelihood and it will continue to provide sustenance to the Orang Asli from generation to generation. Looking at the function of the forest, it is transpired in the life of Orang Asli. Therefore, missionary workers must understand this phenomenon and understand also the reason why they are overwhelmingly reliant on the forest.

In the communication process, Zulkefli & S. Salahuddin (2016) explain that this is the first thing to consider before planning to do *da`wah* work. In other words the *da`wah* workers have done prior research and obtain the information about the life and lifestyle of the Orang Asli community before they embark on the *da`wah*. This is in line with the statement by Muhammad Sholikhin (2013) who says that in the context of *da`wah*, the *da`wah* workers must take into consideration the aspect of the community that is muti-ethnic in nature in order to ensure that the communication process is effective. Zulkefli et al. (2014) states that this method is an inter-cultural *da`wah* communication process i.e. the effort of the *da`wah* workers to understand the culture of their *mad$^{e}$u* (i.e those who become a target group as well as a receiver of the messege of *da`wah* from *da`wah* worker).

The conclusion is that at the initial stage to form *da`wah* communication it involves the communication methods (used by the *da`wah* workers) which are verbal and non-verbal. The verbal communication of the *da`wah* workers can be seen when they greet the Orang Asli with "salam", the wish of "selamat sejahtera" or "greetings to all", and when they are shaking hands with them. Meanwhile the non-verbal communication is referring to the facial expressions of the *da`wah* workers that is they smile when they are meeting the Orang Asli. In line with Zawiyah's (2009) statement that says facial expressions are a person's non-verbal language that can give out all sorts of meaning in its delivery. Therefore, the *da`wah* workers' effort to learn the socio-cultural aspect and the lifestyle of the Orang Asli community is imortant because the language that is used in the process of communication is capable of influencing the feelings of the the Orang Asli community.

2. The Strategy in Initiating the Communication Form for *Da`wah*

Fariza et al. (2000) explains that the preparation involes the process of identifying the goals, the target group, challenges to be encountered and strategies used by the *da`wah* workers in achieving the *da`wah* mission. In their effort to form *da`wah* communication, Ab. Aziz (2001)

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explains that *da`wah* delivery covers two components. The components are the methodology and the strategy that suits the target group. It is explained further that the *da`wah* workers must know what the content of the *da`wah* is so that it can suit the method of delivering the *da`wah* message. Similarly, Amien Wibowo (2015) too explains that the planning is also part of the strategy of *da`wah* communication in order to achieve the objective of spreading the message of Islam.

The finding from the study also reveals that PK 1 also makes a strategy by introducing the concept of 'Mentor Mentee' to the Orang Asli community. PK 1 expalins that a *da`wah* worker must consider himself/ herself as a 'Mentor' when conveying the *da`wah*. However, the 'Mentor' that is meant here does not have the complete authority to control the Orang Asli community. On the flip side, they workers must always be prepared and be cautious with every action that they take.

Meanwhile for PK 4 the strategy used is by getting acquainted with the people who have strong influence in the Orang Asli community for example the Tok Batin, village head and the Village Security and Development Committee (the term used among Malaysian is *Jawatankuasa Kemajuan Keselamatan Kampung* or JKKK). He explains that if the *da`wah* workers have a good relationship with this group of people, their presence in the village is more welcomed by the people there. Furthermore, the local inhabitants are more willing to accept what is said by the *da`wah* worker when they see that the Tok Batin or Orang Asli village headmen, and JKKK welcome the presence of the *da`wah* worker. This kind of effort eases the work of the *da`wah* worker in building the communication and relationship with the locals. Ma'rof & Sarjit (2008) explain that the village head of Orang Asli is appointed through two ways i.e. inheritance and appointment. The selection is done depending on the credibility of the individual in the Orang Asli community. Thus, the strategy of approaching the influential people in the community is necessary because in the study (Johari & Nazri 2006; Colin et al. 2010) it is found that the Orang Asli practice the obedience system in their daily life. This kind of lifestyle has become the practice from generation to generation and it is their ancestral tradition. Therefore, this situation makes the position of the Tok Batin one who is respected and constantly becomes the source of reference of the local people.

Besides that, the research finding also shows that the *da`wah* workers strategize in terms of lexical choice and the content of coversation when communicating with the Orang Asli community.This is agreed by PK 1 , PK 2, PK 3, PK 6 and PK 8 who also add that besides being cautious with the lexical choice and the content of coversation, ethics and manners of the *da`wah* worker are also important in influencing and inviting Orang Asli to get closer to Islam. The research finding explains that the wearing of *jubah* (robe) is not suitable when entering the Orang Asli village. This is because it can make the Orang Asli feel uncomfortable. This is in line with Juli Edo's (1988) study that indicates that the influence and believe towards the supernatural power shapes the social life of the Orang Asli and this covers values, attitudes and personality, taboos and customs. In addition to that Mohammad Aslam et al.'s (2004) study shows that the strong belief moulds the community's culture. The factor of holding on to the customs and culture exposes the character and social life of the Orang Asli who are always careful in life. Therefore, it is not strange to see that the Orang Asli community are concerned about ethics to ensure that they will not do anything that is against their customs and culture that is integral in their life.

In addition to that, the research finding also indicates that PK 5 and PK 7 make a preparation by attending related courses to learn the languages of the Orang Asli. Even though the Orang Asli community in Selangor are able to understand and to speak in Bahasa Melayu, the *da`wah* workers' capability to master the language of the orang Asli gives them a positive

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image among the Orang Asli. The study by Sa'adiah (2014) finds that the Che Wong tribe that is made up of groups of Orang Asli from the Senoi community use their own language more when they are communicating among themselves as compared to using Bahasa Melayu. The same thing is also found in Zuriatunfadzlia et al.'s (2009) study shows that the Bateq tribe are still not affected by changes especially in terms of language even though they are experiencing cultural changes due to the emergence of eco-tourism. The research finding shows that the preservation of the usage of the Orang Asli language is through the communication link with family members, neighbours and the people in the community. This indicates that they are preserving their language identity even though their population is small and they are only a minoriy people. The need for a *da`wah* worker to learn the Orang Asli languages, even only minimally, is necessary because with the language it gives an advantage to the dakwah workers when they want to engage the Orang Asli (Halim & Zulkefli, 2014).

From the aspect of planning to build a communication connection with the Orang Asli, the research finding shows the various efforts done by the *da`wah* workers to get closer to the Orang Asli community. The efforts are through the practice of mentor-mentee concept in learning, the effort to approach the influential individuals in the Orang Asli community, the strategy of choosing the words to be used in the content of coversation, the observance of ethics and appropriate manners as a *da`wah* worker and finally attending related courses to learn the language of the Orang Asli. In the context of *da`wah*, Bassamul ᶜUmush (2005) says that it is a process (التعريف قبل التأثير في) or wining the heart of *mad`u* first before explaining the Islamic terminologies) of trying to learn about the background of the *madᶜu* in much detail in order to get to know them a lot better.

3. Types of Topics of Conversation in *Da`wah* Communication

al-Bayanuni (2010) explains that the tenets of *da`wah* is basically made up of three aspects which are *daᶜie*, *madᶜu* and *mawduᶜ* (content) of *da`wah*. In the aspect of *mawduᶜ* of dakwah, it is explained that it discusses all aspects that relate to *da`wah*, *aqidah* (belief) and *syariah* (Islamic law). According to Asep (2013) the content of *da`wah* refers to the information and messages that invite human to accept the *syariah*. It is further explained that the discussion process carried out will create a form of *da`wah* communication between the *da`wah* worker as the source of information and the target group as the recipient of the message. Therefore, as the outcome of the interviews with the *da`wah* workers it shows that the topic of conversation in this study can be divided into two aspects i.e. *da`wah* knowledge and general knowledge.

i. Knowledge of *Da`wah*

The knowledge of *da`wah* is the knowledge and information that leads man to the way of Allah (Kustadi, 2013). It is further explained that knowledge is divided into two i.e. *da`wah* knowledge and general knowledge. Meanwhile, according to Sohirin (2008), the knowledge of *da`wah* that is also known as the science of *da`wah* can be defined as knowledge which through it can be known the means of conviction and whether the means is in the form of sayings such as preaching and teaching or lecturing or the means in the form of behaviour such as giving good example, beneficial work, as well as the good account of life. However, in this study, the konwledge of *da`wah* refers to the content of *da`wah* itself that delivered by the *da`wah* workers to their *mad`u*. Therefore, in this study, the result of the interviews reveal that PK 1, PK 2 and

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PK 6 explains that the Orang Asli community are very likely to ask about one thing that they consider difficult to do for example *solat* (prayers), *wudhu* (ablution), fasting and *khitan* (circumcision). These practices are considered difficult to adopt considering the lifestyle of Orang Asli who never practiced them before they learned about Islam. Mohd Nizam & Che Zarrina's (2005) study also identifies the push factors among the Orang Asli that make them difficult to accept acts of worship like *khitan* (circumcision), fasting, halal diet and difference in culture also contributes to this. They find it difficult to perform acts of worship because they are not used to them as they have never done them before. This situation makes them distance themselves from Islam because they consider it as a burden in life.

Moreover, the study also discovers that according to PK 4 and PK 5, it is usually the *da`wah* workers who have to initiate the discussion on the topics about Islam when conversing with the Orang Asli. However, the *da`wah* workers explain that they cannot really say whether or not the Orang Asli community truly understand the message of Islam communicated to them. This is due to their attitude that is they prefer to stay silent while the teaching and learning process is carried out. Below is the statement by PK 4:

> "…in my experience teaching this man, he always keeps silent. When we ask him whether he understands or not, he replies that he understands .But when we ask him a question he can't answer. He actually doesn't understand. What it means here is that he is just imitating what we say".

(PK 4: 53-59)

Nazariyah's (2014) study finds that the character of the Orang Asli children, the environment, diet, interests, education and parents' influence are shaping their attitude that is one that does not pay attention to matters pertaining to religion and also education in their daily life. Because of this they do not want to ask questions and as a consequence the *da`wah* workers are not sure whether the message conveyed is understood or not. The research finding also shows that the same sentiment is shared by PK 8 who portrays the Orang Asli as merely 'pessengers' in their class. The following is the statement:

"…There are those who are merely pessengers in the class. Well, they listen only. Whether they understand or not they don't seem to show. It's impossible for us to understand them. We do not know whether they understand or not. We know that they are shy and if there is anyone among them that might ask questions, he or she must be someone with a career (i.e. has education). What we tell them they understand, but when we ask them back they cannot answer".
(PK 8:133-137)

However, refusal to ask questions is not something strange when it comes to conveying *da`wah* to Orang Asli. This attitude is synonymous with the Orang Asli community. Based on the research by Doris et al. (2012) it is found that the Orang Asli community are imbued with prejudice due to their natural character that is shy and they have low self-esteem when they are around outsiders. Besides that, the study by Mohd Johdi et al. (2009) finds that the level of awareness among Orang Asli is still low. This is due to a few factors like attitude, family and their surroundings. As a result of this, as discovered in Abdul Sukor et al.'s (2011) study that shows the Orang Asli community has weak memory and this causes them unable to master the 3M skills i.e. writing, reading and arithmetic. These factors stop them from asking about something or from being curious about Islam.

The research finding tells the experience of the *da`wah* workers in their effort to approach this group and it has been discovered that the main factors as to why it is difficult to communicate the message of *da`wah* to the orang Asli are their shyness and low self-esteem. According to the *da`wah* workers, these factors make them reluctant to ask questions although the *da`wah* message conveyed is not clearly understood by them. This is in line with the finding of the study conducted by Ahmad et al. (2009) that shows Orang Asli are known to have shy and modest character. Doris (2012) explains that Orang Asli do not freely expose themselves in public and because of that they are prejudiced towards the general public. W.A Amir Zal's (2013) study calls this 'social capitalisme' that is they have community connection according to their own way of life.

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ii. General Knowledge

Unlike matters related to general knowledge, the issues of assistance, welfare and the behaviour of the Muslim community constantly become the main questions asked by Orang Asli to the *da`wah* workers. From the study it is found that PK 3, PK 6, PK 7 and PK 8 make similar statements that is Orang Asli always question the attitude and the negative actions of the Muslim community. More seriously considering that there are some Muslims who do irresponsible things like stealing, not minding their words, not looking after their manners, drinking, traficking and pushing drugs, entering the village of Orang Asli without permission, raping and even staying together with Orang Asli women outside of wedlock. All these create a bad image of Muslims among the Orang Asli community. This situation becomes a challenge to the *da`wah* workers who have been given the special task in the Orang Asli villages. The research finding also shows that, based on the statements of the *da`wah* workers, there are some inhabitants who do not welcome the presence of the *da`wah* workers whenever they hear the word "*ustaz*" (religious teacher) being used. This situation explains why it is not something odd to hear Orang Asli have the impression that by being converted to Islam they are also directly being turned into Malay.

In line with the study by Syed Abdurrahman (2009) that finds Orang Asli equate the Malay community with Islam. However, the negative attitude displayed by the Malay community creates a negative perception among the Orang Asli about Muslims. As a consequence, Orang Asli believe that by being converted to Islam they are becoming Malay (Zulkefli & Halim 2014; Padzal 1997; Ramlee Abdullah 1988).

Besides that, from the research it is also found that the questions asked by the Orang Asli to the *da`wah* workers are characteristically unpredictable. This demands the *da`wah* workers to possess skills to answer the questions and to ensure that the orang Asli are convinced with the the answers given. PK 2 shares the experience concerning the question posed by the Orang Asli to him:

> "some examples of the questions: we are old, if we convert to Islam, can we avoid being circumcised? What more we are diabetic… Then, like when I was teaching yesterday, there was one Orang Asli asked me about the different types of crying. Meaning how many types. It was difficult to research and find answer to the question. I answered 10 types of crying. This crying is due to pain, happiness, sadness and crying because one sees another person crying. Can you see that? These questions asked by Orang Asli sometimes are very unpredictable. They are something else".

(PK 2: 14-27)

The following is the question asked to PK 4 who confesses that he had to really think about what was the most appropriate answer before he gave the answer to the Orang Asli who posed the question:

> "Like in the topic about *solat* (prayers) he asked why do we need to first say the intention. Why not start the prayer with *Takbir*? This is common. Maybe he was thinking why it was like that…".

(PK 4: 78-80)

The same also with the explanation by PK 8 who considers the questions asked are challenging and difficult to answer spontaneously. This is in order to ensure that the answer

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given is accurate and appropriate, and can be accepted by the Orang Asli community according to their level of understanding:

> "When it comes to the topic on death, they'd ask you what the life will be like after death. So it's quite a challenge to answer , right?"

(PK 8: 35-37)

From the finding of the research, it shows that there are some *da`wah* workers who are not prepared to answer questions posed spontaneously. This is due to they are not able to anticipate the questions asked by the Orang Asli community and because of that they need time to find the answer that can convince the Orang Asli. Therefore, *da`wah* workers must be more prepared when they face with questions from the Orang Asli. *Da`wah* workers' preparation is important so that every answer they give is true, easy to understand and can be accepted and can convince the Orang Asli community.

Conclusion

Overall, the research findings show that the types of da`wah communication to the Orang Asli community involve three main stages i.e. the initiation stage, strategizing and topics of conversation during communication. Every element has its role and influence that can affect the *da`wah* work carried out by PMOA and PDM towards the Orang Asli community. For *da`wah* workers who are proactive and can perform multiple skills that suit the current situation, their communication with the Orang Asli can lead to something positive and their presence in the village is welcome by the Orang Asli community. However, the *da`wah* workers must be more prepared to answer questions asked by the Orang Asli so that they will accept and can be convinced by every answer given by the *da`wah* workers. The research finding concerning the initiation stage, strategizing and topics of conversation show that *da`wah* workers are utilizing all sorts of methods in order to approach the Orang Asli community. However, every approach taken by PMOA and PDM is different because it must suit the community in which they are doing their dakwah. This is because every Orang Asli settlement has certain unique features. Therefore, this situation requires for effort and skills on the part of the *da`wah* workers to learn about the background and lifestyle of the locals.

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ULTRASONIC ECHO SIGNAL ANALYSIS FOR WELDING INSPECTION

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Abstract: In order to inspect the quality of spot welding, NDT has difficulties to be used in the automotive production due to complexity of the waveform analysis. In this paper, NDT system inspecting the quality of spot welding is proposed to complement NDT inspecting the quality of spot welding. Proposed NDT system can determine the quality of spot welding automatically so that productivity of automotive production will be improved. Several specimens with a variety of welding quality was produced to evaluate the performance of the proposed mobile ultrasonic NDT system, through this experiments, the proposed mobile ultrasonic NDT system indicates the superior properties compared to the conventional equipment in terms of convenience, productivity, and economic.

Keywords: NDT, Spot Welding, Ultrasonic, Transducer

Introduction

In general, 8,000 points of spot welding are performed in order for a car manufacturer to assemble a car, so the crash stability test absolutely depends on the quality of the spot welding. The destructive inspection such as the tensile test and the driver-check or the non-destructive inspection using transmission of the ultrasound will be carried out in the field of inspecting the welding defects in the spot welding (Kwon, 2016). Despite the destructive inspection has the disadvantages of deteriorating the appearance and taking a long inspection time, the destructive inspection through the driver-check after the appearance inspection is widely used. On the other hand, Ultrasonic NDT (non-destructive test) is a method of discriminating the position and size of defects by analyzing the reflected signal after transmitting ultrasonic wave into the test specimen. However, because NDT mainly focuses on inspecting ultrasound waves, it requires specialists with accurate analytical capabilities for the ultrasound waveform. There are limitations in NDT such that ultrasonic equipment are very expensive and depend entirely on foreign equipment until now. Moreover, it is troublesome to change the ultrasonic transducers operating at specific frequencies depending on the type of metal specimens (Kim, 2014). Typical ultrasonic NDT equipment, exclusively monopolized by several companies, has a problem with mobility due to its size and weight so that it is difficult to measure freely welding quality at the production site where ultrasonic equipment is not easy to access. In this paper, a NDT inspection system based on the ultrasonic transducer enabling to evaluate the welding quality automatically without the evaluation of the skilled inspector is proposed. In ultrasonic NDT, because echo signal reflected from the specimen has information such as the thickness and welding quality of specimen, the welding quality of each welding point can be confirmed by analyzing the magnitude and time component of the reflected ultrasonic signal.

Ultrasonic Inspection

Ultrasonic inspection uses high frequency wave of 1~15 MHz to conduct flaw detection and evaluation. A general ultrasonic inspection system composed of pulse generator, receiver, ultrasonic transducer, and display devices can be illustrated as in Fig. 1 (NDT Resource Center, 2017). A pulse generator may produce high voltage electrical pulses to induce dipoles within the molecular of the piezo transducer so that the transducer generates high frequency ultrasonic signals. This ultrasonic signal generated by the transducer will be introduced and propagates through the specimen in the form of wave. If there is a discontinuity such as a crack, some part of the energy in the transmitted ultrasonic signal will be reflected back from the surface of crack. The strength of the reflected ultrasonic signal can be displayed according to the time from when ultrasonic signal was emitted to when echo wave was received. The fact that the travel time of the ultrasonic wave is directly related to the distance that the signal traveled can be confirmed from the information in the display. The properties of wave propagation in solid

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materials are deeply related to factors such as wavelength, frequency, and sound velocity. The wavelength is directly proportional to the velocity of the wave and inversely proportional to the frequency of the wave. Generally in the ultrasonic testing, the shorter wavelength will usually provide for the detection of smaller flaw in the specimen (Leon, 2014). The intensity of ultrasound signal traveling through a specimen will diminish with the traveling distance. The amplitude of ultrasound is reduced by spreading of the wave, scattering, and absorption so that ultrasonic attenuation is the decay rate of the waves as it propagates through material. Scattering and absorption represents the reflection of the ultrasound and the conversion of the sound energy to other forms of energy, representatively, and the combination of scattering and absorption is called attenuation (Na, 2014)(Emeterio, 2012).

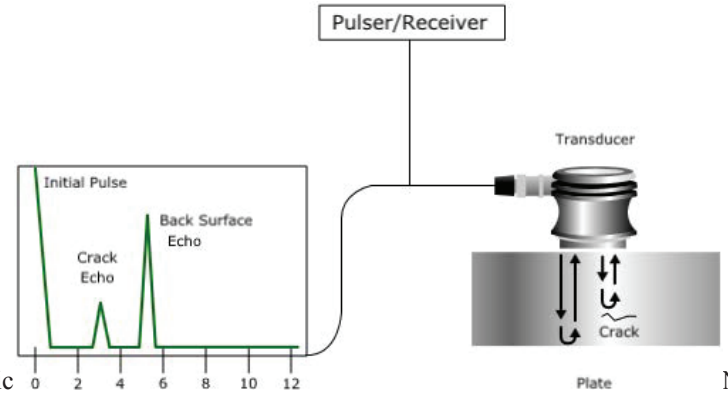

Figure 1. Ultrasonic NDT inspection system.

The Proposed Ultrasonic Signal Analysis Algorithm

Based on the characteristics of the ultrasound signal, an efficient ultrasonic analysis algorithm composed of detecting the location of the welding point and evaluating the welding quality is proposed in this paper

A. Detection of Welding Point

The location of the welding point in a material can be determined by measuring the traveling time of ultrasound wave generated by a transducer, which will be reflected from the back or the point of a discontinuity, and returned to the transducer. As the point of flaw in medium can be obtained by these routines, the welding point can be detected by as follow. If a flaw signal was measured around the welding point, it means that no welding had been done, that is, the measured flaw signal was reflected between the non-welded two plates. Conversely, if no flaw signal and only a back-wall echo signal was detected, it can be seen that two materials was melted due to the welding process. So the location of the welding point can be determined relatively accurate by analyzing the location of the flaw signal presenting between initial and back-wall pulse.

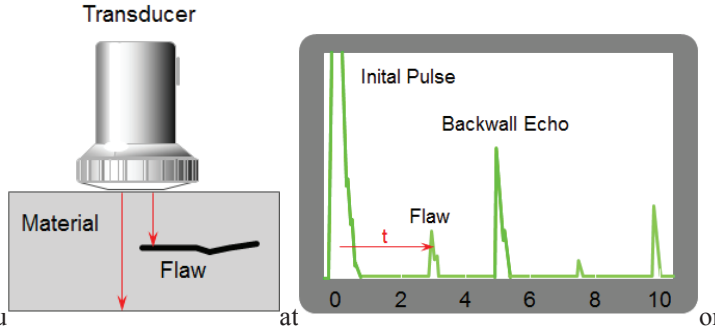

Figure 2. Configuration of flaw detection and displaying echo signal.

B. Analysis of Welding Quality

The algorithm detecting the location of the welding point was introduced in the previous section, the method to judge the welding quality will be introduced in this section. Welding quality including the no welding at all to the burnt can be revealed by analyzing the amplitude of the echo pulse as shown in the Fig. 3. It can be seen as the no welding if the amplitude of the echo signal is very large, on the other hand, the two plates are completely burnt if very small. Therefore the welding quality can be classified into several by quantizing the amplitude of the echo

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signal into several intervals. The welding quality was classified into five steps in Fig. 3 but it can be changed according to the quantization intervals. The welding quality classified in this manner can be displayed as a two dimensional grey image in C scan method.

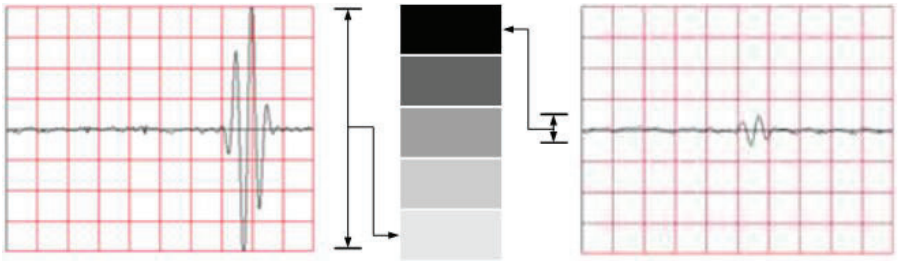
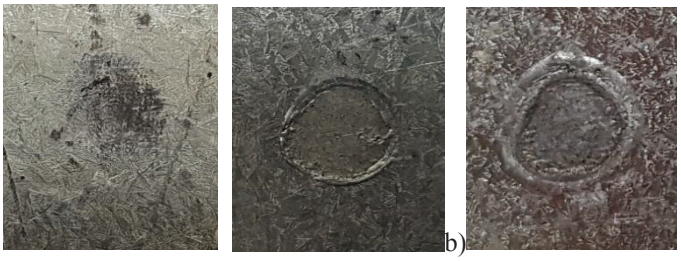


Figure 3. Displaying the welding quality by evaluating the amplitude of echo pulse.

Experimental Results

This section presents the experimental results to evaluate the performances of the proposed ultrasonic signal analysis algorithm. The experiments were performed on three test specimen as shown in Fig. 4 through two dimensional transducer consisting of array type of a single ultrasonic transducer as shown in Fig. 5. Fig. 6 shows the waveform of the echo signal according to each point in case of the welding quality of good welding. In case of (a), no reflected signal exists because welding was done well in this part. The case of (b) can be also judged as good welding because reflected signal is not seen but there is a slight difference between (a) and (b) since the amplitude and position of IP for (b) is relatively large and fast in comparison of (a) so that it can be judged that there is no indentation in (b). Because echo signal is visible from (c) and the amplitude of echo signal in (d) is larger than that of (c), it can be seen that the welding strength was no not relatively higher in (d).



(a) b)

(c)

Figure 4. Test specimen of (a) small nugget, (b) good welding, and (c) burnt used in this experiments

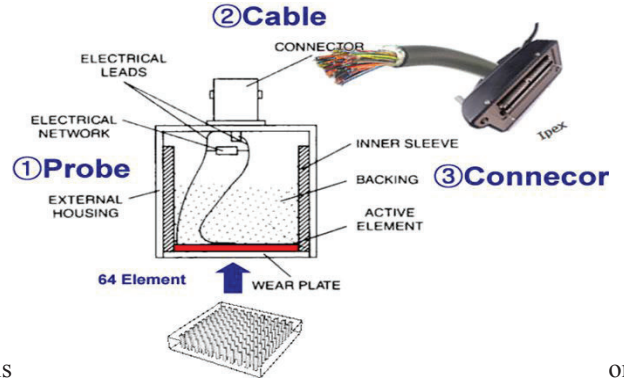


Figure 5. Two dimens onal ultrasonic transducer.

Conclusions

The proposed analysis algorithm of ultrasonic signal in NDT system can determine the quality of spot welding automatically so that convenience of NDT and productivity of automobile production will be improved. It is easy

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to manipulate ultrasonic NDT equipment due to its compact size and its inspection results that can be checked immediately.

Acknowledgements

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URBAN LAND USE AND URBAN LAND USE PROBLEMS: A CASE STUDY OF SURUÇ CITY. (ŞEHİRSEL ARAZİ KULLANIMI VE ŞEHİRSEL ARAZİ KULLANIMI SORUNLARI: SURUÇ ŞEHRİ ÖRNEĞİ)

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Özet

Şehirler beşeri ve ekonomik fonksiyonları olan ve bu fonksiyonları itibariyle içinde yaşayanlara ve çevresindeki kırsal alanlar ile daha küçük şehirlere bu hizmetleri götüren ve bir takım ihtiyaçlarını bu alanlardan karşılayan yerleşmelerdir. Bu nedenle şehirlerde birçok beşeri (ikamet, sağlık, eğitim, kültür, eğlence ve dinlence, dini) ve ekonomik (endüstri, ticaret, ulaşım, turizm, bankacılık/sigortacılık ve diğer mali işler) fonksiyonlar gelişmiştir. Her bir şehirsel fonksiyonun icra edilmiş olduğu alanlar şehirsel kullanım özelliklerini ortaya çıkarmaktadır. Şehirsel arazi kullanımının düzenli olması, şehirsel yaşam konforunu artıran bir özellik iken, yanlış arazi kullanımı, ulaşım, elektrik, su, yol vb altyapı hizmetlerini, eğitim ve sağlık olanaklarına ulaşmada güçlükler, hava, toprak ve su kirliliği, tarımsal alanların imara açılması gibi birçok zoruna yol açmaktadır.

Bu çalışmadada yaklaşık olarak 5 bin yıllık bir yerleşme tarihi olan Suruç şehrinin, şehirsel fonksiyon ve alanları ile şehirsel arazi kullanımından kaynaklanan sorunların ortaya çıkarılması ve çözüm önerileri geliştirilmesi hedeflenmiştir. Bu amaçla Suruç şehrinde coğrafyanın temel araştırma metodu olan gözlem metodu kullanılmıştır. Yerinde yapılan gözlemlerle şehrin fonksiyon alanları haritalanmış, fonksiyon alanlarının dağılışı coğrafyanın dağılış, bağlantı ve nedensellik ilkeleri ışığında analiz edilmiştir.

Çalışmanın sonucunda idari fonksiyon alanlarının çehrin merkezi alanlarında, ticari fonksiyon alanların Mürşitpınar caddesi etrafında yoğunlaştığı ve ikamet alanlarının bu alanların efrafında geliştiği ortaya çıkmıştır. Ayrıca sağlık, eğitim, dini fonksiyon alanları şehrin farklı kesimlerinde dğılış gösterirken, sanayi fonksiyonu genel olarak şehrin kuzeyinde yoğunluk kazanmıştır. Bu arazi kullanımın bir sonucu olarak trafik, imar, tarım alanlarının işgali, cadde ve sokak sisteminde yetersizlik/düzensizlik gibi sorunlar tespit edilmiştir.

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Abstract

Urban land use is an important issue of urban geography. Cities or urban areas are defined as settlements have large amount of population and population density also some social and economical functions. All urban functions are carried out in different parts of cities and those places called as function areas. The distribution of function areas in a city is defined as urban land use.

The main purpose of this study is to reveal urban land use pattern of Suruç city that has a long history estimated approximetaly 5.000 years. Finding out urban functions of Suruç, the distribution of functions in the city and factors played role on this distribution are among the purpose of this study.

The main method of study is observation method that geography's most important research method. Field research was carried out within the scope of observation method to find our Suruç citiy's urban land and the distribution of urban function areas mapped.

Field research carried out in Suruç citiy reveals that while commercial function areas are concentrated around Müşitpınar Street, administrative areas of city are concentrated in the central part of the city. Residental areas of city are spread around the commercial and administrative areas. Educational, health and religious function areas are distributed in different parts of Suruç, while industrial areas are concentrated at the noth of the city. As a result of this land use, there are some problems caused from land use such as traffic, housing, infrastructure problems and housing on agricultural fields, inedequacy of streets.

Keywords: Urban Geography, Urban Land Use, Urban Functions, Urban Problems, Suruç. (Şehir Coğrafyası, Şehirsel Arazi Kullanımı, Şehirsel Fonksiyonlar, Şehirsel Problemler, Suruç)

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USE OF INFORMATİON TECHNOLOGİES İN APPLICATION SPHERE

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Abstract: When conducting their business, companies increasingly apply the use of information technologies, which are to facilitate the work of employees at all positions. This study deals with their use in quality management system, where it is important to apply the most advanced forms of management and use every opportunity to improve the quality in general. On a sample of three large companies in South Bohemia region (the Czech Republic), we aim to discover the current state of using information technologies in the application sphere. Two research assumptions were established and the purpose will attempt to confirm / to refuse them through two research approaches: interviews with managers of all 3 observed companies and a subsequently compiled questionnaire distributed to the total of 130 employees of the companies. The assumptions were as follows: 1) To achieve the required quality, companies must use information technologies; 2) Information technologies are used in companies with quality management system, regardless of their business. The results of research, concerning the quality and information technologies, confirmed a particular connection between the use of information technologies and the resulting quality.

Keywords: Information Technologies, Private sector, E-learning

Introduction

When conducting their business, companies increasingly apply the use of information technologies, which are to facilitate the work of employees at all positions. This study deals with their use in quality management system, where it is important to apply the most advanced forms of management and use every opportunity to improve the quality of supply (cp. Kožíšek & Stieberová, 2010; Janeček, 2001; Veber 2006; Nenadál, 2001). Eriksson (2016) reminds that large companies are ahead of small and medium enterprises in the race for quality progress. In general, it means that in comparison of public with private companies, private ones do better, and the practice of process management seems to be easier for private firms (Eriksson, 2016). Quality management may be a source of competitive advantage (Elshaer & Augustyn, 2016).

Information technologies are means and procedures, devices as well as systems that help one to work with information more efficiently. In order to perform the aforementioned functions, information technologies consist of computer sets and other elements. Therefore, the basic building block is hardware in the form of computer sets, printers, fax machines, telephones, etc. Other elements include software equipment, i.e. basic (operating systems, office applications, programming languages, etc.), application (programs for production control, trade control ...) as well as technology (e-mail, word processor, etc.) or communication networks, workstations, robotics and smart chips (Vymětal et al., 2006). According to Tvrdíková (2000), based on the levels of management, information systems are classified into transactional systems, information management systems, decision support systems and senior management support systems.

In their operations, many companies frequently use separate information systems (e.g. one for production management and the others for logistics, distribution, asset management, sales, billing, accounting, human resources, etc.) instead of one that is integrated (Odbor statistik rozvoje společnosti, 2011, 22). Integrated information system provides a comprehensive view and delivers a complete information package for professional positions in the given company (Zounek, 2009; Rábová 2008; Truneček et al., 1997).

Research goals

On a sample of three large companies in South Bohemia region (the Czech Republic), the authors aim to discover the current state of using information technologies in the application sphere.

Two research assumptions were established and the purpose will reside in an attempt to confirm / to refute them through two research approaches: interviews with managers of all 3 observed companies and a subsequently

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compiled questionnaire distributed to the total of 130 employees of the companies. The assumptions are as follows:

1. To achieve the required quality, companies must use information technologies.
2. Information technologies are used in companies with quality management system, regardless of their business.

Methodological Approach

On approaching the companies, it was necessary to select those having available quality management, and to create a questionnaire based on interviews with managers of the companies. The included questions mainly concerned the companies themselves, their attitude to quality and information technologies, and how these two elements are used by management of the companies to make their operations more effective.

When creating the questionnaire, the biggest effort was put in the answers' informative value, while maintaining a certain clarity for an average respondent without detailed knowledge of management terms. The data analysis objective was to evaluate the possibilities of use and the amount of benefits (or failures) of information technologies in quality management system in the South Bohemian companies. Therefore, it was essential to approach companies with quality management systems and to select those fulfilling the requirements of the ISO 9001 certification. Since the selections included companies with quality management systems that may be applied virtually to any area (field), the companies each have different core businesses.

Research sample

Company 1: The manufacturing enterprise in the field of telecommunication, founded in 1991 as a company dealing with automation and measuring technologies in various fields as industry, food business, energetic and health. The main interests of the company today are telecommunications services together with the construction of telecommunication systems, solar systems and software equipment. This company interest comprises also sort of e-commerce. Despite its focus, the company poses no integrated information system but several information systems are used for various activities such as warehousing or accounting. Despite the lack of integrated information system, the company deals with using electronic invoicing to make it easier for the accounting department (the need to improve quality by reducing error rates). This is also confirmed by the obtained quality certificate in that field.

Company 2: The franchisee company operating in the field of services. It entered the Czech market in 1998. The main subjects of business are providing services in the field of vehicle rental and operational leasing. This company uses an integrated information system for the purpose of effective company managing. The security of this system is ensured not only by using the strong passwords, but also by electronic signatures. An intranet is also very important part of the company's information technologies. The intranet is used for communication with employees and for controlling them. This company strategy comprises a complex e-commerce business. They offer for long years full services via Internet (booking and payment). Regarding quality, the company received quality awards for best services, best customer services etc.

Company 3: In the rail transport engaged company that focuses on a wide range of shipments. The company offers a specialized solution systems for almost every kind of goods, but they are specialized in transportation of solid fuels and construction materials. Liquid goods can be transported in tanks. Moreover they are able to transport also military consignments or engineering raw materials and machines. The company uses an integrated information system and an intranet. The Internet is restricted for some employees. It was also found that the company is seeking for obtain quality certificates and they also tries to implement new systems for improving their business.

The research data, which allow us confirm or avoid the determined research assumptions, represents the answers of 133 employees of the companies described above. Of these, 55% were male (73 respondents) and 45% female (60 respondents). The age of the respondents represent 14 persons under 25 years of age, 49 respondents are aged 26-35 years, the same number of persons (also 49 respondents) are aged between 36-45 years, 16 persons in the 46-55 age group and 5 respondents are aged over 55 years.

Results and Discussion

The three observed companies, albeit in different sectors (telecommunications, logistics), must use information technologies for their operations. The assumption – that companies working with quality management system maximize the use of computers and technologies in all workplaces – was confirmed, with the use of computer networks, namely Internet and Intranet, being at a very high level as well. However, it was surprising to determine the absence of Intranet in company 1. Likewise, this company lacks any integrated information system, as opposed to companies 2 and 3. These findings were all the more surprising, since company 1 has newer and hence more modern information technologies than the other observed companies. In comparison with them, this company (1) also differs in other aspects, such as not using any e-learning. According to the answers of the company 1 management, this is due to the fact that the company is completely housed in one building and thus there is no need to use this method of training or any further qualification expansions. From their perspective, centralization is the reason for the Intranet absence as well.

As the survey results show, 95% of respondents agree with the claim that the company they work for seeks for quality improvement by using, in particular, information technology. Only 5% of respondents (representing only 7 people), don't agree to this claim. Especially, in the company 2, 100% of respondents agree with the idea of improving quality with help of using of information technologies. It is quite understandable, considering the type of business and the age structure of employees, which are very young and thus closer to modern trends in the field of information technologies.

The extent of the IT using in work

The respondents used a scale from 1 to 5. Most respondents (66) chose highest value 5. The second largest number of respondents (61) chose value 4, which represents also a high rate of utilization. The remaining 6 respondents indicated the middle value 3.

Table 1: The extent of the IT using in work (comparison of Internet and Intranet using)

	Using of Internet for work		Using of Intranet for work	
	Yes	No	Yes	No
Company 1	47	0	0	47
Company 2	15	23	38	0
Company 3	15	33	48	0
Total	77	56	86	47

Documentation system used at the workplace

The combination of electronic and paper documentation form is the most used system in all three companies (78%). It is positively surprising that only paper form of documentation we can't find in any company. Companies are aware of the information technologies benefits in the sense of speed and economy as opposed to slow and non-ecological paper form of documentation.

Table 2: The form of documentation system at the workplace

	Electronic database	Paper form only	Combination of both
Company 1	20	0	27
Company 2	4	0	34
Company 3	5	0	43
Total	29	0	104

Using of e-learning at the workplace

The results we get are very specifically balanced. It's influenced by the fact e-learning is completely missing in the company 1. On the contrary, situations in the companies 2 and 3 are very diverse. The difference is probably caused by different positions of respondents. Few of them hardly know what's the word e-learning about, others use it very often. Nevertheless, the results illustrate the companies' effort for an effectiveness in the cost reduction

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when we talk about the staff training and learning. The differences are also result of diversity in companies' sizes. Company 1 where isn't e-learning used in any form is quite small company and all employees work in one building.

Table 3: The purpose of using e-learning at the workplace

	Obligatory training according legislation	Vocational training	Qualification expansion	Other
Company 1	0	0	0	0
Company 2	27	7	0	0
Company 3	40	12	10	0
Total	67	19	10	0

Using of specialized programs for work

According to respondents' answers, companies use the mostly from 1 to 2 specialized programs This percentage represents 69 respondents. (52%). The need for 3-4 specialized programs for work has been expressed in answers of 52 respondents (39%). Multiple programs for work, i.e. 5-6 used by only 10 respondents.

The importance of information technologies from the employees' point of view

The respondents answered the question "How much would change the impossibility to use information technologies the quality of your work" and they used a scale from 1 to 5. The majority of the 70 respondents (representing 53% of respondents) thinks that the quality of their work would definitely suffer (answer "5" on scale) in the case if they could not use the information technology. The second largest part of respondents chose the answer "4". The result of these The answer to the question is the determination of respondents' dependence on information technologies, for quality job performance. The average response rate respondent is very high, namely 4,51. Respondents therefore believe that their work is greatly influenced by information technology. The average answer of company 1 respondents is 4,51, higher average was reported by company 2 with a value of 4,71 and company 3 has the lowest average of 4,25.

The results show that the use of information technologies in companies, pursuing a comprehensive improvement and quality control, is necessary as well as it is very effective. Each of the observed companies uses quality management system, and both the equipment and the use of information technologies are at a very high level.

Conclusion

The study aimed to find out the possibilities of using information technologies in companies that have available quality management system (see Nanda, 2005). It was also necessary to determine whether these technologies provide the desired effect. The objective was met as it turns out that the possibilities of using information technologies are virtually limitless and very effective, and the above information technologies are used by companies from all sectors for a great variety of activities.

Despite all three companies use the information technologies, their application remains in some aspects individual. Some companies can obtain bigger and some only minor benefits. However, the basic purpose in saving the budget and improving the quality in general benefit for all of them. As confirmed in the research, these information technologies save the time of the staff. Thanks to this savings, the companies are able to save also in reducing the number of full-time job positions that would have to be created without the use of information technology. More efficiency can be seen in communications, where new technologies have enormous benefits (cp. Rábová 2008; Truneček et al., 1997). For larger companies it's easier to communicate through corporate networks or Intranets among single departments, as well as sharing data. Of course, communication does not only concern the internal business. Internet is unnecessary form of communication with the world outside of company.

It is clear from the obtained data that the information technologies are used by companies, regardless of their business focus. This confirmed the first established assumption: Information technologies are used in companies with quality management system, regardless of their business. At the same time, the questionnaire survey results and interviews with the managers also confirm the other research assumption: to achieve the required quality, companies must use information technologies. The results of research, concerning the quality assurance and information technologies, confirmed a particular connection between the use of information technologies and the resulting quality. Nevertheless, how suggests research findings of Ahmad & Schroeder (2002), managers should not limit their attention to potential employees' technical skills.

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USING LEARNING STYLES TO BECOME BETTER TEACHERS

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We all learn in different ways. Whether we are learning how to find the slope of a line, analyzing a table of values to determine a relationship, or translating a "real world" application into an equation that can be used to model that situation, we depend on individual learning styles.

In this session, teachers will be provided with a hands-on activity they can use with their students to help them identify their learning style and to use their individual style to learn better and to make that learning fun.

When teachers have a better sense of how their students learn, and students understand better their preferred learning styles, activities can be planned with those styles in mind. When we can help our students become active learners in our classrooms, we all benefit. This session will provide some of the tools to achieve this goal.

Keywords: Learning styles; Real world applications; Interactive activity

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UŞAK İLİ VE ÇEVRESİNDE KULLANILAN YAPI MALZEMELERİNİN DOĞAL RADYOAKTİVİTESİNİN BELİRLENMESİ

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Özet:İnşaat sektörünün ülkemizde 170'den fazla sektöre doğrudan ya da dolaylı katkısı vardır. Ülkemizin kalkınmasında lokomotif sektör konumundadır. Özelliklekonut yapımında kullanılan yapı malzemelerinin büyük bir kısmı ülkemiz doğal kaynakları kullanılarak üretilmekte ve kullanılmaktadır. Bu yapı malzemelerinde bulunan doğal radyoaktivite değerlerinin bilinmesi hem çevre hem de insan sağlığı açısından çok önemlidir. Bu konuda birçok ülke gerekli çalışmaları yapmış ve standartları belirlemiştir. Ülkemizde ise bu konuda yeterli çalışmaların yapılmadığı görülmektedir.

Kullanılacak yapı malzemelerinin seçiminde içerdiği doğal radyoaktivite değerleri de seçim kriterleri arasında olmalıdır. Doğal radyasyona en büyük katkı tabiatta doğal olarak bulunan ^{238}U, ^{232}Th ile bunların bozunma ürünleri olan ^{226}Ra, ^{222}Rn, ^{235}U ve ^{40}K gibi radyoaktif elementlerden ileri gelmektedir. Uşak ili ve çevresinde kullanılan yapı malzemelerinden alınan numunelerin sahip oldukları doğal radyoaktivite değerlerinin belirlenmesi amacıyla bu çalışma yapılmıştır. Alınan numuneler; tane çapı max. 16mm olan agrega, CEM I 42,5 sınıfı çimento, hazır beton santralinde üretilmiş C25 sınıfı 15x15x15 cm boyutlarında hazır beton, tuğla-kiremit, bims blok, kireç, bazalt, mermer şeklindedir.

Doğal radyoaktivite değerlerinin belirlenmesinde en yaygın kullanılan yöntem Gama Spektroskopisi yöntemidir. Yapılan çalışmada bu yöntem kullanılarak,İstanbul Teknik Üniversitesi Enerji Enstitüsü'nde bulunan laboratuvarda hazırlanan numunelerin, gama sayım çalışmaları yapılmış ve numunelerin doğal radyoaktivite değerleri hesaplanmıştır. Yapılan deneyle elde edilen gama sayımları sonucunda alınan spektrumlarda 238U serisinin bozunma ürünü olan ^{214}Bi (603,9 – 1120 – 1764,1 keV), ^{208}Th serisinin bozunma ürünü olan ^{228}Ac (911,2 keV) ve 40K (1460,8 keV) pikleri dikkate alınmıştır.

Yapılan bu çalışmanın analiz sonuçları uluslararası kabul edilen sınır değerler ile karşılaştırılmıştır. Elde edilen sonuçlarda, bazalt numunesinde sınır değerin %58' in üzerinde çıktığı görülmektedir. Bu sonucun bazalt kayacının volkanik kökenli olmasından kaynaklandığı düşünülmektedir.

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Anahtar Kelimeler: Doğal Radyoaktivite, Gama Spektrometresi, Yapı Malzemesi.

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ÜNIVERSITE ÖĞRENCILERININ YAŞAM KALITESI ALGISININ BAZI FAKTÖRLER AÇISINDAN İNCELENMESI

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Günümüzde yükseköğrenime yönelik artan talebin ve öğrenen merkezli eğitim anlayışının, öğrencilerin üniversiteler ve öğretim elemanlarıyla ilişkilerini değiştirdiği görülmektedir. Globalleşme ve rekabetçi ortamdan etkilenen üniversitelerin kalite ve farklılaşmaya odaklandıkları ve öğrenci beklenti ve ihtiyaçlarını karşılamaya yönelik girişimlerde bulundukları görülmektedir. Ancak giderek artan genç nüfus ve eğitime olan taleple daha fazla öğrenciye yükseköğrenim olanağı sunmak belli zorlukları da beraberinde getirmektedir. Üniversitedekilerdeki öğrenci sayısı arttıkça öğrencilerin üniversite yaşamlarını doğrudan etkileyen akademik, sosyal ve kültürel konuları etkili bir şekilde yönetmek giderek daha zor ve karmaşık bir hâl almaktadır.

Üniversiteler, öğrencilerin akademik gelişimlerinden sorumlu olduğu kadar sosyal gelişimlerinden de sorumlu kurumlardır. İnsan faktörünün büyük önem taşıdığı kurumlar olan üniversitelerde öğrencilere sunulan öğretimin kalitesi kadar, okulun genel ortamının özelliklerini yansıtan yaşam kalitesi de oldukça önemlidir. Yapılan araştırmalarda, üniversite ortamında çeşitli etkinliklere katılma fırsatı bulan, sınıf içinde ve dışında akranlarıyla ve öğretim üyeleriyle olumlu ilişkiler kurabilen ve üniversite yaşamının kendisine sunduğu olanaklardan doyum sağlayabilen öğrencilerin akademik ve kişisel gelişimlerinde daha başarılı oldukları ortaya çıkmıştır. Bu konuyla ilgili olarak günümüzde üniversite öğrencilerinin hem akademik başarılarını hem de bireysel yaşamlarındaki doyumu etkileyen üniversite yaşam kalitesinin ele alınması son derece önemli bir hale gelmiştir. Üniversite yaşam kalitesi, üniversiteden memnuniyet derecesini ve öğrencilerin üniversite yaşamı boyunca pozitif duygular yaratan deneyimlerini içermektedir. Üniversite öğrencilerinin yaşam kalitelerini arttırmak, eğitimin daha verimli ve öğrencilerin kendilerini daha iyi hissetmeleri açısından önemlidir. Ayrıca üniversite öğrencilerinin, üniversitede başarılı bir öğrenim süreci geçirmelerinde ve mesleklerinin gerektirdiği tüm nitelikleri kazanmalarında üniversite yaşam kalitesinin önemli bir etken olduğu söylenebilir.

Bu doğrultuda DEÜ'ndeki öğrencilerinin yaşam kalitesinin ölçülmesi ve üniversite yaşam kalitesi kavramının genel yaşam kalitesi, genel yaşam doyumu ve üniversite ile özdeşleşme üzerine olan etkilerinin tespit edilmesi amaçlanmıştır.

Keywords: : üniversite yaşam kalitesi, genel yaşam kalitesi, genel yaşam doyumu, özdeşleşme.

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ÜNİVERSİTELERDE SEKTÖR UYGULAMALARI EĞİTİMİNİN ÖNEMİ VE DEĞERLENDİRİLMESİ

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Sektör uygulamaları eğitimi(İNTÖRN) uygulamalı eğitim görmekte olan son sınıf öğrencilerine verilen isimdir. Lisans öğrencileri için 8. Yarıyıl, önlisans öğrencileri için 4. Yarıyıla kadar edindikleri bilgi ve becerileri, son yarıyılı kapsayan intörn eğitim döneminde gözden geçirilerek, uygulama, arttırma, yoğunlaştırma şansı ve fırsatı bulurlar. Sektör uygulamaları eğitiminin esas amacı öğrencinin yükseköğretim hayatında edindiği teorik ve pratik bilgileri sektördeki uzman kişiler denetiminde ve gözetiminde uygulayabilmesi ve geliştirilmesini sağlamaktır. İntörn eğitim modeli bir staj değildir. Staj uygulamasının ötesinde, sektörde adeta bir çalışan gibi görev almak ve çalışmalara katılmaktır. İntörn öğrenciler mezun olduktan sonra içinde bulunacakları çalışma ortamını çok önceden görme, tanıma ve adapte olma şansını yakalar. Bu süreç onların meslek gelişmelerinde büyük katkı sağlar. Bu eğitim sayesinde öğrenciler aynı zamanda mezun olmadan iş bulabilme imkanına sahip olacaklardır.

Bu çalışmada, üniversitelerde intörn eğitim model uygulaması sayesinde, Üniversite-Sanayi işbirliği geliştirilerek hem sanayide hem de eğitimde verimliliğin arttırılması, üniversitelerde, sanayinin ihtiyaç duyduğu nitelikte eleman yetiştirilmesi, üniversite hocalarının ve öğrencilerin sanayi ile irtibatının sağlanması, mezun öğrencilerin iş bulmalarında kolaylık sağlanması amaçlanmaktadır. Bu bağlamda, sanayi ve üniversite adaptasyonun şekillenmesi, nitelikli işgücü ve bunun getireceği verimli bir ekonominin sağlanmasının ülkemiz için oldukça fayda sağlayacağı kanaatına varılmıştır. Bu konudaki bilgi birikimimiz ve tecrübelerimiz diğer üniversitelerdeki hocalarımızla paylaşılacak, onlarında intörn eğitim uygulamasına geçmeleri teşvik edilecektir.

Keywords: İntörn, Sektör Uygulamaları, Üniversite Sanayi İşbirliği

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VALIDATION OF SIC PRESENCE IN SILICA SUPPORTED NI CATALYSTS VIA CHARACTERIZATION ANALYSES

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Nickel (Ni) has been utilized in a variety of reactions including steam reforming of methane, partial oxidation of methane and dry reforming of methane. High activity obtained in the presence of Ni based catalysts enabled its potential use in industry [1]. The main problem with Ni-based catalysts was their low coking resistance and studies mainly focused on elimination of this problem [2]. Formation of SiC during dry reforming of methane reaction was reported in our previous study [3]. SiC formed during dry reforming could eliminate coke formation and hence provide sustainable activity of the catalyst.

The aim of this study was to simulate SiC formation during dry reforming of methane (DRM). Methane decomposition in the presence of Ni based catalysts and silica solely utilized as catalyst was utilized as carbon source for SiC formation. Methane decomposition reaction was conducted in the presence of Ni based silica microsphere, Ni/MCM-41 and silica microsphere used as blank. The catalysts were reduced by a flow of H_2 for 3 h at 750°C, prior to use and reaction was conducted in identical conditions (3 h at 750°C) with equal volumetric flows of methane and argon (20 ml/min). Experiments were conducted in a fixed bed reactor fitted inside a quartz tube with a loading of 0.1 g catalyst. The changes in the structure of the catalysts and SiC formation on catalyst structure was validated by the use of XRD, SEM, ATR-FT-IR, TGA and Raman spectroscopy techniques.

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Keywords: microsphere, methane decomposition, SiC

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VAN GÖLÜ HAVZASI'NDAKI YERALTI SULARINA VAN GÖLÜ SUYUNUN ETKISI VE YERLATI SULARININ TARIMSAL SULAMA AÇISINDAN DEĞERLENDIRILMESI: AHLAT İLÇESI ÖRNEĞI

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Yağış miktarının tarımsal ürün yetiştirilmesi için yeterli olmadığı alanlarda, tarımsal ürünün hasat dönemine kadar gereksinim duyduğu suyun, ihtiyaç duyulan devrede ve ideal şekillerde verilmesine "tarımsal sulama" denir. Sulama sularının içeriğinin ve içerisindeki eriyik haldeki maddelerin bilinmesi, tarımsal ürün yetiştiriciliği açısından önem arz etmektedir. İçerisinde olumsuz etkiye sahip olabilen maddelerin yoğun olduğu sularla sulanan tarım alanlarında, zaman içerisinde tuzlulaşma ve çoraklaşma görülmektedir. Sulama suyunun barındırdığı zehirleyici minerallerin etkisiyle tarım ürünlerinin olgunlaşma hızında da gerileme veya durma olabilir.

Yarı kurak bir iklime sahip olan Van Gölü Kapalı Havzası'nın kuzeybatısında bulunan Ahlat (Bitlis) ilçesindeki tarım alanları havzanın en önemli tarım alanlarından birini oluşturmaktadır. Son yıllarda ilçede tarım ürünü deseni değişmeye başlamıştır. Özellikle su ihtiyacı yüksek olan tarım ürünlerinin ekiminde görülen artış, tarım alanlarında sulama suyu amaçlı kuyuların sayısının çoğalmasına neden olmuştur. Plansız ve özellikle ruhsatsız pompajlarla yeraltı suyu kullanımının bir sonucu olarak Van Gölü'nün kıyı kesimlerinde tatlı su akiferlerinin etkilenme potansiyeli artmaktadır. Bu durum, özelikle kıyı kesiminde zamanla önemli çevre sorunlarını da beraberinde getirecektir. Bu çalışma, Ahlat ilçesinin Van Gölü kıyısı ve yakın çevresinde, özellikle yeraltı suyunun yoğun olarak kullanıldığı 1650 metre (Van Gölü kıyısı) ile 1850 metreleri arasındaki tarım alanları ile sınırlandırılmıştır.

Çalışmada, yeraltı suyuna Van Gölü suyunun girişinin olup olmadığı araştırılıp, göl suyu girişinin yeraltı suyu kalitesi üzerine olan etkileri incelenecektir. Dolayısıyla yeraltı su kaynaklarının kalitesinin belirlenmesi amacıyla yöredeki kaynaklardan ve sondaj kuyularından örnekler alınacaktır. Su örnekleri 2017 yılı içerisinde Mayıs ve Eylül aylarında alınacaktır. Alınan örneklerde fiziksel ve kimyasal su kalite parametreleri incelenecektir. Yeraltı suyu verilerinin etkin bir biçimde değerlendirilmesi amacı ile Coğrafi Bilgi Sistemleri'nden (CBS) faydalanılarak analizler yapılacaktır.

Bu çalışmanın amacı, Ahlat ilçesinde 1650 - 1850 metreleri arasındaki tarımsal alanların sulanmasında kullanılan yeraltı sularının kalitesini tespit etmek ve bu kalite parametrelerinin dikkate alınarak tarımsal üretimde verim kaybını azaltmak ve muhtemel çevresel sorunları minimize etmek için bazı önerilerde bulunmaktır.

Keywords: Ahlat İlçesi (Bitlis), Yeraltı Suyu, Tarımsal Sulama, Van Gölü, Van Gölü Havzası

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VOLATILE COMPOUNDS AND MICROBIOLOGYCAL QUALITY IN ROSEWATERS

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Rosewater is a rose-scented colorless liquid obtained as a by-product during the preparation of rose oil with water distillation. Oil rose flowers are collected on a daily basis, and rose flowers and rose water are distilled from fresh flowers collected by water distillation technique. The water distillation is done by pulling the rose oilwhich is light from the resultant water with the injector fromthe top. The aromatic water (hydrolate) that accumulates under the roseoil is treated as rosewater. Inshort, rosewater is a sideproduct of roseoil. Rosa domascena petals under pressure are subjected to water vapordistillation. The first and second distillation result is obtained from rose oil. The remaining oil aqueous solution is mixede qually with the remaining boiler water in the distillation boiler. Thismixtureformsrosewater. Roseoildoes not representthetruefloralaroma of freshroseflowers. Because, duringthedistillation, phenylethylalcohol, an importantodorsubstance, passesalmostalloverthepulpwaterandrosewater. Forthisreason, phenylethylalcohol, which is high in roseflowers, is foundlow in roseoilandhigh in rosewaterwhichaccumulatesunderroseoil. As thecontent of phenylethylalcoholincreases, thequality of rosewaterincreases. Rosewater, afterbeingproduced, if not keptwell, is soondegradedorsour. Light, warmthandairacceleratethedegradation of rosewater. Forthisreason, rosewatersshould be stored in airlesscups, in placescooland not seenbythelight. Althoughrosewater is highlyantimicrobial at highlevels, somebacteriacauserosewaterto break down. Inthisstudy, theimportance of examiningthevolatilecomponentsandmicrobialpollution of rosewatersold in the market arediscussed.

Keywords: Rosewater, microbiologicalanalysis, volatilecomponents

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Yürüme Engellilere Yönelik Yapılan Düzenlemelerin Kamu Kurumlarına Maliyeti İçin Örnek İnceleme Alanı; Erciyes Üniversitesi

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Özet: Hareket kısıtlılığı olan engelliler, ele alındığında yapay mekânların tasarımında bu gruplara yönelik olan çalışmalar önem kazanmaktadır. Engelli tanımlaması ile ötekileştirilen kişilerin fiziksel zorlukları aşabilecekleri mimari çözümlemeler, önemlidir. Konu ile ilgili olarak mimari çözümlemelerde tasarım ve yapım aşamalarında farklılıklarla karşılaşılmaktadır. Ayrıca mevcut yapı stoğunda bulunmayan engellilere yönelik çözümlemelerin maliyetli olacağı düşünüldüğünden gerekli olan uygulamalar gecikmektedir. Bir kamu kurumu olan üniversitelerde bile fiziki problemler bulunmaktadır. Üniversitelerin sosyal ve fiziksel özellikleri ile topluma örnek teşkil etmesi düşünülmektedir. Bu çalışmada, üniversitelerin engellilere yönelik mevcuttaki fiziksel yeterlilikleri ile yasa ve yönetmeliklerdeki olması gereken çözümlerin karşılaştırılması ve maliyet hesabı söz konusudur. Çalışma yapılırken Erciyes Üniversitesi Merkez Kampusu örneklem alan olarak belirlenmiştir. Erciyes Üniversitesi merkez kampusu içerisinde yer alan tüm fakülte, yüksek okul, meslek yüksek okulu binaları ve ekleri incelenmeye çalışılmıştır. Ancak çalışmanın kapsamının geniş olacağı düşünüldüğünden engellilere yönelik araştırma yürüme engellilere yönelik yapılan uygulamalar üzerinde yoğunlaştırılmıştır. Bu çalışmada özellikle kampus içerisindeki yapılara yaklaşımlar ve giriş mekanlarında yapılacak doğru uygulamaların maliyeti hesaplanmıştır. Bu çalışma ile diğer üniversitelerde engellilere yönelik yapılmış ve/veya yapılacak düzenlemelerin maliyetinin miktarının ne olabileceği konusunda katkı sağlanması umulmaktadır.

Keywords: Engelliler, Mimari Uygulamalar, Erciyes Üniversitesi.

Giriş

Türkiye'de yapılan bir araştırmaya göre nüfusun %12,29'u engelli olarak tespit edilmiştir (BÖDB., 2011). Böylesine yüksek engelli oranına sahip bir ülke olmamıza rağmen, yapılan çalışmaların yetersiz olması, koşulların tüm bireyler için eşit olmaması, engellilerin kentte ve kamusal alanlarda rahatlıkla hareket edememesi gibi nedenler engelli olmanın getirdiği olumsuzlukları daha da üst seviyelere taşımaktadır. Engelli bireylerin diğer bireylerle eşit koşullarda yaşamlarını sürdürebilmesi, başka bireylere fiziksel bağımlılıklarının azaltılması, yapılı çevrenin onlar için de ulaşılabilir biçimde planlanması, tasarlanması ve uygulanmasıyla olacaktır. Bu duruma yönelik yasal mevzuat üzerindeki çalışmalar, 1990'da ABD'de Engelli Amerikan Yasası (ADA: The Americans With Disabilities Act) ve 1995'de İngiltere'de yürürlüğe giren Engelliler Ayrımcılıkla Mücadele Yasası (DDA: Disability Discrimination Act) ile yasal zeminde gerçekleştirlmiştir (Yılmaz F., Çakırer Özservet Y., 2013). Ülkemizde ise yasal mevzuat kapsamında engelliler için ulaşılabilirliğin sağlanmasına yönelik yapılan ilk yasal düzenleme 1997 yılında 572 sayılı Kanun Hükmünde Kararname ile 3194 sayılı İmar Kanunu'na ulaşılabilirlikle ilgili bir madde eklenmesiyle gerçekleşmiştir (Resmi Gazete, 1997).

Dezavantajlı grup olarak görülen özellikle fiziksel engelli kesimin toplum hayatına katılımı, oluşturulan yapay çevrenin uygun planlanması ve yapılması ile gerçekleşebilmektedir. Bu durumda ulaşılabilirlik önemli olmaktadır. Ulaşılabilirliğin ise iki temel başlığı; bilgi ve mesaja ulaşım ve fiziksel çevreye ulaşım olarak belirlenmiştir (BÖDB., 2011). Özellikle yaşam içerisinde gerekli olan faaliyetleri, engelli bireylerin bir diğer bireye ihtiyacı olmadan gerçekleştirebilmesi için fiziksel çevreye ulaşım önemli görülmektedir. Her bireyin konut dışı, eğitim, eğlence vb. Kamusal ihtiyaçları vardır. Bu gereksinimlere yönelik olarak kamu binaları ve yakın çevresinin ulaşılabilirliğinin sağlanması önemlidir. Yanlış, eksik yada yetersiz yapılan uygulamalar sebebi ile engelli bireylerin toplu kullanıma yönelik yapı ve yakın çevrelerinde problem yaşamaları kaçınılmazdır.

Topluma engelli bireylerin yeteri derecede katılımlarını, toplumun sosyal ve kültürel yapısının yanında özellikle fiziksel çevrenin yetersizliği de engellemektedir. Farklı engel grupları düşünülerek fiziksel çevrede olumlu değişimler yapılabilmektedir. Örneğin; görme engelliler için farklı dokularda yönlendirici zeminler, işitme engelliler için yine yönlendirici uyarı levhaları ve aydınlatma sistemleri, fiziki engeli olanlar için asansör, rampa vb yapısal düzenlemeler yapılması önemlidir. Bu yönde yapısal farkındalıklar olsa da mevcut durumdaki

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elemanlar, yapım ve planlamada yanlışlıklara ve eksikliklere sahiptir. Beklenen performans özelliklerini gösterememektedirler. Bu durumun kamu kurumlarının konuya göstermiş olduğu tutum ve bakış açısı ile olduğu kadar engellilere yönelik yapılacak düzenlemelerin maliyeti ve kaynağının nereden sağlanacağı gibi konulardan da kaynaklandığı düşünülmektedir. Yeni yapılan kamu yapılarında engelli ulaşımlarına yönelik yasal yaptırımlar uygulamaya koyulmuştur. Ancak mevcut yapı stoklarında engellilere yönelik fiziki oluşumların nasıl ve ne kadar maliyet ile yapılacağı konusunda net bilgiler mevcut değildir. Akademik ortamın konu üzerindeki çalışmaları da sınırlı olmaktadır. Çünkü akademik çalışmalarda teorik kısımlar yer almasına rağmen çözüme yönelik çalışmalar kısıtlı kalmıştır. Özellikle konunun maddi boyutu ve fiziki gereklilikleri konusunda bu yetersizlik kendini göstermektedir.

Bu çalışmada engelsiz tasarım uygulamaları kapsamında Erciyes Üniversitesi'nin, ortopedik engellilere yönelik, yapısal öğe ve bileşenin dış mekan uyumluluğu sorgulanarak, bu engel grubuna yönelik olarak yapılması gerekenler ortaya koyulmaya çalışılmış ve bunun sonucunda engelsiz mekanların yaratılması için Çevre ve Şehircilik Bakanlığı'nın 2017 birim fiyat listesi baz alınarak engellilere yönelik yapılacak yapı birimlerinin maliyeti çıkartılmaya çalışılmıştır.

Bu çalışmada; bir kamu ve eğitim kurumu olarak Erciyes Üniversitesi'nin sosyal amaçlı kullanıma yönelik olan tasarlanan yapıları inceleme alanı olarak tercih edilmiştir. Bu mevcut yapılada, engelliler için yapılması gerekli olan rampa, engelli asansörü, ve ıslak hacimlerin maliyet hesaplamaları çıkartılmaya çalışılmıştır. Böylece tüm kamu ve eğitim kurumu olan üniversitelerde engellilere yönelik yapılacak fiziki düzenlemelerin üniversitelerde maliyetinin ne olacağının hesaplanmasına yön gösterilemeye çalışılmıştır. Bu, örnek uygulama olarak Erciyes Üniversitesi sosyal kullanıma yönelik binalarında gerçekleştirilmiştir. Çalışmanın öncelikle kamu kurumlarındaki mevcut yapı stoklarındaki engellilere yönelik yapılacak fiziki düzenleme maliyetleri konusunda yardımcı olması umulmaktadır. Ayrıca konu üzerinde yapılacak yeni akademik çalışmalara temel teşkil etmesi açısından özendirici olması beklenmektedir.

Engellilere Yönelik Mekansal Düzenlemeler

Her birey yaşamının kısa da olsa bir kesitinde engelli adayıdır. Engelli kelimesi; sakat ve özürlü kelimelerinin yerine kullanılarak, insanlarda zamanla özürlü olma durumundan kurtulabilmeyi, düşüncelerde yumuşamayı sağlayan bir terim olarak kullanılmaktadır. Engelli doğum ile birlikte ya da herhangi bir olağan dışı durum sonucunda beden, zihin, ruhsal, duygusal ve sosyal aktivitelerinde farklı düzeylerde kayıplar olan ve bu sebeple günlük yaşama uyum sağlamakta problem yaşayan ve dahi destek hizmetlere gerek duyan birey olarak tanımlanmaktadır (Koca D., Yılmaz M., 2017). BM'in tanımına gore engelli; "*Normal bir kişinin kişisel ya da sosyal yaşantısında kendi kendisine yapması gereken işleri, bedensel veya ruhsal yeteneklerindeki kalıtımsal ya da sonradan olma herhangi bir noksanlık sonucu yapamayan*" olarak tanımlanmıştır (BM, 2007). Birleşmiş Milletler (BM) Engellilerin İnsan Haklarına Dair Sözleşme 2007'de imzaya açılmıştır (BM., 2007). Türkiye ise 2008'de onaylamış ve 2009'da yürürlüğe koymuştur. Dünya Sağlık Örgütü ise engelli tanımını Noksanlık (Impairment), Özürlülük (Disability), Maluliyet (Handicap) olarak ele almış ve hastalık sonuçlarına dayanan, sağlık yönünü ön plana çıkaran bir tanımlama ve sınıflama yapmıştır (WHO., 2017).

Dolayısı ile her kurumun yaklaşımına gore tanımlama farklıdır. Tüm tanımlamalardan engelli kişilerin özgürlükleri ve doğal yaşamlarının kısıtlanması sonucu çıkarmak mümkündür. Yaşamın gerçekleştiği doğal ve yapay çevrenin engellilere yönelik olarak mekansal düzenlemelerinin yapılması ile bu durumun kolaylaştırılması ve her bireyin eşit olarak eğitim, kamu ve sosyal imkanlardan yararlanmalarının sağlanması önemlidir. Bireylerin özgürlüklerini kısıtlayan mekansal düzenlemelerin giderilmesi konusunda yapılacak çalışmalara kamu ve üniversite yapılarında ihtiyaç vardır. Yapılacak fiziki mekan planlamalarının hayata geçirilmesi elbette maliyeti de beraberinde getirecektir. Ancak tek bir kişi bile olsa hareket kısıtlılığının giderilip tüm bireylerle eşit imkanlarda olması çağdaş yaşamın önemli bir konusudur.

Engelli bireyler de eğitim, sosyal ve kamu mekanlarından yararlanmak durumundadır. Engelli bireylerin fiziki mekanlardaki ihtiyaçları ise engel durumuna göre farklılık göstermektedir. Bu çalışma kapsamında tekerlekli sandalyedeki engellilere (ortopedik) yönelik olarak Erciyes Üniversitesi'deki yapısal öğe ve bileşenin dış mekan uyumluluğu sorgulanarak, bu engel grubuna yönelik olarak yapılması gerekenler ortaya koyulmaya çalışılmıştır. Kamunun mevcut yapı stoklarına engelliler için gerekli düzenlemelerin yapılmasındaki sorunlardan olan inşa edilecek olan yapı elemanlarının maliyeti olarak görülmektedir. Çünkü hemen her binaya yeni elemanlareklenmesi kamuya maliyet açısından yük getireceği düşünülmektedir. Bu çalışma ile bu maliyetin ne kadar olacağı ortaya koyulmaya çalışılmıştır. Maliyet hesabında ise Çevre ve şehircilik Bakanlığı'nın 2017 birim fiyat listesi temel alınmıştır. Çalışmanın maliyet aşamasından önce ise engelliler için yapılacak düzenlemelerde dikkat edilecek hususlara bu bölümde değinilmiştir.

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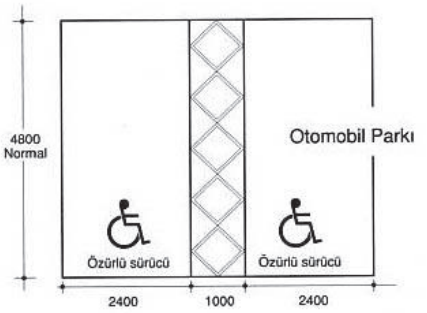
Türkiye'de engellilere yönelik mekansal düzenlemelerde, uluslararası uygulama esasları dışında, imar kanunu, imar yönetmelikleri ve Mimarlar Odası'nın belirlemiş olduğu yasal standartlar mevcuttur. Bu düzenlemelerde yapı içi erişim olduğu kadar yapı çevresinden binaya ulaşım için de düzenlemeler bulunmaktadır. Çalışmaya konu olan ortopedik ve görme engellire yönelik olarak mimari düzenlemeler ve bu düzenlemelerin tasarımları yapılırken dikkat edilmesi gereken yapısal boyutları vardır.

Ortopedik bir engellinin, başka bir kişinin yardımına ihtiyacı olmadan, otoparktan bina giriş kapısına yöntmeliğe gore maksimum 50 m.'de ulaşması gerekmektedir. Otoparkların % 2 lik kısmı engelli sürücülerin araçlarına ayrılmalı ve Engelli otomobili için 350 x 500 cm genişliğinde bir park yeri bırakılmalıdır Şekil 1, Foto 1). Binaların girişi ise doğrudan erişime uygun olmalı ve tekerlekli sandalye için yeterli haraket alanı bulunmalıdır (izmimod, 2017). Rampa eğimleri %5 ile %10 arasındadır (Şekil 2, Foto 2). Eğer rampanın uzunluğu 6 m.'den fazla ise 150 cm'lik bir ara sahanlık planlanmalıdır. Genişliği ise 130 cm'nin altında olmamalıdır (izmimod, 2017)

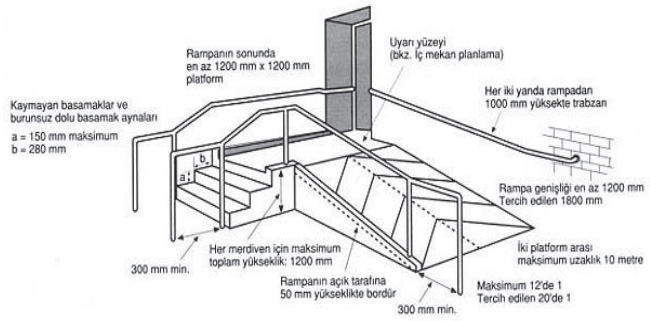


Şekil 1. Engelli otoparkı ölçüleri (izmimod, 2017)

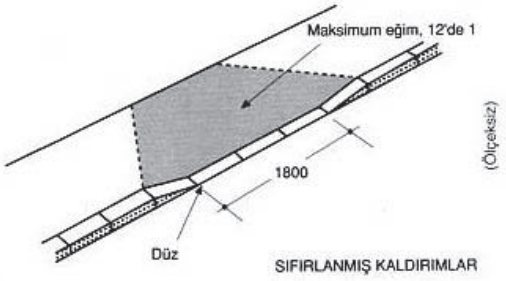


Foto 1: Engelli otoparkı (bursa.com, 2017)

Ülkemizde büyük problem olan ve normal bireylerin bile çıkmakta zorlandığı kaldırım düzenlemeleri vardır. Kaldırıma araç parkını engellemek için yüksek yapılan kaldırımlar ile karşılaşılmaktadır. Yönetmelikte verilen kaldırım yükseklikleri 6-15 cm arasında olmalı ve tekerlekli sandalyenin çıkabilmesi için kaldırımların uygun yerlerine rampalar yapılmalıdır (izmimod, 2017). Bu giriş noktası önüne başka araçların park etmemesi için dubalar ile engeller konulmalı geçiş sağlanmalıdır. Rampa eğimleri %8 civarında alınmalıdır. Kaldırım rampalarının genişliği 140 cm yapılırsa yan yana yürüyen iki insanın da buradan geçmeleri sağlanmış olur (Şekil 3, Foto 3).



Şekil 2. Bina girişi engelli rampası (izmimod, 2017)



Şekil 3. Kaldırım engelli rampası (izmimod, 2017)

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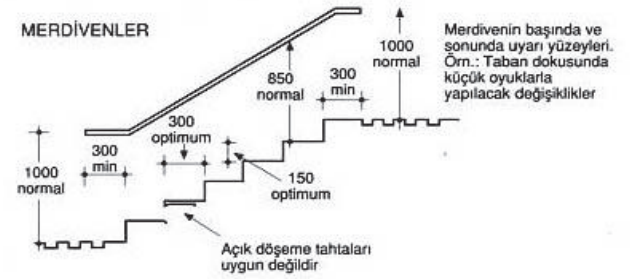
Foto 2: Bina girişi engelli rampası (lamaisondestravaux, 2017)

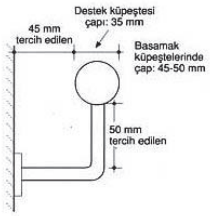


Foto 3: Kaldırımda engelli rampa (ada.ashdownarch 2017)

İç mekanlarda ise tüm mekanların kot farkı yapılmadan tek seviyede planlanması ve inşa edilmesi önemlidir. Giriş kapıları, asansör girişleri, erişebilir alanlar seviye farkının bulunmaması gereken bölümlerdir. Değişen kot farklarında ise yukarıda da belirtilen boyutlarda rampalar kullanılmalıdır. Ayrıca ortopedik engelli olmayıp ta farklı engel türü olan bireyler için merdivenlerde gerekli düzenlemeler yapılmalıdır. Tek ve düz kollu ve sahanlıklı merdivenler, engelli kullanımı için önemlidir (Şekil 4., Foto 4.). Özellikle döner merdivenler engelli kişiler için problem kaynağıdır (izmimod, 2017). Merdivenlerde basamak genişliği 280-300 mm, basamak yüksekliği 150-160 mm olmalıdır. Küpeştenin merdivenin her iki tarafına koyulması gerekir ve yüksekliği 90 cm 4 cm çapında dairesel kesitli bir küpeşte tercih edilmelidir (Şekil 5., Foto5.)(izmimod, 2017).



Şekil 4. Merdivenler (izmimod, 2017)



Şekil 5. Küpeşte (izmimod, 2017)

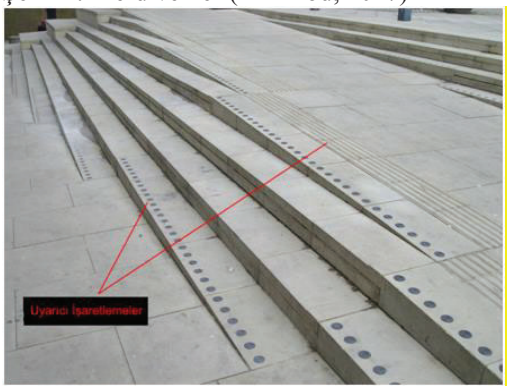


Foto 4: Engelli düzenlemesi olan merdivenler (engelsizkent, 2017)



Foto 5: Küpeşte (engelsizpusula, 2017)

Asansör düzenlemelerinde ise asansörün kapısına kadar basamaksız ve eşiksiz ulaşım sağlanmalıdır (Şekil 6., Foto 6.). Asansörlerdeki kumanda düğmelerinin tekerlekli sandalyedeki insanın da uzanabileceği yüksekliğe konulması gereklidir (Şekil 7., Foto 7.) (izmimod, 2017).

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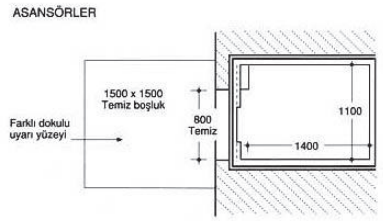
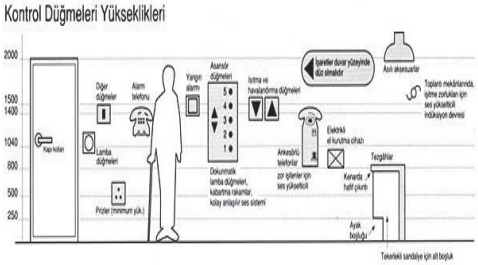


Şekil 6. Engelli asansörü boyutu (izmimod, 2017)



Şekil 7. Kontrol düğmeleri (izmimod, 2017)



Foto 6: Engelli asansörü (gumusasansor, 2017)



Foto 7: Kontrol düğmeleri (abc, 2017)

İç mekanlarda yüzey malzemeleri de önemli olduğu için yasal mevzuatta yer almaktadır. Özellikle malzemelerde göz kamaştırıcı seçimler yapılmamalıdır. Zemin en önemli yapı elemanı olarak görülmektedir. Zemin kaplama malzemeleri karmaşık olmamalı, ıslak ve kuru iken kaygan olmamalı, su ve hava yalıtımlı olmalı ve zeminlerde ani kot değişikliklerinden kaçınılmalıdır. Mekanlar arasında da eşik bulunmamalıdır. Her türlü renk, kot, doku değişikliklerine karşı ışıklandırma, farklı renklendirme ve doku ile uyarılar yapılmalı ve duvar yüzeylerinde de ani değişikliklerden kaçınılmalıdır (izmimod, 2017). Bina girişlerinde, bina iç ve yakın çevresinde, asansörlerde, ıslak hacimlerde, otoparklarda engellilere yönelik işaretlemeler de yapılmalıdır (izmimod, 2017).

Hiçbir engel olmadan bir tekerlekli sandalyenin dönüş çapının 150 cm olduğu dikkate alınarak iç mekan düzenlemeleri gerçekleştirilmelidir. Iki mekan arasında geçişi sağlayan kapılarda da tekrarlekli sandalyenin boyutları önemli olmaktadır. Kapılar temiz ölçüde en az 80 cm olarak ülkemizde belirlenmiş olsa da Alman normlarına göre temiz geçiş açıklığı en az 90 cm'dir (izmimod, 2017). Engelli kişilein hastalanma durumarı olabileceği göz önünde bulundurularak geniş ölçünün tercih edilmesi önerilmektedir.

Çalışmanın bu bölümünde engellilere yönelik mekânsal organizasyonlarda yasal mevzuatta da yer alan ve dikkat edilmesi gereken planlamalara yer verilmiştir. Bu çalışmada iki engel durumu belirlenmiştir. Bunlar tekerlekli sandalye kullanmak zorunda olan veya olmayan ortopedik engellidir. Bu grup için de mevcut yapı stokunda düzenlemeler gidilmesi ve yukarıda bahsi geçen planlamalardan bu engel gruplarına yönelik olarak yapılacak inşaatın maliyeti çıkarılmaya çalışılmıştır.

Yöntem

Bu çalışma kapsamında Tekerlekli Sandalyedeki Engellilere yönelik olarak Erciyes Üniversitesi'deki mevcut durum ve bu engel grubuna yönelik olarak yapılması gerekenler ortaya koyulmaya çalışılmıştır. Burada bir kamu kurumu olarak üniversitenin sosyal merkezlerinde yer alan ana kullanımda bulunan yapıları seçilmiştir. Çünkü bu yapıların kullanım yoğunluğu fazladır. Bu yüzden engellilere yönelik çalışmaların yoğun olarak yapılacağı yapay çevrelerdir. Erciyes Üniversitesi içerisinde 10 ana yapı belirlenmiş ve bu yapılarda yapılması gerekli olan ve bu çalışma ile önerilen rampa, engelli asansörü, ve engelliler için gerekli olan ıslak hacimler için maliyet çıkartılmaya çalışılmıştır. Maliyetler Çevre ve Şehircilik Bakanlığı'nın 2017 birim fiyat listesi baz alınarak yapılmıştır. Bazı özel üretim olarak gerçekleştirilen engellilere yönelik uygulamalarda ise firma bazında maliyet belirlenmiştir.

Çalışmda, belirlenen sosyal amaçlı kullanılan yapıların engellilere yönelik olarak mekansal analizi yapıldı ve mevcut durumu dijital ortamda arşivlenerek belirlendi. Mevcut durum üzerinden eksiklikler ve yapılması

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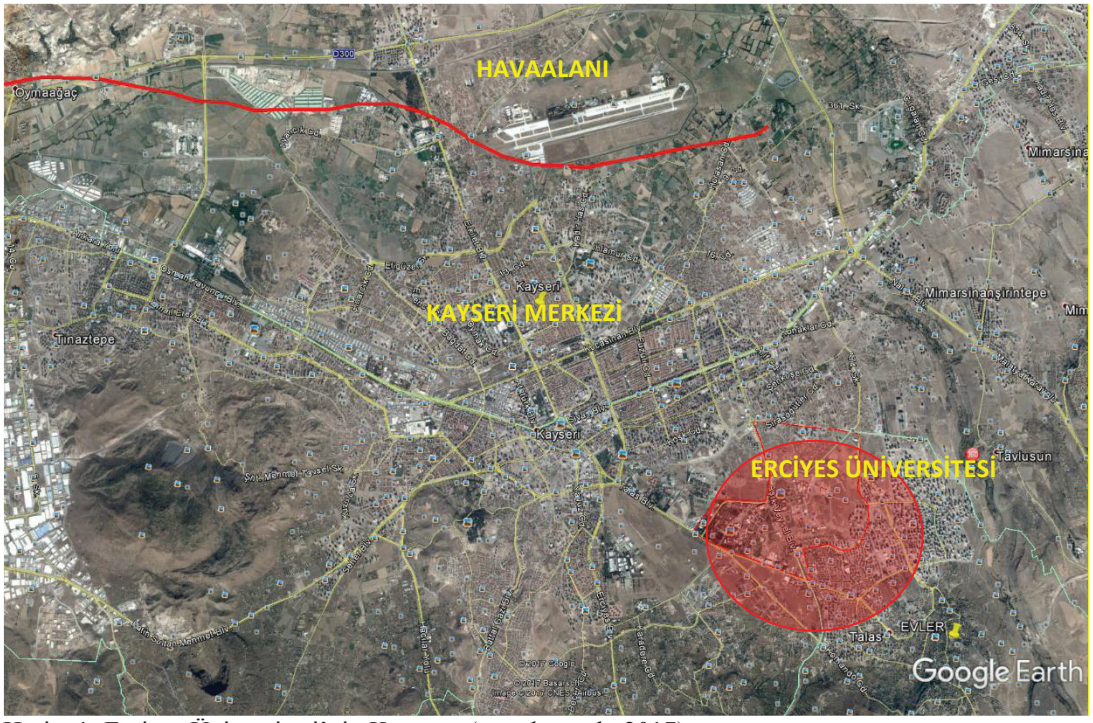
gerekenler ortaya koyuldu. Engellilere yönelik olarak yapılacak olan yapı elemanlarının durumuna gore yapım işlemleri ve malzemesi belirlendi. Bu belirlemeler sonucu oluşturulacak elemanın maliyet hesapları çıkartılmıştır.

Erciyes Üniversitesi'nde Belirlenen Yapılarda Mevcut Durum

Erciyes Üniversitesi Kayseri kent merkezine yakınlığı, diğer kentlerle olan ana ulaşım aks bağlantılarından rahat ulaşımı ile tüm bölgenin eğitim-öğretim ve sağlık fonksiyonlarında tercih edilen bir üniversitedir. Akademik alandaki çoğu konuda dünya ve Türkiye sıralamalarında yer almaktadır. Farklı yerleşkelieri bulunan Erciyes üniversitei'nin ana kampusu ise Kayseri-Talas ana ulaşım aksında yer almaktadır (Harita 1). Kampuse toplu ulaşımarda otobüs ve raylı sistem aktif kullanılmaktadır. Bu durum ile birlikte kampus içerisi ulaşımda toplu ulaşım için durak noktaları fazla olmaktadır. Her eğitim, sosyal ve idari binaya ulaşım araçla ve yaya olarak sağlanabilmektedir. Erciyes Üniversitesi'ne dışardan ulaşım ve üniversite içi ulaşım rahat olmasına rağme üniversite içerisinde engellilere yönelik ulaşım uygulamalarında problemler görülmektedir.

Erciyes Üniversitesi merkez kampusu içerisinde eğitim-öğretim, idari, sosyal lojman ve kreş vb amaçlı kullanılan toplam 77 bina bulunmaktadır. Bu yapılardan 67'sinde idari ve eğitim hizmetleri gerçekleştirilmektedir. Bu binalardan 62'si birden fazla kata sahiptir (engelsiz.erciyes, 2017).



Harita 1: Erciyes Üniversitesi'nin Konumu (google earth, 2017)

Üniversite bünyesinde farklı birimlerde eğitim alan ve bildirilen 162 engelli öğrenci bulunmaktadır (engelsiz.erciyes, 2017). Mevcutta Engelliler için yapılan uygulamalarda görme engelli bireyler için hissedilebilir zemin uygulaması üç binada yapılmıştır. Mevcut binaların 62'si birden fazla kata sahiptir ve birden fazla katlı binalarda bulunan asansör sayısı 62 ve bunların üç tanesi sesli uyarı sistemine sahiptir. Tekerlekli sandalye kullananlar için rampa vb. fiziksel düzenlemeler yapılan 33 bina ve standarda uygun engelli tuvaleti bulunan 49 bina vardır. Ayrıca İşitme engelliler için indüksiyon döngü-iyi duyma sistemleri kurulu üç bina bulunmaktadır (engelsiz.erciyes, 2017). Bu yapılardaki engellilere yönelik uygulamaların hepsinin yeterliliği ve mevzuata uygunluğu tartışılabilmektedir.

Erciyes Üniversitesi Merkez kampus içerisinde incelemeye konu olan sosyal amaçlı kullanıma sahip mevcut yapı ve yakın çevresinde engelli bireyler için yapılan uygulamlar vardır. Erciyes üniversitesi Sürekli Eğitim Merkezi (ERSEM) binası girişinde giriş merdivenleri ve sahanlığının yanından tekerlekli sandalye için bir rampa eklenmiştir (Foto 8). Öğrencilerin özellikle ders çalışma amaçlı olarak daha çok tercih ettikleri Kütüphane ve Dökümantasyon Daire Başkanlığı binası girişinde yine rampa mevcuttur (Foto 9). Kütüphanedeki rampa , eğim ve

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korkuluk çözümleri ile otoparktan mekan içine girişi sağlıyabildiği ancak yapılan çalışmada kütüphanede engelliler için ayrılmış özel otopark yeri ve işaretçilerinin olmadığı görülmüştür. Her iki binanın girişinde düzenlenmiş olan bu rampaların eğimlerinin birbirinden çok farklı olması dikkat çekicidir. Üniversite yapılarınada bile mevzuat dışı ve yerine göre uygulama yapıldığının açık örneğidir. Her ikisinde de kullanılan kaplama malzemeleri tekerlekli sandalyenin ulaşımını zorlaştırıcı yapıya sahiptir. ERSEM binasının girişi kuzeyden sağlanmaktadır. Kış aylarında soğuk iklim koşulları ve kuzeyde girişin olması sebebi ile engelli rampasının kullanımı daha da zorlaşmaktadır.

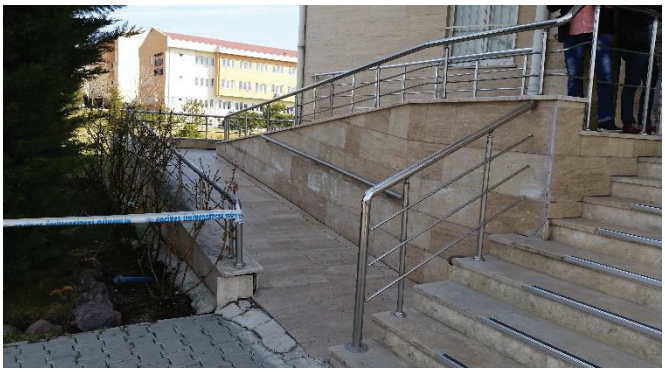

Foto 8: ERSEM binası giriş engelli rampa uygulaması (Yıldırım, 2017)



Foto 9: Kütüphane binası giriş engelli rampa uygulaması (Yıldırım, 2017)

Kampus içerisinde öğrencilerin en çok kullandığı yer olan eski Mediko-Sosyal binası yeni adı ile Öğrenci İşleri binasında farklı bir uygulama mevcuttur. engellilere yönelik ayrılan park yerinin hemen karşısında yapıya ulaşabilmek için rampalar tercih edilmemiştir. Bunun yerine engelli asansörü uygulaması gerçekleştirilmiştir (Foto 10). Otoparkta ise engellilere ayrıaln alan en kısa mesafede asansöre ulaşın sağlandığı alan olarak belirlenmiştir (Foto 11). Modern bir yaklaşım olarak nitelendirilebilecek uygulamarı görmek sevindiricidir. Ancak Kayseri gibi kışların soğuk, kar yağışlı olduğu yerlerde mekanik sistemlerin dış ortamda sağlıklı çalışmasını sağlamak problem olarak görülmektedir. Bu sistem rampaya göre kolaylaştırıcı olmasına rağmen maliyeti de yüksektir. Mediko Sosyal Binasının bazı eksiklikleri olmasına rağmen ortopedik engelli bireyler için ulaşım bakımından donatısı mevzuata göre güncellenen bir bina olduğu göstermektedir.



Foto 10: Öğrenci işleri binası girişi engelli asansörü (Yıldırım, 2017)



Foto 11: Öğrenci işleri binası girişi engelli asansörü (Yıldırım, 2017)

Kampus içerisinde kullanım yoğunluğu fazla olan bir diğer yapı ise merkez yemekhanedir. Öğrenci ve personelin aynı anda kullandığı binanın iki grup kullanıcı için aynı yerden binaya yaklaşımı bulunmaktadır. Yapının güney cephesinde iki farklı girişten yemekhanelere ulaşılmaktadır. Bu durum hem personelin hem de öğrencilerin kullanabileceği tek bir engelli rampası eklenmesi yeterli görülmüştür (Foto 12). Rampa kaplama malzemesi

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kaygan yüzeye sahip olmasına rağmen malzemenin uygulamasında yapılan detay ile kayma engellenmiştir. Ayrıca girişin güney yönünde yer alması ile rampada soğuk iklim koşullarına oluşabilecek buzlanma problemi bir nebze çözülmüştür. Bu rampanın eğiminin ise yönetmelikler açısından tekrar ele alınması gereklidir.

Erciyes Üniversitesi lojmanları binalarında da engelli bireylere yönelik rampalar bulunmaktadır. Bu ampaların kullanışsızlığı sözkonusudur. Kış aylarında kuzeye bakan bina girişine ulaşan bu rampalarda kaymayı önlemek amaçlı tekstil malzemeler kullanılımştır (Foto 13). Tekerlekli andalyenin dönüşü için zor olan köşelerde yer alan bu rampaların eğimlerinin de birbirinden farklı olduğu anlaşılmaktadır (Foto 13).

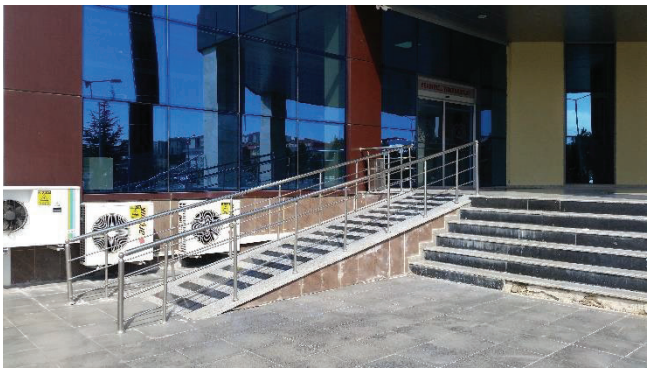

Foto 12: Yemekhane binası girişi engelli rampası (Yıldırım, 2017)



Foto 13: Lojmanlar binası girişi engelli rampası (Erkman, 2017)



Foto 14: Lojmanlar binası girişi engelli rampası (Erkman, 2017)

Burada yerinde incelenen üniversite bünyesindeki binaların beşinde görülen sorunun diğer tüm binalarda görüldüğünü söylemek mümkündür. Rampaların eğimleri duruma ve yerine göre farklılık göstermektedir. Rampalarda kullanılan kaplama malzemesi kaygan ve kış koşullarında daha da kaygan olan malzemelerden yapılmıştır. Rampa kenarlarında küpeşte uygulaması yetersiz ya da yoktur. Bina girişleri kuzey yönünde ise rampaların kullanımı zorlaşmaktadır. Bu olumsuzlukların bir üniversite kampusu içerisinde yer alan binalarda görülmesi, konunun diğer toplu kullanıma yönelik binalardaki vehametini hatırlatmaktadır. Öncelikle topluma yol göstericci olan eğitim-öğretim kurumlarının en üst düzeyinde bulunan uygulamaları düzelmesi ve mevzuata uygun yapımların gerçekleşmesi önemli görülmektedir.

Erciyes Üniversitesi'nde Çalışmaya Konu Olan Binalarda Belirlenen Engel Grubuna Göre Yapılacak İnşanın Maliyeti

Bu çalışmada Erciyes Üniversitesi Merkez Kampüsünde bulunan ortak kullanıma açık olan mekanlardan; Merkez Öğrenci Yemekhanesi, Öğrenci Yemekhanesi ve Personel Yemekhanesi, Süleyman Demirel Kapalı Spor Salonu, Kütüphane ve Dökümentasyon Daire Başkanlığı, Mediko Sosyal Merkezi, Sabancı Kültür Sitesi, Sürekli Eğitim Merkezi, Kapalı Yüzme Havuzu, Lojmanlar ele alınmıştır.

Bu binaların engelli bireyler için mevcut durumu incelenmiştir (Tablo 1-2). İncelemeler doğrultusunda yürüme engellilere yönelik çalışmaların kısmen yapıldığı veya hiç yapılmadığı düzenlemelere rastlanmıştır. Mevcut durumdaki karmaşa göz önüne alınarak bahsi geçen binalara yapılacak uygulamalar ve maliyetleri çıkarılmıştır.

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Çevre Şehircilik Bakanlığı'nın birim fiyat listesi ve yönetmelikler gereği yapılması gerekli elemanların ölçüleri maliyet hesaplamada kullanılan ana veriler olmuştur.

Incelenen binalarda mevcutta bina girişlerinde rampalar olduğu görülmüştür. Süleyman Demirel Kapalı Spor salonunun rampası olmadığı ve girişinde kot farkı veya herhangi bir kat daha olmadığı için rampaya ihtiyaç olmadığı düşünülmektedir. Öğrenci yemekhanesinde ise yine rampa olmadığı ancak bu binada bir adet rampa ihtiyacı olduğu tespit edilmiştir. Bina içerisinde ise sadece Sabancı Kültür Sitesi'nde mevcut bir rampa olduğu ve bir diğer rampaya daha ihtiyaç olduğu tepit edilmiştir. Yapılardaki asansör durumu incelenmiştir. Ele alınan binalardan kütüphane ve lojmanlarda toplanm 5 adet asansör olduğu ve Süleyman Demirek kapalı spor salonu, sabancı kültür sitesi ve ERSEM binalarına olmak üzere toplam üç asansör ihtiyacı olduğu belirlenmiştir. Engelli wc ve lavabolarında ise eksikliğin fazla olduğu görülmektedir. Mecutta kütüphanede bir havuzda iki adet vardır. Yemekhalere toplamda 12 adet, kapalı spor salonuna 2, öğrenci işlerine 2, ERSEM'e 2 ve Sabancı kültür Sitesine 1 adet olmak üzere toplamda 19 engelli lavabo_wc'ye ihtiyaç bulunmaktadır .

Tablo 1: Belirlenen Binalarda Mevcut Ve İhtiyaç Olan Rampa, Asansör Wc Durumu

Mevcut Durum Ve İhtiyaç Listesi	Bina Girişi Engelli Rampası		Bina İçi Engelli Rampası		Asansör		Engelli Tuvalet & Lavabo	
	Mevcut (adet)	İhtiyaç (adet)	Mevcut (adet)	İhtiyaç (adet)	Mevcut (adet)	İhtiyaç (adet)	Mevcut (adet)	İhtiyaç (adet)
Öğrenci Yemekhanesi (Alt) 320	0	1	0	0	0	0	0	4
Öğrenci Yemekhanesi	1	0	0	0	0	0	0	4
Personel Yemekhanesi Süleyman Demirel Kapalı Spor Salonu	1	0	0	0	0	0	0	4
Kütüphane Ve Dokümasyon D.B.	0	0	0	0	0	1	0	2
Öğrenci İşleri	4	0	0	0	1	0	1	0
Sabancı Kültür Sitesi 60	0	0	0	0	0	0	0	2
Sürekli Eğitim Merkezi (ERSEM)	4	0	1	1	0	1	1	1
Havuz	1	0	0	0	0	1	0	2
Lojmanlar (4 Blok)	1	0	0	0	0	0	2	0
	4	0	0	0	4	0	0	0
TOPLAM	**16**	**1**	**1**	**1**	**5**	**3**	**4**	**19**

Bina yakın çevrelerinden yapıya ulaşmak engelli kişiler için önemlidir. Engelli bireyler için düzenlenen araç park durumu seçilen binaların yakın çevresi için mevcut ve ihtiyaç olan olarak ele alınmıştır. Öğrenci işleri binasında mevcuttta yeterli park yeri olduğu için engelli parkına ihtiyaç bulunmamaktadır. diğer binaların hepsinde engelli park yerine ihtiyaç vardır. Toplamda 22 adet engelli parkı düzenlemesi yapılması gereklidir. İncelenen binaların hiç birinde engelli bireyler için kullanışlı olduğu bilinen merdiven kenarı engelli asansörü bulnmamaktadır. Bu donatının tabloda da belirtilen binalarda toplamda 6 adet olarak yapılması önerilmektedir (Tablo 2). Ortopedik engelliler için gerekli olan donatılar için yapılacak olan yapı elemanlarının yapım maliyetinin miktarını belirlemekte mevcut durumun tespiti ve ihtiyaç olan elemanların durumu hesaplanmıştır (Tablo 2).

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Tablo 2: Belirlenen Binalarda Mevcut Ve İhtiyaç Olan Engelli araç park yeri, merdiven kenarı engelli asansörü ve görme engelli işaretçilerinin Durumu

Mevcut Durum Ve İhtiyaç Listesi	Engelli Araç Park Yeri		Merd. Kenarı Engelli Asn.	
	Mevcut (adet)	İhtiyaç (adet)	Mevcut (adet)	İhtiyaç (adet)
Öğrenci Yemekhanesi (Alt) 320	0	2	0	1
Öğrenci Yemekhanesi	0	2	0	1
Personel Yemekhanesi	0	2	0	1
Süleyman Demirel Kapalı Spor Salonu	0	2	0	0
Kütüphane Ve Dokümasyon D.B.	0	2	0	0
Öğrenci İşleri	4	0	0	2
Sabancı Kültür Sitesi 60	0	4	0	1
Sürekli Eğitim Merkezi (ERSEM)	0	2	0	0
Havuz	0	2	0	0
Lojmanlar (4 Blok)	0	4	0	0
TOPLAM	**4**	**22**	**0**	**6**

Kampusun alt kısmında bulunan öğrenci yemekhanesi, öğrenci yemekhanesi, personel yemekhanesi, Süleyman Demirel Kapalı Spor Salonu, Kütüphane, Mediko Sosyal Merkezi, Sabancı Kültür Merkezi, Sürekli Eğitim Merkezi Ersem, Havuz ve Lojmanların her biri için engelli bireylere yönelik imalatlar rampa, engelli wc, hareketli bant, engelli otoparkı ve olarak belirlenmiştir. Bu uygulamalar, binaların ihtiyaçlarına göre ayrılarak her bina için yapılması gerekli işlemlerin neler olduğu, miktarı, birimi, birim fiyatları ayrı ayrı hesaplanmıştır. Belirlenen bu imalatlar içerisinde yapılması gerekli işlemler ve malzemeler sıralanmıştır. Buna göre; rampa için El ile sert küskülük kazılması, Ahşaptan seri kalıp yapılması, Hafif agrega (elenmiş kömür curufu) ile dolgu yapılması, C 20/25 beton harcı, C 25/30 beton harcı, Nervürlü çelik hasırın yerine konulması 1,500-3,000 kg/m2, 3x30x30 cm Bazalt taşı plak, 2x30x30 cm Bazalt taşı plak, Alüminyum Paslanmaz Korkuluk olarak işlemler ve malzemeler belirlenmiştir. Engelli wc için, 0018100 Bedensel Engelli Klozet + Rezervuar, 017100-u Bedensel Engelli Lavabo 60 cm, 9AD0751010 Lavabo için Duvara Sabit Tutunma Barı (Duvar-Duvar) 60 cm, 9AD0751010 Klozet için Duvara Sabit Tutunma Barı (Duvar-Duvar) 60 cm işlemler ve malzemeler belirlenmiştir. Harekteli bant için; Merdiven Kenarı Engelli Asansör Bant belirlenmiştir. Engelli otoparkı için; 60x120 cm, 0,60 mm kalınlığında, galvanize sacdan mamul deliklisiz plaka, Brüt beton, sıvalı veya eski boyalı yüzeylere, astar uygulanarak akrilik esaslı su bazlı boya yapılması, Esnek Refüj Başı Tabelası, Engelli Park Yeri - 25x35 cm Sticker (Yapışkanlı) olarak belirlenmiştir. Bu malzeme ve imalatlar için ÇŞB'nın poz numaraları baz alınarak imalat cinsine, imalat açıklamasına, birimine ve miktarına göre maliyet çıkarılmıştır.

Tablo 1 ve 2 de ihtiyaç olan ve miktarı belirlenen yapı elemanlarının maliyet hesabında yapılması gerekli imalat durumu ve tutarı hesaplanmıştır (Tablo 3). Belirlenen binalardan her biri için ayrı ayrı imalatta cinsi belirlenmiştir. Bular; rampa, engelli wc (klozet + lavabo + tutunma barları), merdiven kenarı engelli asansör bant, engelli otoparkı çalışması ve iyileştirmesi olarak detaylandırılmıştır. Bahsi geçen iş kalemleri için öğrenci yemekhanesi binasına 16.358,65+A TL, Öğrenci Yemekhanesi binasına 3.215,30 TL, personel Yemekhanesi binasına 3.215,30 TL, Süleyman Demirel Kapalı Spor Salonu binasına 1.724,72 +B TL, Kütüphane binasına 234,14 TL, Öğrenci Merkezi binasına 1.538,23 TL, Sabancı Kültür Merkezi binasına 2.035,66+B TL, Sürekli Eğitim Merkezi (Ersem) binasına 1.724,72+B TL, Havuz binasına 234,14 TL, Lojmanlar (4 adet) binalarına 420,63 TL olmak üzere toplamda 30.701,49+A+3B TL maliyet bulunmuştur (Tablo 3). Burada verilen A değeri öğrenci yemekhanesi merdiven kenarı engelli ve asansörü bantları için değişken, B değeri ise Süleyman Demirel kapalı spor salonu, Sabancı Kültür merkezi ve ERSEM için engelli asansörü yapım maliyetine değişken olarak belirlenmiştir. Bu A ve B değişkenleri de toplam maliyete eklenecek değerlerdir. Ancak firma bazlı değerler olduğu için ve yerinde ölçümlerde hata olma durumu göz önüne alınarak ek değer olarak verilmesi uygun görülmüştür.

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Tablo 3: Belirlenen Binalarda Yapılacak Yürüme Engellilere Yönelik İmalatlar Ve Maliyetleri

ÖĞRENCİ YEMEKHANESİ (ALT)	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Rampa	13.143,35 ₺
	2	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	2.981,16 ₺
	3	Merdiven Kenarı Engelli Asansör Bant	A
	4	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**16.358,65 ₺**
ÖĞRENCİ YEMEKHANESİ	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	2.981,16 ₺
	2	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**3.215,30 ₺**
PERSONEL YEMEKHANESİ	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	2.981,16 ₺
	2	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**3.215,30 ₺**
SÜLEYMAN DEMİREL KAP. SPOR. SALONU	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	1.490,58 ₺
	2	Engelli Asansörü	B
	3	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**1.724,72 ₺**
KÜTÜPHANE	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**234,14 ₺**
MEDİKO SOSYAL (ÖĞRENCİ MERKEZİ)	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	1.490,58 ₺
	2	Engelli Otoparkı Çalışması ve İyileştirmesi	47,65 ₺
		ARA TOPLAM	**1.538,23 ₺**
SABANCI KÜLTÜR MERKEZİ	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Rampa	869,74 ₺
	2	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	745,29 ₺
	3	Engelli Asansörü	B
	4	Engelli Otoparkı Çalışması ve İyileştirmesi	420,63 ₺

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		ARA TOPLAM	**2.035,66 ₺**
SÜREKLİ EĞİTİM MERKEZİ (ERSEM)	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Wc (Klozet + Lavabo + Tutunma Barları)	1.490,58 ₺
	2	Engelli Asansörü	B
	3	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**1.724,72 ₺**
HAVUZ	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Otoparkı Çalışması ve İyileştirmesi	234,14 ₺
		ARA TOPLAM	**234,14 ₺**
LOJMANLAR	**Sıra No**	**İmalatın Açıklaması**	Tutar
	1	Engelli Otoparkı Çalışması ve İyileştirmesi	420,63 ₺
		ARA TOPLAM	**420,63 ₺**
		GENEL TOPLAM	**30.701,49 ₺**

SONUÇ

Engelli bireylerin günlük hayatlarını kolaylaştıracak ve sunulan hizmetlere erişim eşitliğini arttıracak uygulamaların hayata geçirilmesi önemlidir. Devletin görevi bu eşitliği sağlamak ve bu yönde çalışmalar gerçekleştirip yatırımlar yapmaktır. İlk uygulama alanları ise kamu hizmeti veren yapılar olacaktır. Eğitim, sağlık vb kamuya açık kullanımlarda eşitlik önemlidir. Eğitim, özellikle toplum içerisinde eşitliğin ulaşılabilirliğin olduğu yapılarda gerçekleşmelidir. Toplum için öncü bireylerin yetişmesinde etkin olan üniversitelerin eğitim yapıları arasında önemli yeri olmaktadır. Engelli bireyler için de öncülük yapacak olan eğitim yapılarındaki fiziki düzenleme diğer kamu yapılarına örnek teşkil edecektir. O zaman engelli bireylerin eğitim haklarını kullanabilmelerine yönelik fiziki mekân düzenlemelerine üniversitelerden başlamak önemlidir. Üniversitelerin mevcut yapı stoklarına bulunmayan veya uygun olmayan engellilere yönelik düzenlemelerin standartlarda yapılması önemlidir. Ancak bu kadar mevcut yapıya engelliler için yapılacak düzenlemelerin maliyeti, yapım işinin ertelenmesine sebep olmaktadır. Üniversitelerin Yapı işleri birimlerinin farklı çalışmaları ve akademik ortamda kalan uygulamaya geçirilemeyen çalışmalar bulunmaktadır. Bu çalışmaların bir araya gelmesi ve ortaya somut bir veri koyulduğu da mevcutta görülmemiştir. Özellikle engellilere yönelik yapılacak düzenlemelerin maliyeti konusunda akademik bir çalışma bulunmamaktadır. Bu çalışma kapsamında Erciyes Üniversitesi'nin yoğun kullanımda olan binalarının yürüme engellilere yönelik düzenlemeleri ve eksiklileri incelenmiş, yapılması gereken işlemler ve bu işlemlerin maliyeti çıkarılmıştır.

Erciyes Üniversitesi'nin 10 adet sosyal merkez olarak görülen binalarında ortopedik engelliler için baştan yapılacak veya iyileştirilecek olan yapı elemanları ve donatıların yapımında toplamda 30.701,49+A+3B TL bütçeye gerek duyulmaktadır. Bunların en kısa sürede yapılması Erciyes Üniversitesi'nin fiziksel koşullarının AB standartlarına getirilerek çağdaş ve eşitlik sağlayan fiziki bir ortamın oluşturulması gereklidir. Ayrıca eğitim denkliklerinin alınmasında bu fiziksel iyileştirmelerin önemli olduğu bilinmektedir.

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Bu çalışmanın tüm kamu yapılarında çıkarılarak, genel bütçeden engellilere için yapılacak düzenlemeye ayrılacak miktarın aslında o kadar yüksek olmadığı ve standartları yükseltme durumu düşünüldüğünde ise bu miktarların tüm kamu kurumları için ayrılması gerekliliği açıktır. Bu çalışmanın tüm diğer üniversitelerde ve Erciyes Üniversitesi'nin diğer binalarında da yapılması için temel teşkil etmesi umulmaktadır. Çalışma ile ülkede üniversiteler özelinde tüm kamu kurumlarına uygulanabilecek engellilere yönelik fiziki düzenlemelerin kabul edilebilir bir maliyette olduğu ortaya koyulmuştur.

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ZEOLİT BENTONİT KARIŞIMLARININ SU EMME KARAKTERİSTİKLERİNE BENTONİT ORANININ ETKİSİ

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Zemin emme karakteristikleri ölçülmesi en zor olan zemin özelliklerinden biridir. Zemin emme basıncı, doymamış zeminlerin nem durumunu açıklamak için kullanılan önemli bir parametredir. Zeminlerin emme davranışlarının doğru biçimde belirlenmesi zeminlerin mekanik davranışlarını tahmin edebilmek için gerekir. Zemin gerilmelerindeki değişim emme basıncı ile açıklanabilmekte ve bu değişim zeminlerin taşıma gücünü, kayma mukavemetini, hacimsel deformasyonunu, yanal toprak basınçlarını ve şev duraylılığını etkilemektedir. Literatürde, killi karışımların su emme basınçlarının belirlenmesine yönelik pek çok çalışma mevcuttur ancak çok az bir kısmı zeolit bentonit karışımları üzerinedir. Oysaki zeolitlerin kafes şeklindeki mikro boşluklu yapısı, iyon değişim ve kimyasal reaksiyonlar için geniş iç ve dış yüzey alanı bu malzemeyi su emme açısından uygun bir malzeme haline getirmektedir. Bu çalışmada, önceden geçirimsiz tabaka kullanımı için önerilmiş olan sıkıştırılmış zeolit ve bentonit karışımlarının, değişik bentonit oranlarında su emme basıncına etkisi sunulmaktadır.Emme basıncının belirlenmesi için kullanılan yöntem filtre kâğıdı tekniğidir ve filtreler Whatman No.42 tip filtre olarak belirlenmiştir. Doygun olmayan zeminlerin toplam emmesi ozmotik ve matris emme bileşenlerinden oluşur. Toplam kuru ağırlığın %10 ve %20 bentonit olacak olacak şekilde sıkıştırılmış karışımların, %20, %30 ve %40 su içeriğine sahip hallerine hem matrik hem de total su emme değerleri belirlenmiştir. Her bir su içeriği için emme değerleri bentonit oranları açısından karşılaştırılmıştır. Sonuç olarak toplam ve matrik emme değerleri bentonit miktarı arttıkça arttığı görülmüştür. Matrik emme değerindeki artışın total emme değerinden daha fazla olduğu görülmüştür.

Keywords: Bentonit, Su Emme, Zeolit, Filtre Kâğıdı Metodu.

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ZEOLİT, SEPİYOLİT VE DOLOMİT KULLANILARAK CMAS ESASLI SERAMİKLERİN ÜRETİMİ

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Özet: Bu çalışmanın amacı doğal hammaddelerden Zeolit, sepiyolit ve dolomit kullanarak CMAS ($CaO-MgO-Al_2O_3-SiO_2$) esaslı seramiklerin üretilmesidir. Mevcut çalışmada, doğal hammaddelerden zeolit, sepiyolit, dolomit ve saf alümina kullanılarak $CMAS_{U1}$ ve $CMAS_{U2}$ sistemleri hazırlanmıştır. Hazırlanan bileşimler bilyalı değirmende yaş olarak homojen karışımı sağlandıktan sonra etüvde 100°C de 24 saat kurutulmuştur. Etüvde kurutulan tozlar sonrasında hidrolik presle şekillendirilmiş ve 10°C/dkısıtma hızında alümina altlıklar üzerinde 1100, 1150 ve 1200°C'lerde1, 3 ve 5 saat sürelerde sinterlenmiştir. Kullanılan başlangıç hammaddelerinin, CMAS esaslı üretilen seramik tozlarının ve sinterlenen numunelerin mikroyapısı ve faz analizi SEM ve XRD analizleri ile incelenmiş, üretilen CMAS seramiklerin mikrosertlik testleri gerçekleştirilmiştir.

Anahtar kelimeler: CMAS seramikler, zeolit, sepiyolit, dolomit

Abstract: The aim of this work is to produce CMAS ($CaO-MgO-Al_2O_3-SiO_2$) based ceramics using zeolite, sepiolite and dolomite from natural raw materials. In the present study, $CMAS_{U1}$ and $CMAS_{U2}$ systems were prepared using natural raw materials, zeolite, sepiolite, dolomite and pure alumina. After preparing the homogeneous mixture as a wet mill, the product was dried at 100 °Cfor 24 hours. The powder was dried and sintered at 1100, 1150 and 1200 ° Cfor 1, 3 and 5 hours on alumina substrates at a heating rate of 10 ° C/ min. Microstructure and phase analysis of the starting raw materials used, CMAS based ceramic powders and sintered samples were examined by SEM and XRD analyzes and microhardness tests of the produced CMAS ceramics were carried out.

Keywords: CAS ceramics, zeolite, sepiolite, dolomite

Giriş

CMAS seramiği $CaO-MgO-Al_2O_3-SiO_2$ oluşan temel seramik sistemlerinden biridir ve diyopsit ($CaMgSi_2O_6$), anortit ($CaAl_2Si_2O_8$) ve kordiyerit ($Mg_2Al_4Si_5O_{18}$) gibi kristalin fazların çökmesine bağlı olarak mükemmel mekanik özellikler, yüksek aşınma ve iyi kimyasal dirence sahiptir. CMAS seramikleri, katı oksit yakıt hücreleri için sızdırmazlık malzemesi, iç ve dış duvarlar için yapı malzemeleri gibi mimari uygulamalar ve bunker, huni ve oluk için koruyucu malzemeler gibi ağır endüstriyel uygulamalar gibi işlevsel uygulamalar için iyi aday malzeme haline gelmiştir. CMAS seramik sistemi, düşük densifikasyon sıcaklığı, düşük termal genleşme katsayısı ($\alpha<5.10^6$ /°C), düşük dielektrik sabiti ($\varepsilon r<10$) ve daha iyi kimyasal dayanım nedeniyle dikkatleri üzerine çekmiştir (Cai, 2014).

Zeolitlerin genel yapısal formülleri; $M\ x/n.Al_2O_3.xSiO_2.yH_2O$ şeklinde olup; M, n değerlikli bir katyon (Na^+,K^+, Ca^{++}, vb.)'dur. Mol sayılarını gösteren x ve y ise zeolit türüne göre değişmektedir. Zeolitleri benzer yapıdaki diğer mineral gruplarından ayıran en önemli özelliği yapı içerisindeki kanallarda su moleküllerinin bulunmasıdır. Yapıda bu su moleküllerinin yer alabileceği birkaç boşluk vardır. Bu boşluklarda Na^+, K^+, Ca^{++} su molekülleri ile çevrilir ve su molekülleri zayıf bağlarla hem artı yüklü katyonlara hem de silikat yapıya bağlıdırlar. Genellikle kalsiyumlu zeolitler diğerlerinden daha fazla su içerirler. Şabazit, höylandit ve stilbit yapısı içindeki su molekülleri potasyumdan daha çok kalsiyum katyonu ile bağlıdır (Zal 2010**)**. Zeolitlerin başlıca fiziksel ve kimyasal özellikleri olan; iyon değişikliği yapabilme adsorbsiyon ve buna bağlı moleküler elek yapısı, silis içeriği, ayrıca tortul zeolitlerde açık renkli olma, hafiflik, küçük kristallerin gözenek yapısı zeolitlerin çok çeşitli endüstriyel alanlarda kullanılmalarına neden olmuştur. Son yıllarda önemli bir endüstriyel hammadde durumuna gelen doğal zeolitlerin bu özelliklerinden dolayı kullanım alanları: kirlilik kontrolü, enerji, tarım hayvancılık, maden-metalürji ve diğer alanlar şeklinde belirtilebilir (Koç 2016). $CaMg(CO_3)_2$ olarak kimyasal kompozisyonunda bir çift karbonat bileşiği içeren dolomit, kireçtaşlarından CaO'in yerini kısmen veya tamamen MgO'in alması ile oluşmaktadır. CaO/MgO=1 olduğunda bu tür dolomitin kireçtaşının bozunması ile oluştuğu söylenebilir (Kurt 2010). Sepiyolit, fillosilikat (tabakalı silikat) grubuna dahil sulu magnezyum silikat bileşimli kil mineralidir. Nagy-Bradley'e göre kimyasal formülü $Si_{12}Mg_8O_{30}(OH)_4(H_2O)_4.8H_2O$ ile ifade edilir. Sepiyolit mineralinin dokusu, yüzey alanı,

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porozitesi, kristal morfolojisi ve kompozisyonu, bu mineralin teknolojik uygulamalarına baz teşkil eden fizikokimyasal özellikleri ile yakından ilişkilidir. Sepiyolit strüktürü, ısıl muamelelere karşı hassastır. Zeolitik ve adsorbe su molekülleri, ısı derecesi yükseldikçe kaybedilir. Mineral ayrıca asitle muameleye karşı da duyarlı olup; bu işlem sonucu kristal yapısı kısmen tahrip olabilir. Hem ısı hem de asit muameleleri, sepiyolitin yüzey özellikleri ve porozitesini değiştirebilir. Böylece mineralin en faydalı özelliklerinden (örneğin absorptif, kolloidal ve katalitik özellikler) bazılarını bu işlemlerle değiştirmek mümkün olabilmektedir (Angur 2016).

Mevcut çalışmada, doğal hammaddelerden zeolit, sepiyolit, dolomit ve saf hammadde kaynağı olarak alümina kullanılarak ağ. %28 CaO+MgO, %14.5 Al_2O_3 ve %57.5 SiO_2 içeren $CMAS_{U1}$ ve $CMAS_{U2}$ sistemleri hazırlanmıştır. Farklı sıcaklık ve sürelerde sinterlenmiş numunelerin faz yapıları, mikroyapısal incelemeleri ile yoğunluk ve mikrosertlik testleri gerçekleştirilmiştir.

Deneysel Çalışmalar

Mevcut çalışmada, Tablo 1'de kimyasal analizleri verilen doğal hammaddeler ve saf alümina kullanılarak belirlenen CMAS-U1 ve CMAS-U2 sistemleri; alümina bilyalar kullanılarak saf su ortamında MSE marka tek eksenli karıştırıcıda karıştırılmış, yaş homojenizasyon işleminin ardından toz bünyesinde bulunan suyun uzaklaştırılması için etüvde kurutulmuştur. CMAS esaslı tozlar MSE marka manuel pres ile 15 mm çapında silindirik paslanmaz çelik bir kalıpta 115 MPa basınç altında preslenmiştir. Sinterleme şartları her iki bileşim için 1100, 1150 ve 1200°C'de 1, 3 ve 5 saat olup; ayrıca 1250°C'de 1 saatlik sinterleme şartlarında $CMAS\text{-}U_1$ bileşimi sorunsuz sinterlenirken; $CMAS\text{-}U_2$ bileşiminin alümina altlığa yapıştığı gözlenmiştir. Üretilen CMAS esaslı numunelerin SEM incelemeleri parlatılmış yüzey görüntüleri yardımı ile gerçekleştirilmiş olup; bu amaç doğrultusunda öncelikle $CMAS\text{-}U_1$ ve $CAS\text{-}U_2$ numuneleri sırasıyla 60-1200 meşlik SiC zımparalar ile zımparalanmış, bu işlemi takiben ise alümina pasta ile parlatma işlemi gerçekleştirilmiştir. Başlangıçta kullanılan hammadde tozlarının, üretilen CMAS esaslı tozların ve seramiklerin mikroyapısının incelenmesi, bunun yanı sıra farklı büyütmelerde noktasal analizlerin alınabilmesi (EDS) amacıyla JEOL 6060 marka taramalı elektron mikroskopu (SEM-EDS) kullanılmıştır. Sinterlenen CMAS numunelerinin yoğunluk ölçümleri Arşimet yöntemi ile ASTM (c693-93) standardına (Eşitlik 1) (**ASTM C 693-93**, 2013) göre saf su ortamında gerçekleştirilmiş ve eşitlik 1 yardımıyla hesaplanmıştır. CMAS esaslı seramiklerin mikrosertlik değerleri Leica marka mikrosertlik cihazı ile parlatılıp HF ile dağlanmış yüzeylere 50 g yük altında 30 sn bekleme süresinde elde edilen 5 ölçümün ortalaması hesaplanarak, faz analizleri ise Rigaku DMAX /2200 marka X-ray difraktometresinde CuKα ışınımı kullanılarak gerçekleştirilmiştir.

Tablo 1. Kullanılan Hammaddelerin Kimyasal analizleri

Hammaddeler	**CaO**	**Al_2O_3**	**SiO_2**	**K_2O**	**Na_2O**	**Fe_2O_3**	**MgO**	**CO_3**	**P_2O_5**	**Y.K.**
Sepiyolit	9.09	0.175	29.3	0.037	-	0.069	12.4	25.9	-	33.5
Dolomit	36.1	-	0.14	-	-	-	17.1	-	-	47
Zeolit	3.2	12	69	3.8	0.5	1.9	1.2	-	0.03	9
Alümina	-	100	-	-	-	-	-	-	-	-

Y.K. (Yanma kaybı)

Mevcut çalışmada; başlangıç hammaddelerinden dolomit CaO+MgO kaynağı olarak, Zeolit SiO_2 kaynağı olarak ve sepiyolit ise SiO_2+CaO+MgO kaynakları olarak kullanılmıştır. Alümina tozu ise ağ.% 28 CaO+MgO, ağ.% 14.5 Al_2O_3 ağ.%57.5 SiO_2 içeren CMAS bileşimini stokiometrik olarak tamamlayıcı olarak kullanılmıştır. Şekil 1'de CMAS seramiklerin üretim akım şeması Tablo 2'de ise hazırlanan CMAS bileşimleri verilmiştir.

Tablo 2. Hazırlanan CMAS bileşimleri

Bileşimler	Kullanılan Hammaddeler (gr)			
	Zeolit	Sepiyolit	Kalsine Dolomit	Alümina
$CMAS\text{-}U_1$	40.286	100	30.29	9.9
$CMAS\text{-}U_2$	50.74	-	50.74	5.46

$$\rho = \frac{w_a}{w_c - w_b} d_S \qquad (1)$$

ρ= numunenin yoğunluğu (g/cm^3),
w_a= numunenin kuru ağırlığı (g),
w_b= sıvı içinde numunenin asılı haldeki ağırlığı (g),
w_c= sıvı emdirilmiş numune ağırlığı (g) ve
d_s= sıvı yoğunluğu (g/cm^3)

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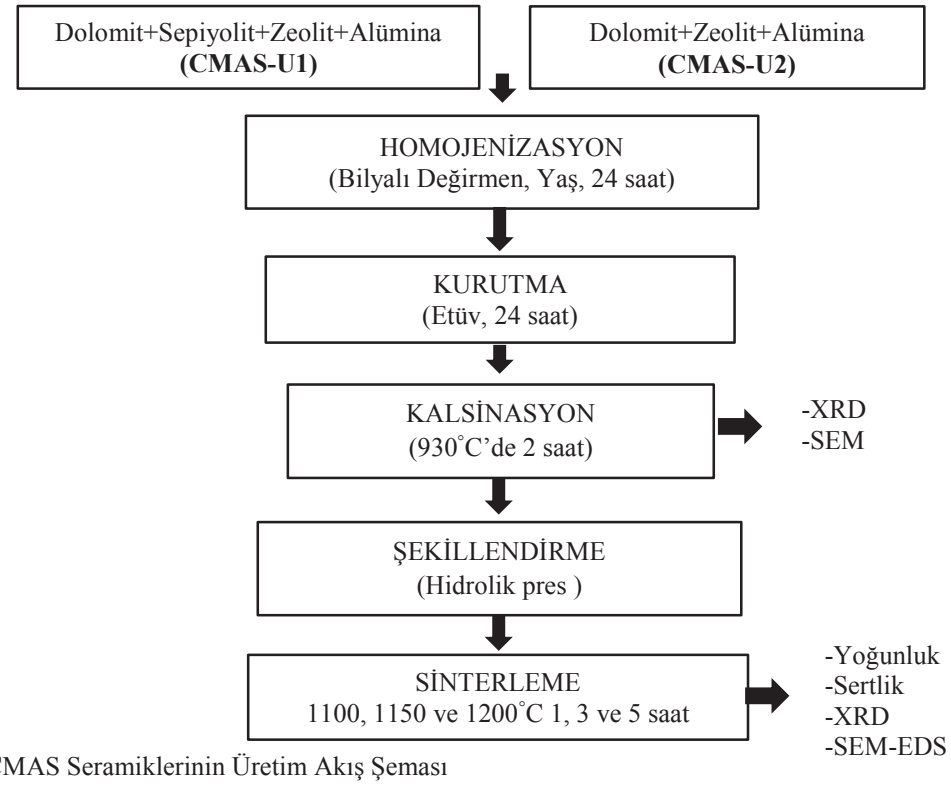


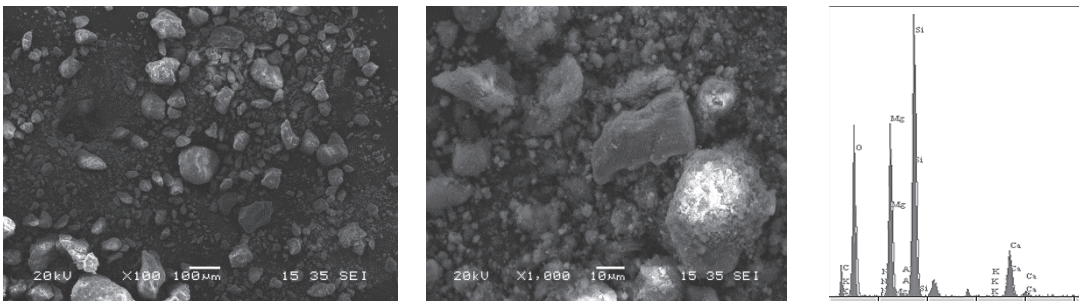
Şekil 1. CMAS Seramiklerinin Üretim Akış Şeması

Deneysel Sonuçlar

Mikroyapı Analizi

Şekil 2.'de CMAS kodlu toz bileşimlerinin ve bu bileşimleri hazırlamakta kullanılan hammaddelerin mikroyapı görüntüleri ve genel EDS analizleri verilmiştir. Sepiyolit, zeolit, dolomit, alümina ve CMAS tozlarına ait SEM görüntülerinden tane boyutunun tüm tozlar için 100 mikronun altında olduğu, toz tane şeklinin sepiyolit dışında küresele yakın olduğu, sepiyolitte ise küresel tanelerin yanı sıra düzensiz şekilli toz tanelerinin de mevcut olduğu görülmüştür. Başlangıç tozlarına ait EDS analizleri Tablo 1'de verilen kimyasal analizlerle örtüşmektedir.

Şekil 3'te 1100°C, 1150°C, 1200°C'lerde 1, 3 ve 5 saat sinterlenmiş CMAS-U_1 ve Şekil 4'te ise CMAS-U_2 kodlu numunelere ait düşük ve yüksek büyültme SEM görüntüleri verilmiştir. CMAS-U_1 kodlu numunelerin mikroyapısında porozitenin mevcut olduğu dikkat çekmekte olup; sıcaklık ve süre artışı ile birlikte poroziteli yapının devam ettiği gözlenmiştir. CMAS-U2 kodlu seramiklerin SEM görüntülerinde CMAS-U1 kadar olmasa da porozitelerin mevcut olduğu görülmektedir. Bu poroziteler artan sinterleme sıcaklık ve süresiyle beraber azalan yönde bir değişim göstermiştir. Artan sinterleme sıcaklık ve süresiyle beraber çubuksu ve bloksu formda oluşumlar yüksek büyültmelerde görülmektedir. Genel olarak artan sinterlenme sıcaklık ve süresiyle beraber seramiklerin yapısındaki porozitelerin azalan yönde bir eğilim sergilediği gözlemlenmiştir ve bu durum Tablo 3'te verilen yoğunluk test sonuçları ile doğrulanmıştır.



(a)

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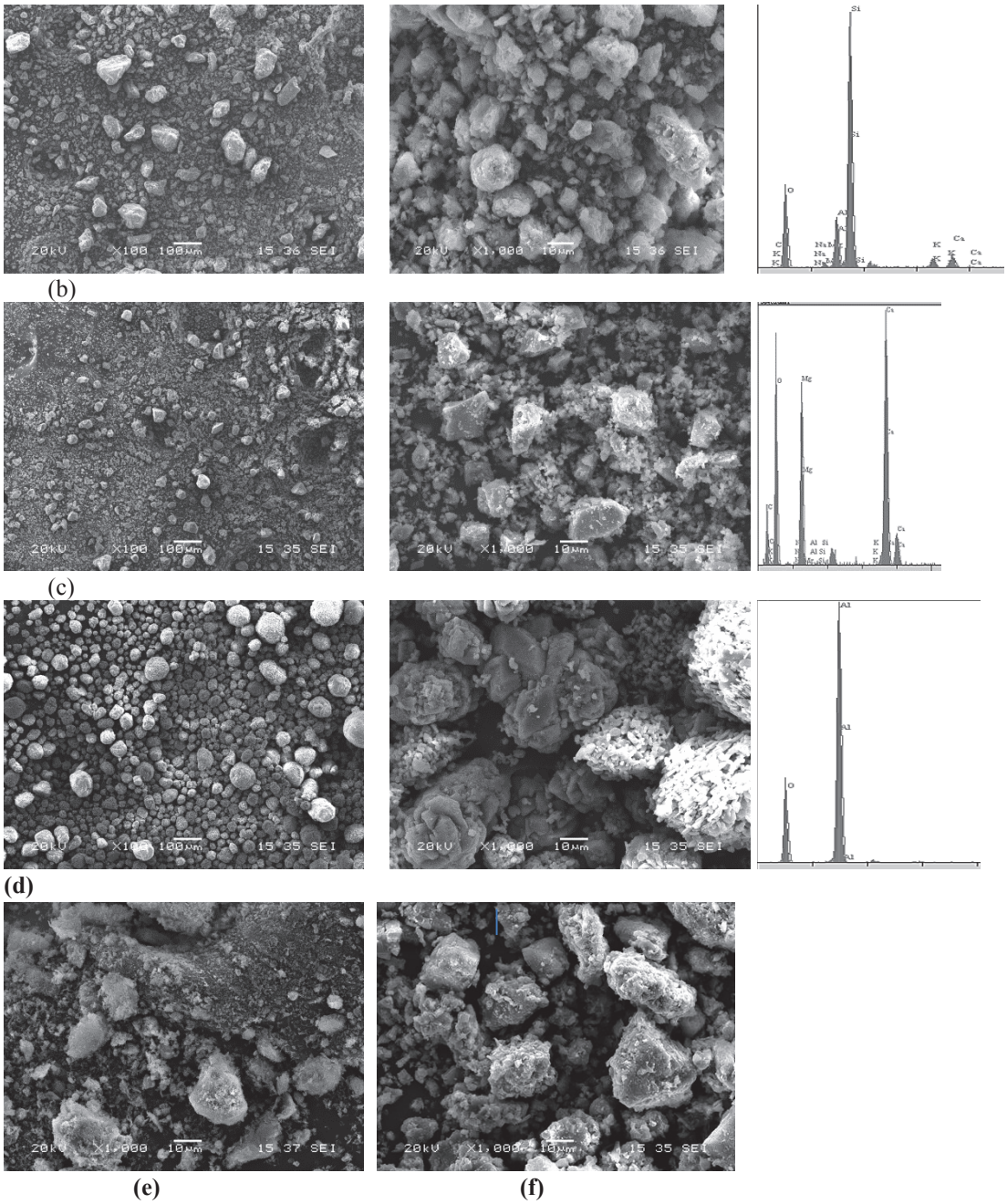
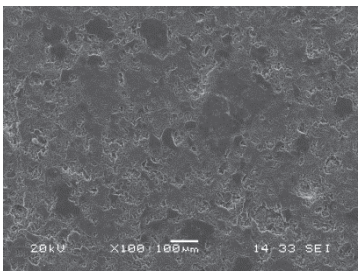
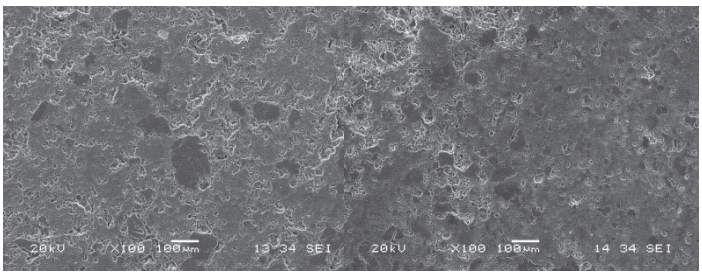


Şekil 2. Deneysel çalışmalarda kullanılan başlangıç hammaddeleri a. sepiyolit, b. zeolit, c. dolomit d. alümina, e. CMAS-U_1 ve f. CMAS-U_2 tozları ve genel EDS analizleri

Sıcaklık ^0C	1 Saat	3 Saat	5 Saat
1100			

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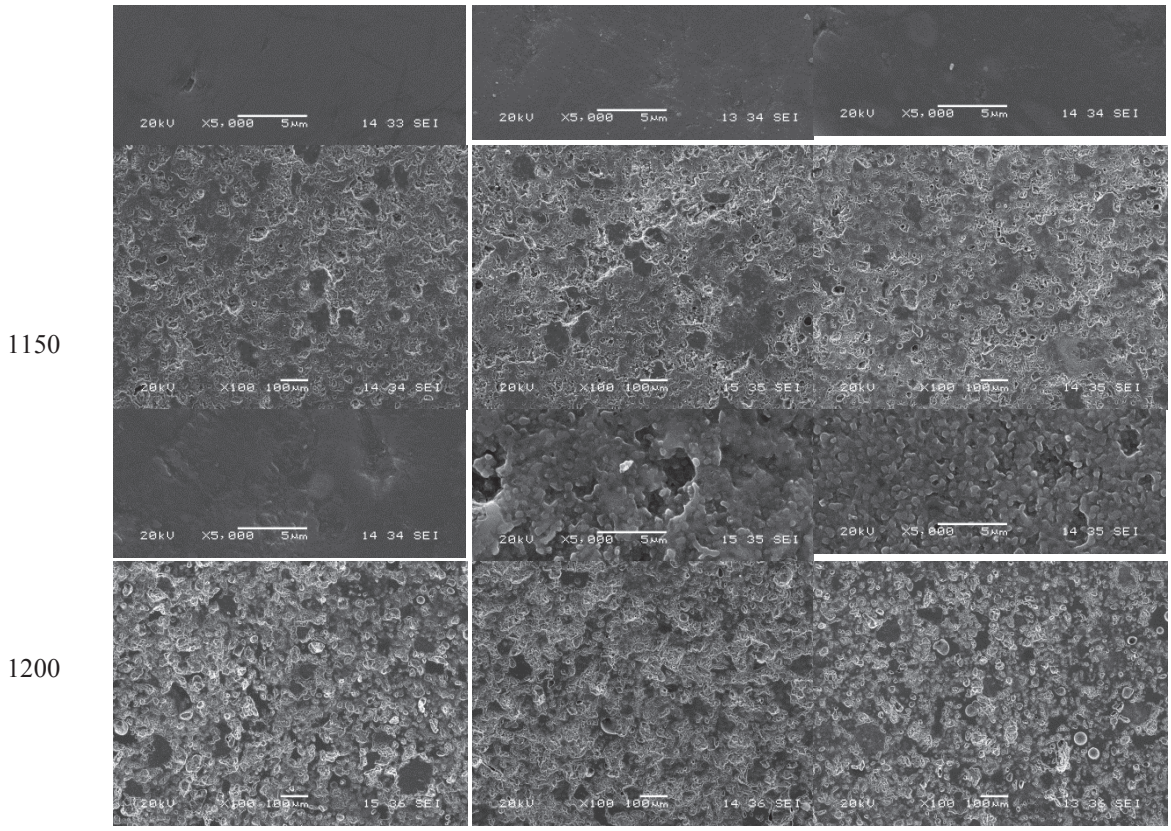

Şekil 3. 1100°C, 1150°C, 1200°C'lerde 1-5 saat sinterlenmiş CMAS-U_1 kodlu numunelere ait SEM görüntüleri

Faz Analizi

Şekil 5 ve 6'da farklı sıcaklıklarda 1 ve 5 saat süreyle sinterlenmiş CMAS-U_1 ve CMAS-U_2 kodlu seramiklere ait faz analizleri görülmektedir. CMAS-U_1 kodlu bileşimin XRD analizlerinde 1100-1250^{0}C sıcaklık aralığında 1 ve 5 saat süreyle sinterlenen numunelerde oluşan akermanit, forsterit, diopsit, periklas, montisellit ana fazları her sıcaklık ve süre için aynı 2θ açılarında gözlemlenmiştir. Sinterleme sıcaklığının artmasıyla montisellit ve diopsit pik şiddetlerinde kademeli bir artış görülmektedir. CMAS-U_2 kodlu bileşimin XRD analizlerinde 1100-1200^{0}C sıcaklık aralığında 1 ve 5 saat süreyle sinterlenen numunelerde oluşan akermanit ($Ca_2Mg(Si_20_7)$), Kyanit (Al_2SiO_5), diopsit ($CaMgSi_2O_6$), periklas (MgO), montisellit (MgSiO) ve kristobolit (SiO_2) ana fazları her sıcaklık ve süre için aynı 2θ açılarında gözlemlenmiştir. 1100-1200^{0}C aralığında sinterleme sıcaklığının artmasıyla kristabolit pik şiddetinin azaldığı; diopsit ve akermanit pik şiddetinin arttığı görülmüştür.

Kuvars kumu dolomit kalsit ve kil karışımını 1400–1420°C'de 1 saat ergitip oda sıcaklığındaki suya döken araştırmacılar cam tozunu 850, 880 ve 920 °C'lerde ısıl işleme tabi tutarak cam-kristalin dönüşümünü sağlamışlardır. Yapılan XRD analizinde anortit, diyopsit ve akermanit fazlarını tespit etmişlerdir (Tulyaganov 2002)

Yoğunluk ve sertlik

Tablo 3'de CMAS kodlu numunelerin yoğunluk ve sertlik testi sonuçları verilmiştir. Tablo olarak düzenlenen veriler incelendiğinde $CMASU_1$ kodlu numune için en yüksek yoğunluk değerine 2,32 g/cm^3 olarak 1250^{0}C'de 1 saat sinterlenme sonucu ulaşılmıştır. $CMASU_2$ kodlu numune için 1200^{0}C'de 5 saat sinterleme ile en yüksek yoğunluk değeri olan 2.71 g/cm^3 sonucu elde edilmiştir. CMAS kodlu seramik numuneler için artan sıcaklık ve sürelerde yoğunluk değerlerinin artma eğilimi gösterdiği tespit edilmiştir. Erol ve arkadaşları Tunçbilek-Orhaneli termik santral uçucu küllerini kullanarak üretmiş olduğu cam seramik malzemelerde civa porozimetresi yardımıyla yoğunluk ve porozite ölçümlerini gerçekleştirmişler ve yoğunluk değerlerini 2,71-3,32 gr/cm^3 aralığında hesaplamışlardır (Erol 2008). Toplan ve çalışma grubu dolomit, kaolin ve zirkonya kullanarak CMAS esaslı olarak ürettikleri seramik numunelerde arşimet prensibi yardımıyla yoğunluk ölçümlerini gerçekleştirmiş ve 1,70-1,99 gr/cm^3 arasında değişen yoğunluk değerleri hesaplamışlardır (Toplan 2016). Mevcut çalışmada CMAS esaslı seramiklerin mikrosertlik değerleri Leica marka mikrosertlik cihazı ile 50 g yük altında 30 sn bekleme süresinde elde edilen 5 ölçümün ortalaması hesaplanarak belirlenmiş olup; $CMASU_1$ kodlu seramik numuneler için en düşük sertlik değeri 762 HV'ye 1100^{0}C 1 saat sinterleme ile, en yüksek sertlik değeri 889 HV ise 1200^{0}C 5 saat sinterleme

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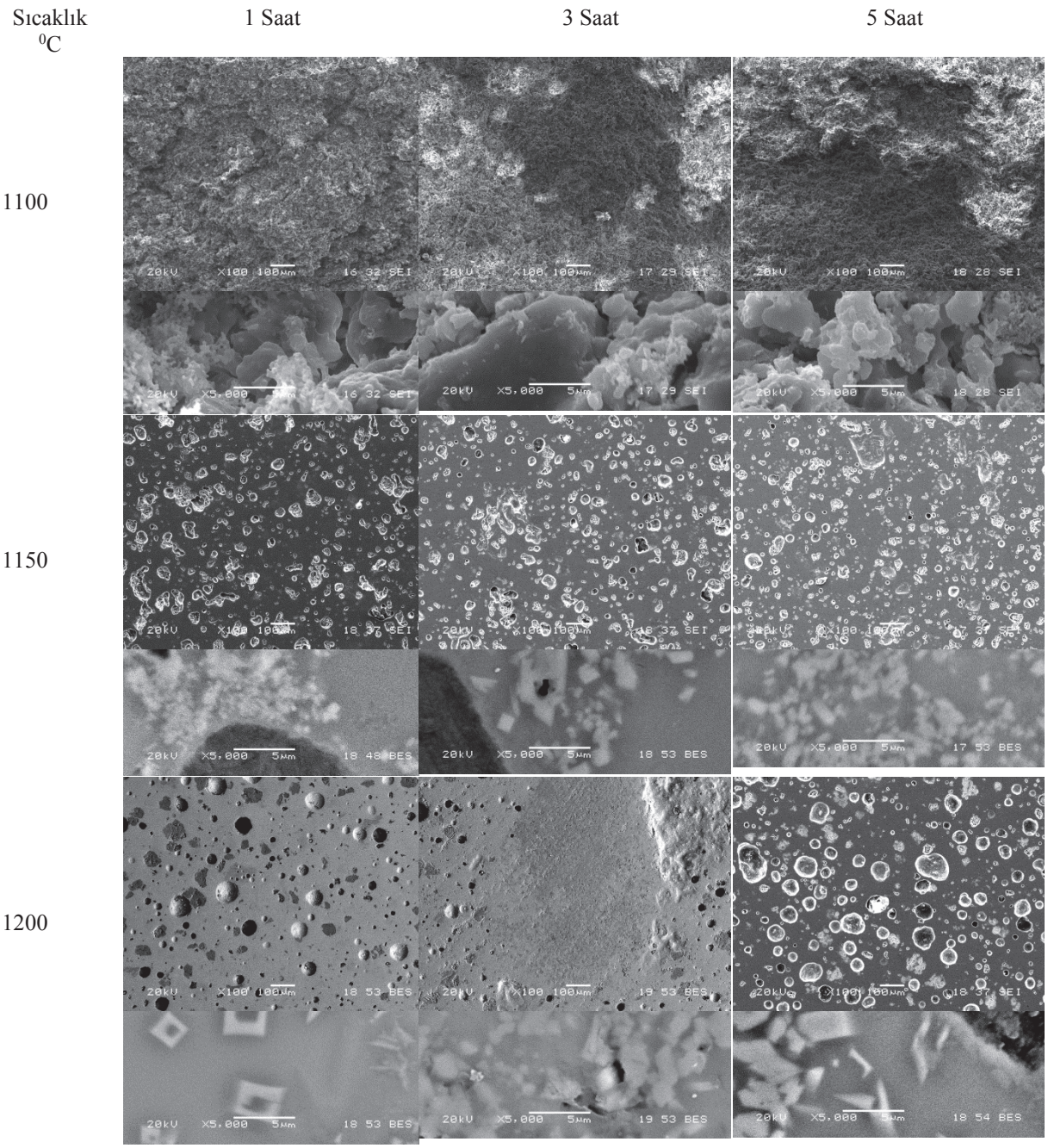
ile; $CMASU_2$ kodlu seramikler için en düşük sertlik değeri 820 HV'ye 1150^0C'de 1 saat sinterlemede, en yüksek sertlik değeri 944 HV'ye 1200^0C 5 saat sinterleme ile elde edilmiştir. $CMASU_2$ kodlu 1100^0C sıcaklıkta sinterlenen numunelerin yüzeyleri hazırlanamadığından sertlik değerleri ölçülememiştir. Erol ve arkadaşları Tunçbilek-Orhaneli termik santral uçucu küllerini kullanarak üretmiş olduğu seramiklerde 577-867 HV arasında değişen sertlik değerlerini (Erol 2008), Toplan ve arkadaşları ise dolomit, kaolin ve zirkonya kullanarak üretmiş olduğu CMAS esaslı seramik numunelerde 522-844 HV arasında sertlik değerleri tespit edilmiştir (Toplan 2016).



Şekil 4. 1100°C, 1150°C, 1200°C 1-5 saat sinterlenmiş CMAS-U_2 kodlu numunelere ait SEM görüntüleri

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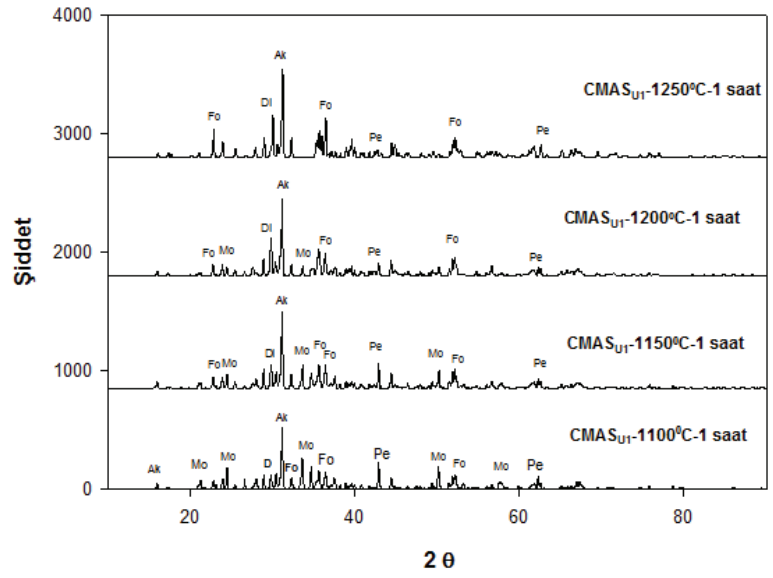

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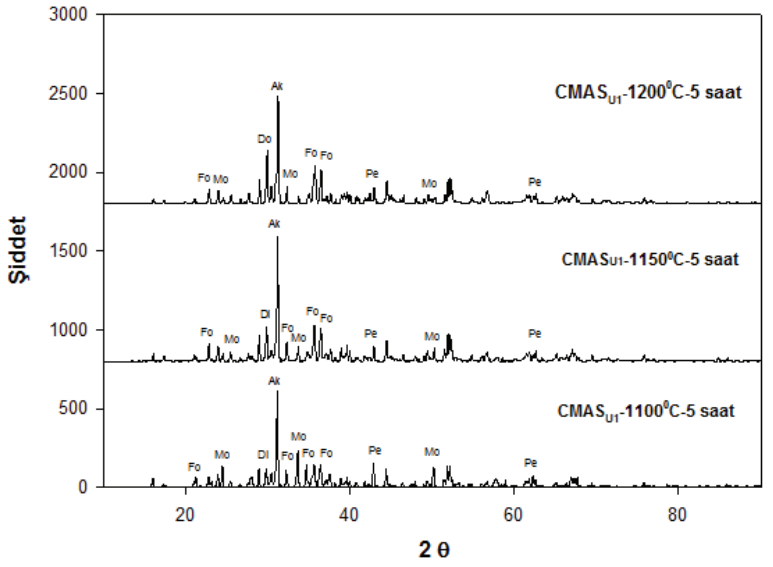

(b)

Şekil 5. Farklı sıcaklıklarda a. 1 ve b. 5 saat süreyle sinterlenen $CMAS_{U1}$ kodlu seramiklere ait faz analizleri (Ak-Akermanit, Fo-Forsterit, Di-Diopsit, Pe-Periklas, Mo-Montisellit)

Tablo 3. CMAS kodlu numunelerin yoğunluk ve sertlik testi sonuçları

Sıcaklık (°C)	Süre (saat)	Mikrosertlik Değerleri ($HV_{0.05}$)		Yoğunluk (gr/cm^3)	
		CMAS-U_1	CMAS-U_2	CMAS-U_1	CMAS-U_2
1100	1	762	-	1.56	1.15
	3	765	-	1.65	1.5
	5	802	-	1.72	1.98
1150	1	834	820	1.66	1.92
	3	845	901	1.73	2.16
	5	844	905	1.75	2.2
1200	1	860	860	1.92	2.36
	3	883	887	1.95	2.4
	5	889	944	2.01	2.71
1250	1 saat	648	-	2.32	-

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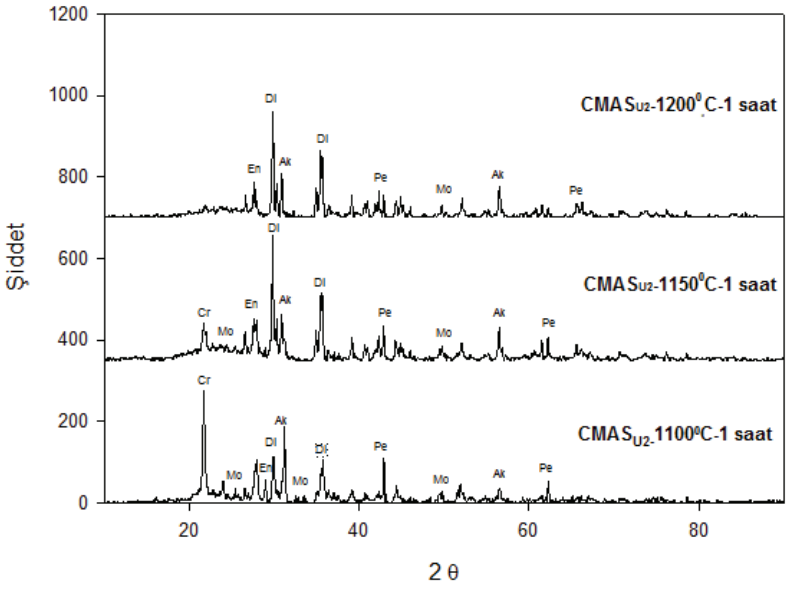
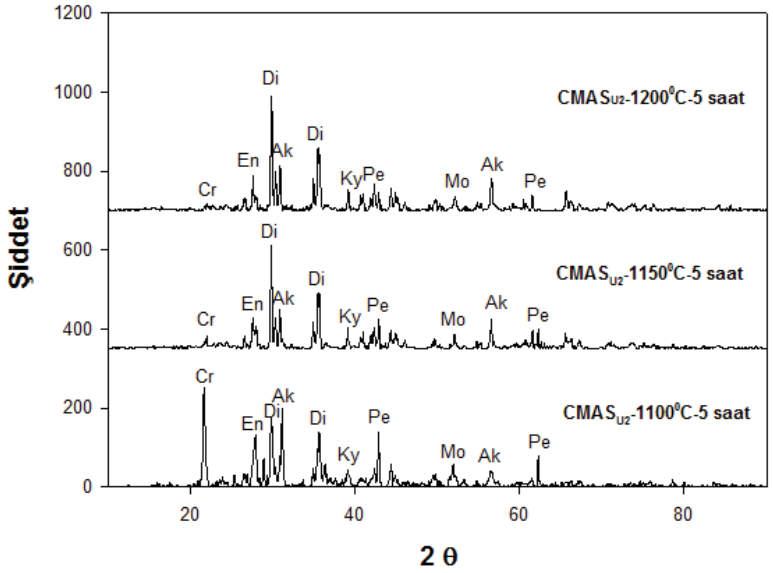


(a)



(b)

Şekil 6. Farklı sıcaklıklarda a. 1 ve b) 5 saat süreyle sinterlen $CMAS_{U2}$ kodlu seramiklere ait faz analizleri (Ak-Akermanit, Ky-Kyanit, Di-Diopsit, Pe-Periklas, Mo-Montisellit, Cr-Kristobalit)

Genel Sonuçlar

1) CMAS-U_1 kodlu numune için en yüksek yoğunluk değeri 2.32 g/cm^3'e 1250°C'de 1 saat sinterleme sonucu $CMASU_2$ kodlu numunede ise 2.71 g/cm^3'e 1200°C'de 5 saat sinterleme sonucu ulaşılmıştır. CMAS kodlu seramik numuneler için ölçülen yoğunluk değerleri artan sıcaklık ve sürelerde artma eğilimi gösterdiği tespit edilmiştir. Zeolit hammaddesi kullanılarak üretilen CMAS-U2 kodlu numunelerin daha yüksek yoğunluk değerlerine sahip olduğu tespit edilmiştir.

2) CMAS kodlu seramikler için mikrosertlik değerleri 762-944 HV arasında değişim göstermektedir. CMAS-U_1 kodlu seramik numunelerde en düşük sertlik değeri 1100°C'de 1 saat sinterleme ile 762 HV iken, en yüksek sertlik değeri ise 1200°C'de 5 saat sinterleme ile 889 HV olarak elde edilmiştir. CMAS-U2 kodlu seramikler için en düşük sertlik değerine 1150°C 1 saatte 820 HV, en yüksek sertlik değerine ise 1200°C 5 saat sinterlenmiş numunede 944 HV olarak ulaşılmıştır. Kullanılan hammaddeler dikkate alındığında Zeolit katkılı CMAS bileşiminin mekanik özelliklerinin daha yüksek olduğu belirtilebilir.

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3) SEM görüntülerinde CMAS-U_1 kodlu seramiklerin bünyesinde CMAS-U_2 kodlulara göre daha fazla porozitenin mevcut olduğu görülmektedir. Bu poroziteler CMAS-U1 kodlu seramiklerin sinterleme sürecinde anortit kristallerin oluşumu nedeniyle meydana gelmektedir. Artan sinterleme sıcaklık ve süresiyle beraber seramiklerin yapısındaki porozitelerin azalan yönde bir eğilim sergilediği gözlemlenmiş ve bu durum yoğunluk testi sonuçları ile doğrulanmıştır. CMAS-U_2 kodlu seramiklerin bünyesinde de CMAS-U1 kadar olmasa da porozitelerin mevcut olduğu görülmektedir. Bu poroziteler artan sinterleme sıcaklık ve süresiyle beraber seramiklerin yapısındaki porozitelerin azalan yönde bir eğilim sergilediği gözlemlenmiştir.

4) $CMASU_1$ ve $CMASU_2$ kodlu bileşimlerin XRD analizlerinde CMAS seramiklere özgü diyopsit, anortit, akermanit ve montisellit ana fazları her sıcaklık ve süre için aynı 2θ açılarında gözlemlenmiştir.

Teşekkür

Çalışmada kullanılan Sepiyolit, Zeolit ve dolomit hammaddeleri için sırasıyla Dolsan mineral yapı kimyasalları madencilik, Rota madencilik A.Ş. ve Turmet madencilik A.Ş. şirketlerine teşekkürlerimi sunarım.

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ODOR MANAGEMENT IN WASTEWATER TREATMENT PLANTS: CASE OF MANISA INDUSTRIAL PARK WWTP

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Abstract: Manisa Industrial Park Wastewater Treatment Plant (MIP-WWTP) has a total capacity of 21.500 m³/day, and continues actual treatment activities since 1993. However, due to the rapid increase of residential buildings around MIP-WWTP, odor released from WWTP have become a major problem for residents. In this study, it is aimed to present the methods applied in MIP-WWWTP to reduce odor emissions. The applications are cost effective and simple process control methods instead of expensive solutions such as chemical stripping and biological filtration depends on covering treatment units. The measures for coping with odor problems contains (i) reducing hydraulic retention time (from 36 hours to 16 hours) by deactivating one of the equalization tank and decreasing water level, (ii) feeding sludge gravity thickener by digested sludge, (iii) replacing the belt press used in dewatering unit with decanters. Consequently, it is observed that changing operational conditions of wastewater treatment plant properly has no negative effect on satisfying discharge limits, but have strong effects for minimizing odor emissions. The results of applied measures were appreciated by the local municipality managers due to sharp decrease in the number of complaints.

Keywords: waste water treatment plant, odor problem, Turkey

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A MODEL SUGGESTION FOR TRAUMA AND PSYCHOLOGICAL PROCESS LIVING PEOPLE AFTER EARTHQUAKE

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Abstract: In geology, "Earthquake" refers to the shaking of the earth's surface caused by the spreading of seismic waves suddenly resulting from breaks in the earth's crust. In fact, an earthquake is a natural phenomenon that shows that everything on earth deemed immobile by people can be damaged. Unfortunately, are people not only unfamiliar with nature but also in the habit of underestimating it. 92% of Turkey is located in the seismic belt. What is more, 95% of the population, 98% of the industrial centers and even 93% of the dams are located in the seismic belts. Since the Erzincan earthquake that took place on December 26, 1939, 1139 people have lost their lives, 2543 people have been injured and 7049 buildings have been completely destroyed every year on average and a devastating earthquake has occurred once every 1.1 years. Although there is not much to do when faced with the reality of earthquakes in Turkey, at the core of this study is an enquiry into a model which will be a guideline for earthquake survivors moving forward with their lives and psychological support provided to them by professionals. The purpose of this model is to assist earthquake survivors to rebuild their post-earthquake private and social lives.

Keywords: Earthquake, Natural Phenomenon, Survival, Psychology, Social Life

DEPREM'DEN SONRA İNSANLARIN YAŞADIĞI TRAVMA VE PSİKOLOJİK SÜREÇ İÇİN BİR MODEL ÖNERİSİ

Özet: Yerbilimlerinde, yerkabuğu içindeki kırılmalar nedeni ile ani olarak ortaya çıkan titreşimlerin sismik dalgalar halinde yayılarak yeryüzünü sarsma olayına "Deprem" denir. Aslında Deprem, insanın hareketsiz kabul ettiği toprağın üzerinde bulunan herşeyin hasar görebileceğini gösteren bir doğa olayıdır. Malesef insanlar doğayı bilemediği gibi hafife almayı da alışkanlık haline getirmişlerdir. Ne yazık ki, ülkemizin %92'si seismic beltnda bulunmaktadır, yine bununla birlikte nüfusumuzun %95'i, sanayi merkezlerimizin %98'i ve hatta barajlarımızın %93'ü deprem bölgelerinde yer almaktadır. 26 Aralık 1939 tarihinde 7,2 büyüklüğünde meydana gelen Erzincan depreminden bu yana yani yaklaşık 75 yıldan beri oluşan depremlerde her yıl ortalama 1139 vatandaşımız hayatını kaybetmekte, 2543 kişi yaralanmakta, 7049 bina tam olarak yıkılmakta ve her 1,1 yılda yıkıcı bir deprem oluşmaktadır. Türkiye'de bu realite ile karşı karşıya kalındığında halihazırda çok fazla birşey yapılacak olmamasına rağmen, deprem afeti sonrasında özellikle hayatta kalanların hayatına devam etmesi ve profosyonel kişiler tarafından onlara sağlanacak psikolojik destek için oluşturulacak bir model bu çalışmanın özüdür. Bu model, özel ve sosyal yaşamımızın deprem sonrası yeniden şekillenmesine yardımcı olabilmek içindir.

Anahtar Kelimeler: Deprem, Doğa Olayı, Hayatta Kalma, Psikoloji, Sosyal Yaşam

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INTRODUCTION

Earthquakes that cause loss of life and property are the mass movements on the mantle of the earth caused by the flow of earth's internal heat to the surface which leads to breaks in the earth's thin crust.

Scientific studies on the prediction of earthquakes have continued in parallel with the speed of technological development for 76 years, particularly after the 1939 Erzincan Earthquake. Changes in groundwater levels and the amount of radon gas and differences in the static electric field reinforce the physical basis for earthquake prediction especially before major earthquakes. The 7.3-magnitude earthquake which hit China in 1975 was predicted based on the observed clues and many people's lives were saved. In addition, the Japanese Meteorological Agency announced that there could be an earthquake 90 minutes before the 7-magnitude earthquake in 1978 in Izu Oshima which survived it with minimum damage.

Historical (before 1900) and instrumental (after 1900) earthquake records indicate that throughout history there have been many quakes in Izmir and its immediate vicinity which contain many active faults. The impact on buildings of seismic waves of medium-sized earthquakes that occur on these faults will be amplified by the unsuitable conditions of the metropolitan area in terms of settlement. It is, therefore, inevitable that many buildings will be damaged by a possible earthquake e.g. an earthquake of magnitude 5.5. In addition, landslide sites will be at greater risk as was the case in İzmir earthquake in 1977.

MODEL CREATION METHOD

Even if it is impossible to prevent the occurrence of this natural phenomenon, it will be possible to live with the reality of earthquakes when we realize the important role they play in the evolution of the earth. For this purpose, potential seismicity can be determined by multidisciplinary studies (e.g. Geological, Geophysical, Construction, Psychological Consultancy etc.).

Sampling and Study Group

Awareness-raising activities titled "Basic Disaster Consciousness" were carried out in İzmir and its immediate vicinity between 2007 and 2011 under the leadership of Izmir Governorship and in cooperation between Dokuz Eylül University, Institute of Marine Sciences and Technology and some public institutions and organizations. These awareness-raising activities have been continuing individually in accordance with the requests of institutions since 2012. Within the scope of these studies, lectures were given at all levels of educational institutions, at public institutions, private companies of importance and places deemed appropriate by local authorities in villages. Different experts from the same occupational groups attended these lectures each time.

In the presentations, firstly, academicians addressed the question "what is an earthquake?" and explained the risk of earthquakes in Turkey in general and seismicity in İzmir in particular. Secondly, experts from the Chamber of Civil Engineers presented some information together with some visual elements pertaining to the current condition of "Our Buildings" and addressed the question "What Should We Do about Our Buildings?" Thirdly, expert trainers assigned by the Izmir Provincial Civil Defense Directorate shared their knowledge and experiences within the context of "What Should We Do before, during and after an Earthquake?" Lastly, psychiatrists and psychologists who are specialized in the fields of normalization of and psychosocial support for post-earthquake life delivered speeches and discussed these issues with attendees in a conversational tone.

Data Collection Tools and Application Methods

Due to the fault systems, large-and-small breaks and fractures, there have been and will be many destructive earthquakes in Turkey which is located in the middle of the active seismic belt of Alp-Himalaya. The most destructive earthquakes in Turkey occurred in Kocaeli-Istanbul, Erzurum-Erzincan, Adana-Antakya and Izmir; the places which have fertile alluvial soils and are densely populated.

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For this study, the earthquake records that have been recorded by Kandilli Observatory and Earthquake Research Institute of Boğaziçi University since 1868 are one of the most important source of information which accounts for the earthquake risks in İzmir and Turkey. Another important source used in this study is the information on the website of Turkish Prime Ministry Disaster and Emergency Management Presidency which enables the real-time monitoring of seismicity in Turkey in general and Izmir in particular. In addition to these sources of information, seismic studies have yielded very valuable results which have provided both clarity and reliability on the data obtained by other sources.

The first attempt to classify active faults in Turkey was the inventorial Active Fault Map of Turkey (scaled: 1: 2.000.000) prepared by the General Directorate of Mineral Research and Exploration (MRE) which used the data collected until 1987. Detailed maps which laid the foundations of this general map were published by Sengör et al (1985),, Şaroğlu et al. (1987), Barka (1992) and Armijo et al (1992) (Figure.1).

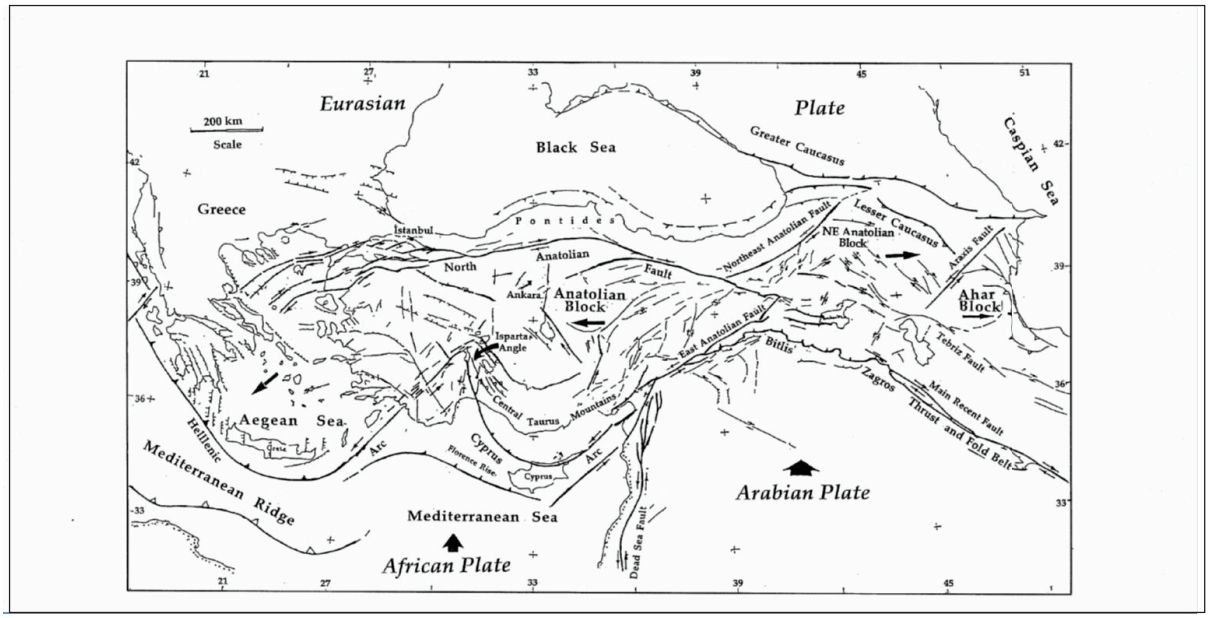

Figure 1. All of Turkey's major seismic potential high active faults and fold belts (Barka and Reilinger, 1977)

The faults (Figure.2) which will cause earthquakes in Izmir and its immediate vicinity have been shown on the maps drawn by researchers, public institutions and private institutions that have been conducting research in the city for many years. However, what should be kept in mind is the fact that no matter what kind of method is applied, neither the exact location of the faults nor their earthquake-generating potentials can be precisely known. At this stage, it is especially important for scientists to regard the data-based predictions as accurate as possible.

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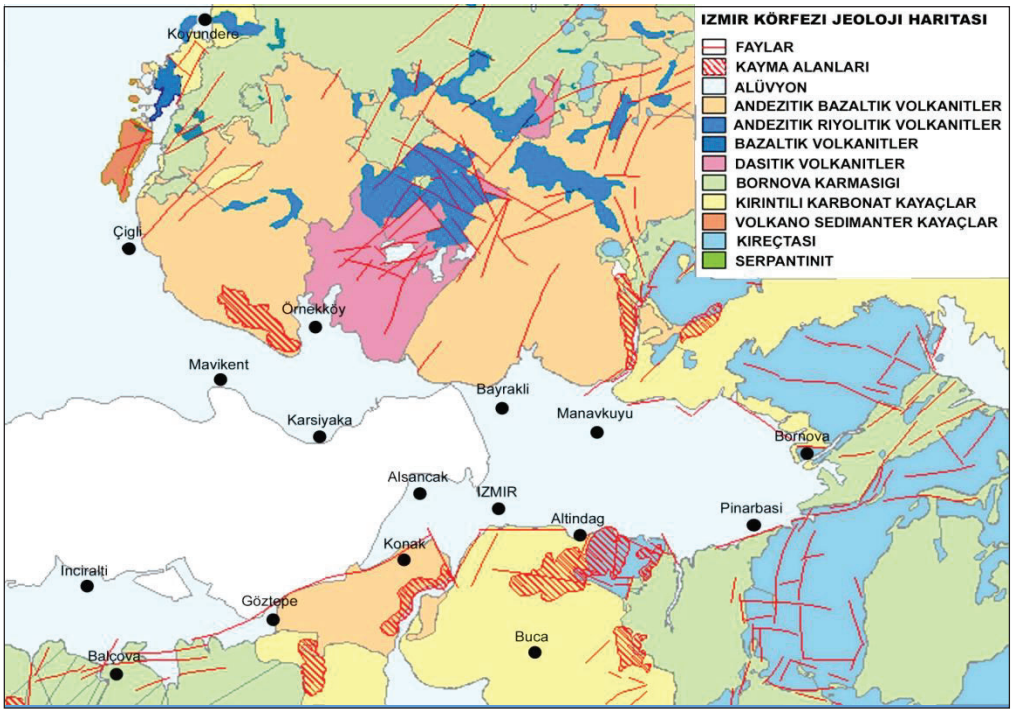

Figure 2. Geological map of Izmir and its immediate vicinity (MRE, 2005, compiled and modified from Tan et al, 2012)

Constituting the second part of the study, the data on the conditions of the Buildings were compiled from the archives of the Chamber of Civil Engineers, and from the personal information and years of experience of the civil engineers who made presentations in the awareness-raising activities as specialists in their field. Thanks to this data, which is the most striking part of the study, many facts on the existing conditions of the buildings in Izmir have been brought to light (Figure 3) and the relevant institutions have been informed about the situation.



Figure 3. A 5-stoeybuilding without a foundation in Şemikler, İzmir (left), an illegal apartment built with the removal of the roof in Çınarlı (right) (Photos; Anonymous, 2009)

A written, visual and applied data set prepared by the Directorate of Izmir Provincial Civil Defense was used in the third part of the presentations within the context of "What Should We Do before, during and after an Earthquake?" Being very critical and aiming to prepare people for possible earthquakes, this part of the study started with some video footage from the earthquake that occurred on August 17, 1999 and then lectures were given to inform people on what to do to avoid the recurrence of such situations in the future. The data set prepared and presented by Civil Defense experts contained information with visual materials from various quarters such as

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a family earthquake plan, reduction of non-structural hazards, earthquake safety at school (Figure 4), safe driving during an earthquake and even what to do if trapped under debris during or after an earthquake.

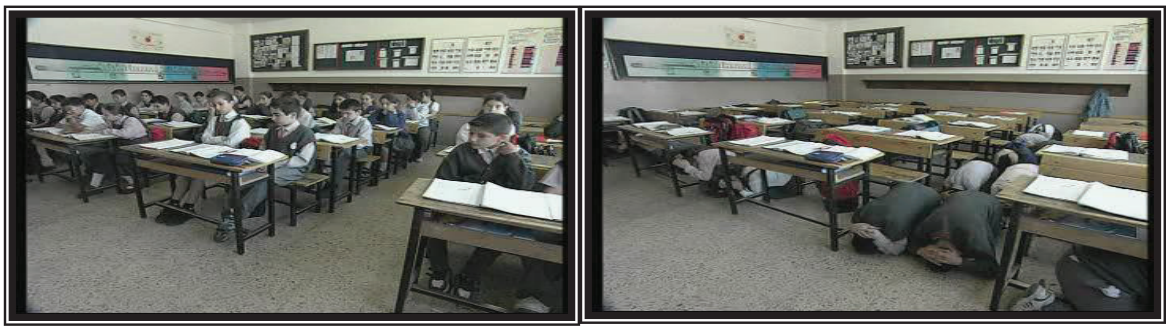

Figure 4. What shou we do if we are at school during an earthquake? (Never go under the wooden desks!)

In the light of what has been explained so far, the last part of the study tackled the question “What will survivors need?" after an earthquake. The data used for this purpose were collected by experienced psychiatrists and psychological counselors who carried out conversation and sharing sessions with people for post-earthquake normalization of life. This part, which is especially very important for the success of this study, is also a sine qua non for the well-being of people who go through tragic events such as an earthquake because human beings tend to live in their emotions and some of the people will try to restore their lives after experiencing an earthquake disaster. People who will have lost their loved ones and possessions in an earthquake, in short, those who will have concerns about the future will need psychosocial support to be able to continue their normal lives again. Psychological first-aid services may not be sufficient at this point. However, proven-effective psychosocial support models which can be applied to people affected by earthquakes and many other similar disasters have just begun to be prepared in Turkey (Figure 5).



Figure 5. Continuineducation in a kindergarten tent established after August 17, 1999 earthquake in Golcuk. (Some of the children in the photo have lost their parents in the earthquake. We remember them with sorrow...)

FINDINGS OF THE STUDY AND AN APPLICABLE MODEL

Having been addressed in a section of the first part of the study, the earthquake reality in Turkey was reemphasized using both historical and recent data. However, there is no denying the fact that it does not seem possible in the near future to predict the location, size and time of an "earthquake" at a reliable level. For this reason, the recent data on earthquakes which occurred and are expected to occur on the known fault lines enable us to make a prediction. The historical and instrumental earthquake records indicate that there have been many earthquakes in Izmir and its immediate vicinity in the past two thousand years. The presence of many active faults in the immediate vicinity makes it difficult to establish a direct relationship between earthquakes and faults (MRE, 2005, Report No: 10754). In order for this relationship to be meaningful and for earthquakes to be predicted, auxiliary data from other disciplines should be processed and included in the interpretation. One of the auxiliary data is the soil conditions of an earthquake area. Despite lacking suitable soil conditions for high-rise buildings, the majority

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of Izmir consists of areas with high settlement density and extremely young and loose alluvial soils (Figure 2). A soil, regardless of the magnitude of an earthquake, makes its movement in the range of its own characteristics and can cause the structures on it to remain intact or to collapse.

The second part of the study revealed the situation of the buildings built on these soils. The scenario which is valid in all of Turkey is the same for Izmir as well. The situation of the buildings in Izmir and its immediate vicinity becomes evident with the data on soil investigation reports and proper location of water and electrical installations in an apartment shared by the specialist engineers, who also shared their knowledge with everyone openly on what we should pay attention to when buying an apartment and especially what our legal rights are.

The findings of the third part of the study demonstrated especially the extraordinary experiences of the search and rescue teams in the earthquakes that occurred in our country and also presented similar examples from different countries and the approaches they adopt and the actions they take in the face of earthquakes. The wide range of information regarding pre- and post-earthquake precautions shared and discussed at this stage included reduction of non-structural hazards and a family earthquake plan before an earthquake, the first aid to be applied to the wounded after an earthquake in Izmir, prevention of possible fire hazards and even the establishment of "Community Disaster Volunteers (CDV)" teams consisting of volunteers by raising the level of consciousness.

The final stage is perhaps the longest and the most comprehensive stage in terms of the scope of the data available since, at this stage, earthquake survivors need first spiritual and then financial support in order to continue their lives. It is especially very difficult to rehabilitate people who lose their mental health after an earthquake and it takes a very long time for people who lose their loved ones in an earthquake to recover. In fact, some people suffer from a loss of joy or a loss of interest in life and some prefer to end their lives as a result of psychological problems. This is one of the saddest truths of our country and unfortunately the majority of the society has been insensitive to it. Extreme feelings we had about and right/wrong reactions we showed towards not only the earthquakes but also the mine accidents in recent years have led to an inevitable situation. Specialist psychiatrists and social support workers exert themselves to the utmost just like they did in the Soma mine accident which took place on May 13, 2014. However, all this effort may be inadequate. For this reason, it is of vital importance to interpret the findings correctly and choose the most suitable model.

Suggested by Berkowitz (2010) and based on the transfer of a series of post-disaster coping skills which psychological counselors can apply in the long term after an earthquake, the "Skills for Psychological Recovery" model was brought up for discussion in the study. This model is an evidence-based modal approach which can be used in situations where psychological first-aid support is not sufficient in the period following traumatic events experienced by children, adolescents and adults. This model is not a mental health treatment but rather a secondary prevention model. In other words, it was designed to reduce stress, describe existing intervention skills and improve operability.

The main goals of this model can be listed as follows;

* Quick recuperation and recovery

* Preventing mental problems

* Supporting work

* Preventing behavioral disorders

In order to achieve these goals, it is imperative that all actors (authorized bodies of the state, engineers, doctors, workers, homeowners, tenants and even foreign experts if needed) fulfill their tasks duly. A defect in one of these integral parts will, otherwise, affect the whole "BUILDING."

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RESULT AND DISCUSSION

Due to the bitter experiences caused by the earthquakes throughout history, people have to accept natural disasters as a normal part of life and learn to live with them. Due to its geological structure and location, there have been and will be many devastating earthquakes in Turkey, which is on one of the most important seismic belts in the world. Material and moral damage incurred by an earthquake can be minimized by effectively implementing planned and rational tasks (Radius project, www.izmir.bel.tr/izmirdeprem/chp1.html). Since we will always encounter natural and man-made disasters, these and similar models should be examined and adaptations should be made considering the existing conditions. This model should be examined in more detail by relevant experts together with the contributions of other disciplines and put into practice.

The model suggested by this study is actually only to help solve the problem. Earthquake scenarios can be described by a number of models, however, it takes a lot of time and effort to describe and implement a psychosocial model that will be set after an earthquake. This model, which is to be implemented to bind up the wounds of the suffering especially after major disasters such as an earthquake, should be adapted and improved further considering all living conditions in our country.

In conclusion, it should be kept in mind that the principle of "Human life comes first." should penetrate all levels of the society and all aspects of social life, and as Mustafa Kemal Atatürk stated "it is of vital importance to think about measures to prevent and be protected from a catastrophe before it actually happens."

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A NEW COMPUTERIZED TEST FOR DETAILED DIAGNOSTICS OF COLOUR-BLINDNESS

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The perception of colours is achieved by a complex process with cone cells in the human retina. Any absence or damage of any cone cells cause impairment of perceiving colours which is also named as colour-blindness. 10 percent of today's population (8 percent of men and 2 percent of women) suffer from colour-blindness. In related literature, there are so many tests to diagnose colour vision deficiency. But most of the tests are just being used to discriminate the subjects whether they have colour vision deficiency or not as simple as in positive/negative logic besides they have many flaws. In this study, a novel computerized test has been designed and compared with other tests in the related literature. The new test has been applied on 50 individuals having colour deficiency. In the name of just diagnosis whether an individual has colour vision deficiency or not, we have achieved 100% sensitivity and 100% specificity though Ishihara test which are being used widespread. In addition to that, the new test also gives some rough results about the colour range which the individual has deficiency. The new test also applied to same individuals with different illimitation conditions and various point of view to measure the effects of light and viewpoint on the new test.

Keywords: Colour blindness, Colour deficiency, New Computerized test, Detailed Diagnosis of Colour deficiency

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A STUDY ON FUTURE GROWTH ENGINE POLICY IN KOREA

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South Korea had one of the world's fastest growing economies from the early 1960s to the late 1990s. In the late 1980s, when the industrialization drived by heavy and chemical industries was finalized, the South Korea government has been planning and implementing various growth engine projects to secure future industrial competitiveness. Specifically, there had been the Kim Young-sam Government's G-7 Project('92-'01), the Kim Dae-jung Government's 21st Century Frontier Project('99-'03) and Knowledge-based Industry Development Strategy('98-'02), the Roh Moo Hyun Government's Next Generation Growth Engines Project('03-'07) and the Lee Myung-bak government's new growth engine business('07-'12).

Also, the Park Geun-hye government, the newly established in 2012, announced the key strategy for creating a growth engine to develop new industry and market as one of the ways to create a creative economic ecosystem in June 2013. In March 2014, the First Creative Economic and Public Consultation Council announced the 13 future growth engines, and the Ministry of Science, ICT & Future Planning(MSIP) established its plans for implementing future growth engines in June 2014. In April 2015, the MSIP expanded its future growth engines to 19 fields integrating the industrial engine projects promoted by the Ministry of Trade, Industry & Energy(MOTIE) and announced action plans which contains technology and business roadmaps considering the roles of the government and the private sector. For implementation of the plan, the government is investing about 1 trillion won every year in related R&D programs.

Since three years have passed after the future growth engine project of Park Geun-hye government was started and outcomes are starting to be derived, it is necessary to check the effectiveness of the R&D polices. So, in this paper, we evaluate the effectiveness of the R&D policies by analyzing the results of intermediate evaluation of national R&D programs related to the 19 future growth engines. The MSIP performs the intermediate evaluation for national R&D programs to improve the efficiency of R&D investment and every national R&D program should be evaluated every three years. The intermediate evaluation is based on relative evaluation by ministries and each R&D programs are scored in views of goal achievement, quality excellence of outcomes, appropriateness of program management, and etc. The evaluation results are given as three grades: 'Good', 'Moderate', and 'Bad'. If an R&D program receives the 'bad' grade in the intermediate evaluation, its R&D budget decrement of next fiscal year is recommended to the National Science & technology Council(NSTC) which takes role of review and coordination of R&D budget.

In 2016, total 103 R&D programs received the intermediate evaluation. Among them, 11 R&D programs are closely related to the future growth engine and it is confirmed by the MSIP. All of them are classified as general R&D. Since the intermediate evaluation is relative evaluation by ministries, we analyzed the percentage of grades. As shown in Table 1, the percentage of the R&D programs which received the 'bad' grade among total 103 R&D programs is 27.2%. However, the 'bad' grade percentage of the future growth engine related R&D programs is 9.1% and this is significantly less than that in total R&D programs. Also, the 'good' grade percentage in the future growth engine related R&D programs is slightly higher than the 'good' grade percentage in total R&D programs.

Table 1: Distribution of Intermediate Evaluation Results in 2016

Grade	# of R&D programs (%)	
	Total R&D programs	Future Growth Engine related R&D programs
Good	8 (7.8%)	1 (9.1%)
moderate	67 (65.0%)	9 (81.8%)
Bad	28 (27.2%)	1 (9.1%)
Total	103 (100%)	11 (100%)

Due to the relative evaluation by ministries, it is meaningful to examine the evaluation results by ministries. As a case study, we analyzed the intermediate evaluation results of the MOTIE which had the highest number of R&D

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programs evaluated in 2016. The MOTIE evaluated total 21 R&D programs and 6 of them are closely related to the future growth engine. The evaluation results are as shown in Table 2. Among total 21 R&D programs, 1, 12 and 8 of them received 'good', 'moderate' and 'bad' grade, respectively, and hence the 'bad' grade percentage of the MOTIE's R&D programs was 38.1%. However, there was no R&D program which received the 'bad' grade among the R&D programs related to the future growth engine. Also, only one R&D program which received 'good' grade was belong to the future growth engine related R&D programs.

Table 2: Distribution of Intermediate Evaluation Results of MOTIE in 2016

Grade	# of R&D programs (%)1		
	Total R&D programs	R&D programs related to Future Growth Engines	R&D programs not related to Future Growth Engines
Good	1 (4.8%)	1 (16.7%)	0 (0%)
moderate	12 (57.1%)	5 (83.4%)	7 (46.7%)
Bad	8 (38.1%)	0 (0.0%)	8 (53.3%)
Total	21 (100%)	6 (100%)	15 (100%)

From above results, we can see that the future growth engine related R&D programs have been well managed by their responsible ministries and derived better outputs, compared with the other R&D programs. This implies that active implementation of the future growth engine policy driven by the government has been effective.

Keywords: Future Growth Engine, National R&D program, Intermediate Evaluation

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A STUDY ON THE PRODUCTION OF PH INDICATOR GEL PEN HOLDER

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Abstract: Stimuli-responsive hydrogels that can be defined as three-dimensional networks, are able to dramatically change their volume and other properties in response to environmental stimuli [1,2]. **The halochromic gels** can be changed their colour as a result of changing acidityof the aqueous solution in which they are in contact [3].In this study, it was aimed to produce hemicelluloses basedpH indicator gels pen holder (**halochromic gel pen holder).** The response of the pH indicator gels to environmental pH changes is observed as the color change of the gel. The halochromic properties of the gel pen holder were provided with additives added to the polymeric matrix. Hemicellulose (HC) and acrylamid (AAm) based halochromic gel pen was synthesized by free radical polymerization using methylene bis acrylamide (BIS) as a crosslinker, ammonium persulfate (APS) as initiator and N,N,N,N-Tetramethylethylenediamine (TEMED) as an activator. Chemical pH indicators such as Thymol blue, Congo red, Bromothymol blue, Phenol red and Alizerine red were used as halochromic agent.The effects of the pH indicator agents, HC/AAm ratio and BIS/(HC+AAm) ratio on characteristic propereties of gel pen holders were investigated. At the end of the polymerization, the gel pen holder was held in deionized water for 12 h and the deionized water was continously refreshed to remove the impurities. Then gel pen holders weredried at 333 K until constant weight was reached. For this purpose the synthesized and dried holders put into deionized water which were adjusted different pH (asidic, basic and neutral media). For this purpose the dried holders were placed into deionized water which has different pH values (acidic, basic and neutral).It was observed that the colors of gel pen holders changed with solution acidity. The swelling ratios of gel pen holders were determined by gravimetric methods at various temperature and acidity. The synthesized indicator gels were characterized by FTIR analysis both before and after turning point of indicators.

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Keywords: Hemicellulose, acrylamide, pH indicators, gel pen holder, swelling ratio.

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A STUDY ON THE RESEARCH TREND ANALYSIS OF STEM CELL BASED ON PATENT INFORMATION AND IMPLICATIONS FOR NATIONAL R&D INVESTMENT OF KOREA

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The field of stem cells has huge potential in various medical fields such as artificial organs and nerve regeneration. Due to rapid technological changes, the stem cell sector needs to be carefully informed about the country's R&D investment environment, including overseas technology trends. In order to promote national research and development projects related to stem cells, it is necessary to analyze domestic and overseas technology competitiveness and to derive promising fields for R&D investment.

Among various research achievements, patent information has a feature that precedes commercialization. Various information can be obtained about a wide range of research achievements through the commercial patent database. In addition, since the format is standardized and effective analysis methods are established, it is advantageous in that quantitative/qualitative analysis and relative comparison are easy to be performed.

In this study, the research trends of the stem cell field were analyzed based on patent information, and implications related to the investment portfolio of the Korea's national R&D project were derived. Using the US and Korean stem cell patent information obtained from the patent database, timeseries analysis of was performed. According to the time series analysis, the trend of change in the field of patent density was confirmed. These results were visually expressed through the patent map. This suggests various implications such as promising investment fields and investment gap. In addition, by using various indices such as Patent Impact Index, Technology Strength, and Cite Per Patent, we compared qualitative competency of patent originated from Korea's national R&D projects with whole patents of US and Korea by detailed fields.

The analyzed patent map was also compared with the budget and patent achievements of national R&D projects of Korea related to stem cells, which were obtained from NTIS(Korea's National Science & Technology Information Service). To match the International Patent Classification of patent information with the technology classification used in the Korea's National R&D, We obtained expert advice from the stem cell sector. Analysis of research trends and competitiveness related to stem cells in Korea's national R&D and comparison between government and private portfolio were also conducted.

Through this study, we could obtain important information that can be used for investment in national R&D in the field of stem cells. As a result of the patent analysis, it was possible to predict the trends of the industry and to compare the competitiveness among the countries (Korea and US). Therefore, we could draw out promising investment fields for government. Especially, through the analysis of time, we observed interesting changes in the field of stem cell research in Korea before and after the temporary investment gap caused by Prof. Hwang Woo-Suk.

Moreover, the analytical method of this study is applicable to a wide range of technical fields and is likely to be used in the future. It can be applied to a wide range of analysis or complex and diverse cases. For example, the

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scope of patent analysis can be analyzed more macroscopically (for example, biotechnology or healthcare) or applied freely to other major fields.

Keywords: R&D Investment Portfolio, Stem Cell Research, Analysis of Patent Information, Patent Map, Promising investment field, government research, national R&D program, R&D coordination

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A STUDY ON THE STRUCTURAL ANALYSIS OF FIVE SIMILAR MOSQUES OF ARCHITECT SINAN

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ABSTRACT

The effect of the architect's technical and design approach is the front plan is one of the attributes of structures that make them unique. it has been observed in the historical process that architects put forth unique technical and design properties. Mimar Sinan's buildings in the mosque architecture have distinctive features in terms of the architect revealing his own experience. Architect Sinan is the most important master who has imprinted his name on the classical period of the Ottoman Empire. Sinan's buildings have a special place Among the mosque buildings. In this study; In addition to the magnificent works that Sinan described as "Mastery", Bali Pasha, Hadim Ibrahim Pasha, Rustem Pasha, Tekirdag Rustem Pasha and Kurşunlu were examined. Despite the size of Sinan's other works, Mimar Sinan's five studied structures are preliminary with their modest identities. In this context, the plan schemes, building materials and the periods during which they were made are discussed. It is hoped that the study will contribute to the study to be done on the subject.

INTRODUCTION

The word mosque means that which gathers and brings together. In this regard, it is the sanctuary where Muslims gather together for worship. The word *mescit* is used in the first historical sources instead of the word mosque. Whereas *mescit* is the name given to the location where muslims “kotow” during prayer. It can roughly be stated that mescits are constructed in neighborhoods, mosques in districts and grand mosques in cities (Vikipedi, 2017).

Many different types of structures were constructed during the transformation of the Ottoman from chiefdom to kingdom in order to meet the demands of the society. Mosques which are indicators of the economic wealth of the state as well as a religious symbol stand out among these architectural works. When the mosques of the Ottoman era are examined, it is clear that there has been a period of development in terms of architecture reaching its pinnacle with the contributions of Mimar Sinan. In this study, Classical Ottoman period structures built by Architect Sinan were compared with respect to various properties such as plan typologies, construction materials etc.. Mimar Sinan’s magnificent features such as volume on the front of the Selatin mosques beside the more modest constructions; The similarities of Bali Pasha, Hadim Ibrahim Pasha, Rustem Pasha, Tekirdag Rustem Pasha and Kursunlu Moses are striking, taking place in this comparison.

Mimar Sinan's five works have been examined on the basis of plan, section, appearance and technical drawings. Despite period differences, analyzes made are similar in architectural style to Sinan's works. In the scope of the study, besides Sinan's large scale structures, it was important in terms of revealing the value and approach style given to the structures even at a small scale.

Five Similar Mosques Of Architect Sinan

In this study, the typology of Bali Pasha, Hadim Ibrahim Pasha, Rustem Pasha, Tekirdag Rustem Pasha and Kurşunlu Mosque which Sinan gave to Ottoman and modern architecture was examined.

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Bali Pasha Mosque Structural and Spatial Analysis

The structure located at the Hoca Üveyz Quarter at the Fatih district of Istanbul was built by Architect Sinan during the years of 1546-1548. Bali Pasha started the construction of the mosque which was completed by his wife Hüma Hatun following the death of Bali Pasha (Ekinci, Y., 2009). Hence, it is also known as Hüma Hatun Mosque (Photograph-2) (mimarsinan.gen.tr, 2017).

The kiblah main gate of the mosque is located on the Hoca Efendi Street with Battal Gazi Street to the east and Balı Pasha Street to the west. The mosque has a square plan and is surrounded by external walls on an area of 900 square meters (Drawing 1) (istanbulkulturturizm.gov.tr, 2017).

The mosque has been built using cut stone and is covered with a dome of 12 m diameter. Verses by poet Kenan Hüdai are written on the 1504 dated inscription (mimarsinan.gen.tr, 2017).

Bâli Pasha Mosque is comprised of a five unit square plan narthex covered with five small domes enveloped in turn with a dome of 11.80 m^2 diameter (Vikipedi, 2017).

Classical Ottoman style can be observed in all aspects of the mosque excluding its proportions put up by using cut sandstones as well as the vertical grooved rails on the portico of the narthex (Drawing 2). There is a square planned minaret pedestal at the northwestern corner and a stairwell tower with the same dimensions at the northeastern corner. Two feet placed on the northern, eastern and western main walls each and three lancet arches combining these carries the upper story mahfil (gathering place) covering the sanctuary from three sides. The upper section of the tower including the stairs to the mahfil (gathering place) has been used as a cross vaulted cell (Drawing 3)

The interior dome of the mosque has been decorated with inscription and writings the minbar of which is made of marble and the mihrab of plaster (Photograph-3-4). It is known that the wooden lectern has been brought in from the Hagia Sophia museum. The rods decorating the single balcony made of stone provide traces of the art of Architect Sinan. The mosque with an interior area of about 300 m^2 has a courtyard, garden and hazier (Vikipedi, 2017).

The outer walls of the mosque garden are made of white brick and the western side is surrounded by trees. There are 8 large pine trees in front of the eastern and western gardens at the entrance and the coffin rest separated by a lower wall from this area is the place where the funeral prayers are performed. The marble fountain to the left is covered by eight wooden columns under the octagonal lead roof. The hazier is located behind the fountain with toilets at the front.

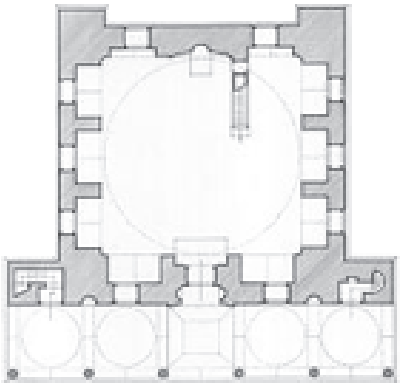
The Neccar Mehmet and Hüsrev Pasha shrines are located near the mosque. The mosque has been repaired in 1935 and 1958 after which it was opened to public prayer services in February 2008 following the repair and renovation works in 2007 (mimarsinan.gen.tr, 2017).



Photograph 2: Balasha Mosque (mimarsinan.gen.tr, 2017)

Drawing 1: Bali Paşa Mosque Ground Plan

(Ülgen, A., S., 1989)



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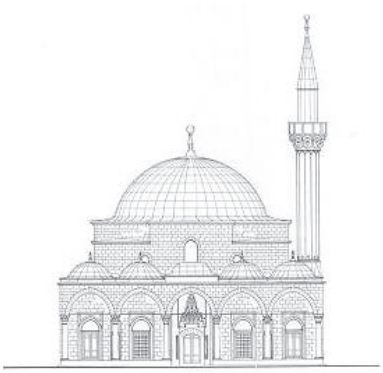
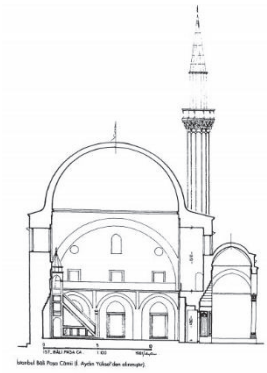
Drawing 2: Bali Paşa Mosque Façade

(Ülgen, A., S., 1989)



Drawing 3: Bali Paşa Mosque Section

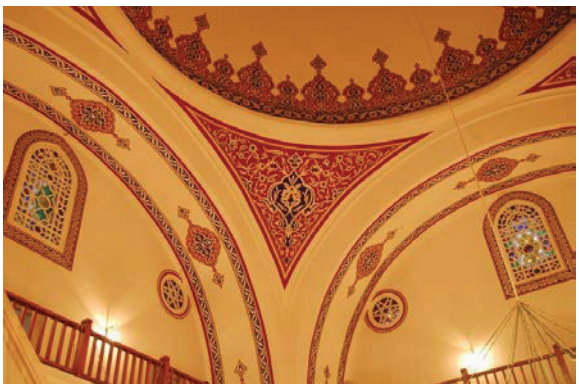
(Ülgen, A., S., 1989)



Photograph 2: Bali Pasha Mosque (mimarsinan.gen.tr, 2017)



Photograph 4: Bali Pasha Mosque (mimarsinan.gen.tr, 2017)



Hadım İbrahim Pasha Mosque Structural and Spatial Analysis

Hadım İbrahim Pasha Mosque is located at Silivrikapı, Fatih district of Istanbul in Turkey. It was ordered in 1551 by Hadım İbrahim Pasha, one of the viziers of Kanuni Sultan Suleiman, to be built by Architect Sinan. No traces outside of the wall remains have been left of the Turkish bath and school of the structure built as a small social complex with its mosque, shrine and Turkish bath (www.tas-istanbul.com, 2017).

The mosque that is a classical period Ottoman architecture piece has a square plan with a central dome in addition to a modest structure (Photograph 5). The main walls of the mosque; southern, eastern and western façades have been built alternatingly by cut sandstone and bricks with only sandstone used on the northern façade.

The 12 m diameter dome of the mosque is placed on a cylindrical hoop divided by windows. This hoop has been supported at the corners by a pair of squinches. The dome is placed directly on the mihrab wall in the kiblah direction and on prop feet extending about 2 m from the wall surfaces while dividing the main walls in three (Drawing 4-5). Clam shaped squinches have been used at the corners for the passage to the dome. The niches that appear between the prop feet provide a movement and richness to the interior. The interior of the dome and the pediments have been decorated by hand-carvings.

The wooden main gates of the mosque are important examples of xylography (Drawing 6). The inner section of the sanctuary entrance along with the columns to the side is covered with marble. There is a small muezzin mahfil to the right of the sanctuary entrance. However, there is no mahfil for women in the mosque. Maksure, which is the high muezzin mahfil close to the mihrab, minbar, mihrab and the muezzin mahfil have been built of marble with a fine workmanship (Photograph 6). There is a water well on the left at the sanctuary entrance. Water from this well used to flow out but now it has dried up. The well cannot be seen today because it has been covered up (fatihmuftuluğu.gov.tr, 2017).

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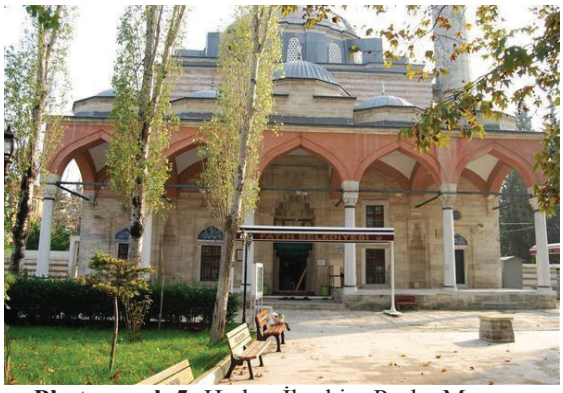
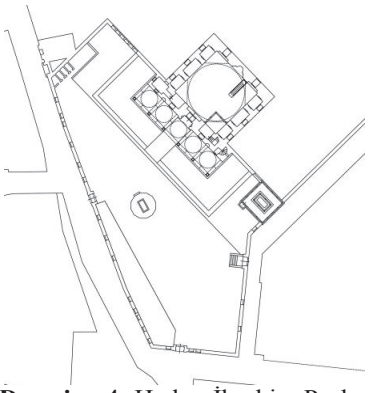
The narthex extends to both sides outside the square plan of the mosque. Of these extensions, the western minaret with a single balcony comprises the lectern of the minaret, in the eastern section there is a cell covered with a vault. Of the domes of the narthex carried with six marble columns and five lancet arches, the middle dome is higher with a sliced exterior. This dome sits on consoles with muqarnas on the inside and is fixed to the other domes with transit pendentives (Drawing 7). Glazed tiles that are rare to find can be seen above the windows inside the sanctuary and the windows inside the narthex. On the left of this section that is closed with an aluminum frame today is the girls Quran lecture hall, and on the right is the women's mahfil (gathering place).

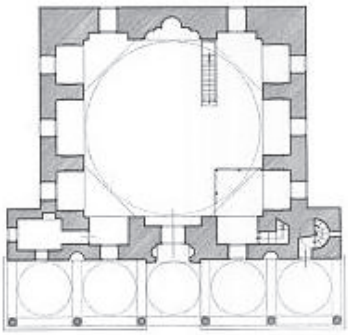
The grave of Hadım İbrahim Pasha, who commissioned the mosque, is inside the mosque. This grave is in the shape of an open dome. The mosque was repaired in 1763-64 following an earthquake and the minaret was rebuilt (tas-istanbul.com, 2017).



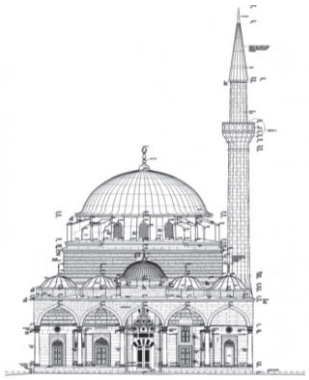
Photograph 5: Hadım İbrahim Pasha Mosque (fatihmuftuluğu.gov.tr, 2017)



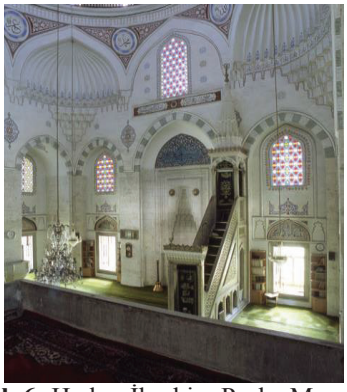
Drawing 4: Hadım İbrahim Pasha Situation plan (Necipoğlu, G., 2005)



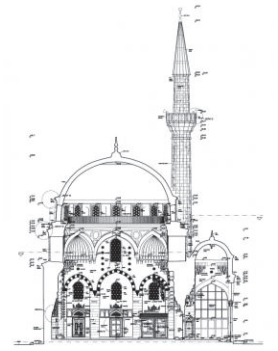
Drawing 5: Hadım İbrahim Pasha Mosque Ground Floor Plan(.mimarsinaneserleri.com, 2017)



Drawing 6: Hadım İbrahim Pasha Mosque Façade (mptasarım.net, 2017)



Photograph 6: Hadım İbrahim Pasha Mosque Interior (Necipoğlu, G., 2005)



Drawing 7: Hadım İbrahim Pasha Mosque Section (mptasarım.net, 2017)

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Tekirdağ Rustem Pasha Mosque Structural and Spatial Analysis

The structure, built in 1552-1553, is located on the Mimar Sinan Street in Tekirdağ city center, across the Tekirdağ municipality building. The autobiographies of Mimar Sinan state that the building was constructed by him. The structure is inside Rustem Pasha Social Complex which has a madrasah, caravanserai, mosque and imaret. The Complex also has a double bath, leather tannery, shops and a school (Photograph 7) (mimarsinan.gen.tr, 2017).

The top of the square planned mosque is covered with a single dome which enables access with trombes. In front of the building constructed with regular cut stone is a double portico narthex and a single balcony minaret on the northwestern side. The structure is entered through a crown gate located on the mihrab axis with polygon niches on the sides, with muqarnas and rectangular edging (Drawing 8-9). Between the suppressed circular arch and the kavsara with muqarnas is the construction book of the building.

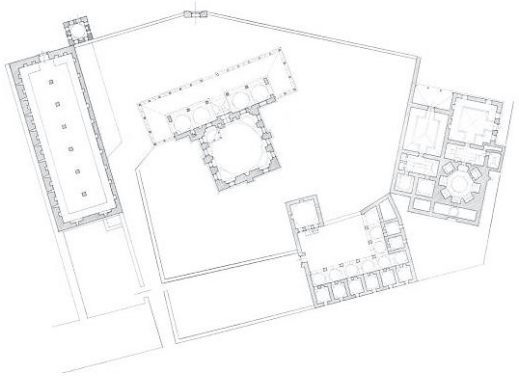
Interior of the luminous and spacious structure is also rich with decorations. There are plaster embossment on the sides and center of the dome which has baroque character flowers and garlands. These decorations that are known to belong to the Abdulmecid period have destroyed the original hard carvings of the mosque. Side backboard and stair railings of the very plain marble minbar are decorated with hemstitch geometric motives (Photograph 8).

Five niched narthex is covered with a mirrored vault in the center and double domes on the sides. The external portico has a lead covered sloped wooden roof on columns and round arches. The minaret of the mosque is made of cut stone and is of polygonal shape, covered with a lead cone. The railings of the balcony with muqarnas is is carved stone. Entrance to the courtyard of the mosque which is surrounded by walls is through a large gate on the north, with a marble fountain (Drawing 10). Lead covered pentagonal roofed fountain that sits on five marble columns with garland heads is understood to be added during the repair in Abdulmecit period. (islamansiklopedisi.info, 2017).

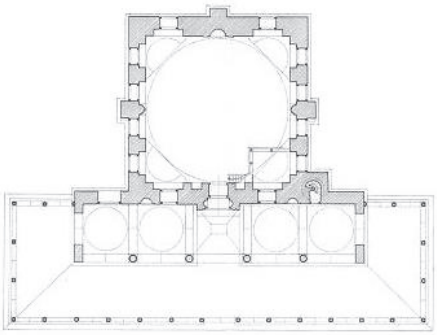
Of the social complex that was built in 1550's, only the mosque, the rebuilt bath and the partial madrasah has survived to this day. Since 1552 when it was built to this day when it's surrounded by high rise buildings, it still has an impressive sight on its hill, commandeering the Tekirdağ Harbor. The mosque which was in fact built in a modest size is interestingly surrounded by a double line monumental portico on the front façade (Drawing 11). The interior of the mosque is plain but impressive with its large size dome (sinanasaygi.org, 2017).



Photograph 7: Tekirdağ Rüstem Pasha Mosque (Cambaz, M., 2014)



Drawing 8: Tekirdağ Rüstem Pasha Situation plan (mimarsinaneserleri.com, 2017)



Drawing 9: Tekirdağ Rüstem Pasha Mosque Ground Plan (Ülgen, A., S., 1989)



Drawing 10: Tekirdağ Rüstem Pasha Mosque Section (Ülgen, A., S., 1989)

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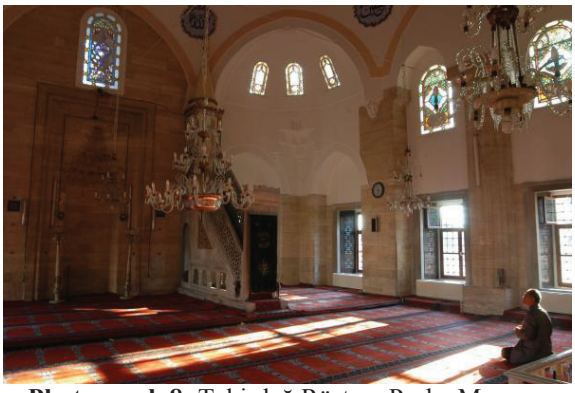
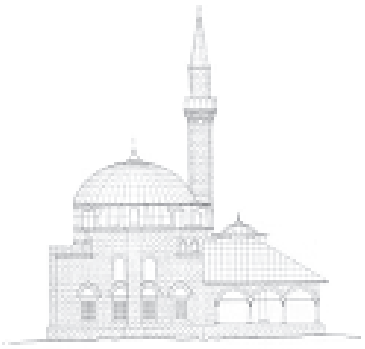


Photograph 8: Tekirdağ Rüstem Pasha Mosque (restorasyonforum.org, 2017)



Drawing 11: Tekirdağ Rüstem Pasha Mosque Façades (Ülgen, A., S., 1989)

Rüstem Pasha Mosque Structural and Spatial Analysis

Rüstem Pasha Mosque was commissioned by Rüstem Pasha, one of the viziers of Kanuni Sultan Süleyman, to Mimar Sinan in 1561 in İstanbul Eminönü (tas-istanbul.com, 2017).

The mosque that was built 6 meters above the street level had storages and stores under, which enabled better utilization of the sloped area and made the silhouette of the mosque look better (Photograph-9). The U-shaped courtyard is accessed by two stairs on the east and west directions. The narrow stairs access is illuminated by windows with iron bars. The narthex with a five domed and six columned portico is covered with a large eaves. The mosque fountain was built on street level. Minaret is built on the northwestern side of the courtyard after the construction date of the mosque.

The mosque has a rectangular architectural plan (Drawing 12-13). The width of the rectangle is 26.80 meters, and the height is 19.60. The diameter of the great dome is 15.20 meters, with a height of 22.80 meters (Erçağ, B., 1987).

The central dome sits on four elephant feet and columns via arches. The ceiling cover is shaped with a 15.20 meter diameter middle dome and smaller half and full domes that support this middle dome. These spaces are covered with a vault that is divided by three (Drawing 14).

The mosque which was commissioned to Mimar Sinan is a far shot to the simplicity of the period and Sinan himself. What makes this a far shot to simplicity is the decorative elements and of course the İznik tiles (Photograph-10-11). Rüstem Pasha Mosque is covered in tiles, up to the dome skirting. Especially the tiles with lily motives are considered to be among the most successful tile examples of the Ottoman period. Hand carvings inside the mosque are in the 18th century baroque style.

The shrine is in the courtyard of Şehzade Mosque. Rüstem Pasha Shrine is a single domed octagonal planned structure made with cut stone (tas-istanbul.com, 2017).



Photograph 9: Rustem Pasa Mosque (mimarsinaneserleri.com, 2017)



Drawing 12 Rustem Pasa Mosque Situation plan (mimarsinaneserleri.com, 2017)

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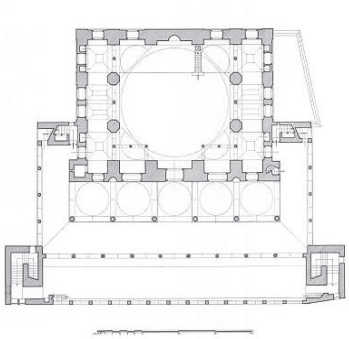
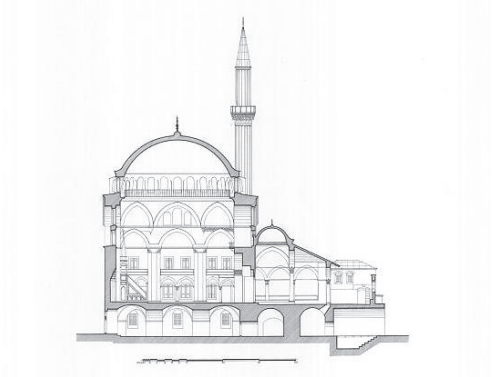
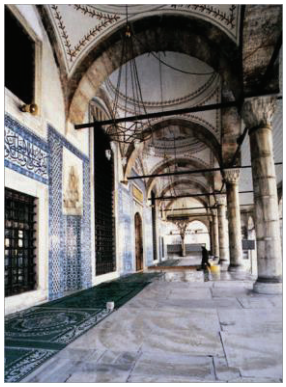


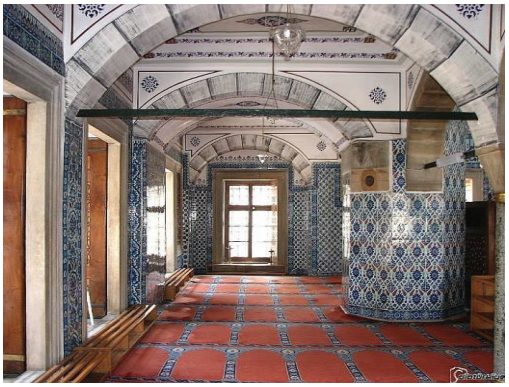
Drawing 13: Rustem Pasha Mosque Ground Floor Plan (Ülgen, A., S., 1989)



Drawing 14: Rustem Pasha Mosque Section (Ülgen, A., S., 1989)



Photograph 10: Rustem Pasa Mosque (gateofturkey.com, 2017)



Photograph 11: Rustem Pasa Mosque (mimarsinaneserleri.com, 2017)

KurşunluMosque Structural and Spatial Analysis

It is located inside the Mimar Sinan Park to the west of the Cumhuriyet Square at the Kocasinan district in the city of Kayseri. Its plan typology is similar to those of the Bali Paşa Mosque and Hadım İbrahim Paşa Mosque which are Beyazıt the Second period structures. In this regard, it is considered to be a Mimar Sinan structure. Kurşunlu Mosque is the only structure by Mimar Sinan that has reached our day from among the two mosques built by him in Kayseri (Photograph 12, Drawing 15). The structure that has taken its current name from the lead coating of its dome is also known as Hacı Ahmet Paşa Mosque. The tablet of the structure bears the dates of 1585-1586. However, it is indicated in the letter of conveyance issued for Ahmet Paşa by Selim the 2nd that this mosque is dated August 1573 (Özbek, Y., Aslan, C., 2008).

The mosque is the only structure that has reached our day from the Hacı Ahmet Paşa Külliye comprised of imaret, inn, school and Turkish bath and consists of a single site sanctuary covered with a dome and the narthex at the north façade. The dome that covers up the single site rests on the feet at the corners and pendentives are used to support the dome There is a minaret with a single balcony at the northwestern corner . The courtyard walls of the mosque have been built later.(Drawing 16-17)

The narthex of the mosque has two porticos much like the Üsküdar Mihrimah, Atik Valide and Eminönü Rüstem Paşa Mosques which are other structures by Sinan. The southern section of the narthex is covered by five domes with pendentives supported by six marble columns and sharp arches on the northern wall The dome at the entrance axis is larger than the other domes. The sides of this section of the narthex are open. The southern section of the narthex has been encompassed in a U shape by the second narthex. This portico made by sharp arches on 24 columns is covered by a hipped roof resembling a lean-to. There is one mihrabiye each on the outer façade of the northern wall of the mosque with one to the east and the other to the west.

The crown gate of the mosque made of marble has five lines of muqarnas. Two pillars have been placed to the eastern and western façades within the width of the supporting arches carrying the dome in the harim space after

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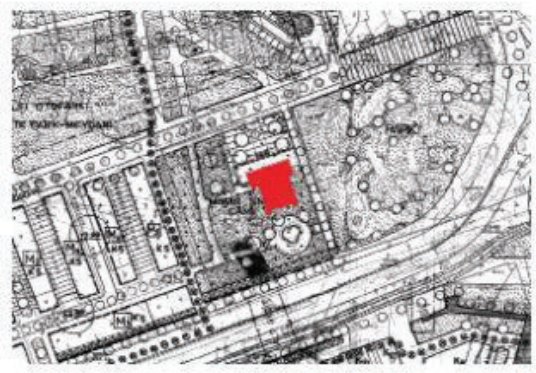
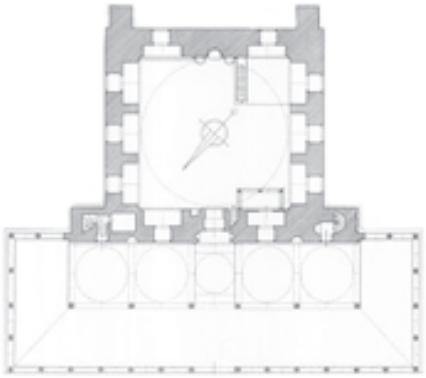
which they were connected via lancet arches thus making a gallery surrounding the interior space at all three façades excluding kiblah. The rear side of the crown gate has been protruded inside like two props for supporting these galleries. There are two windows each at the lower sections of the southern and northern walls and three windows each on the eastern and western walls. These windows have a rectangular form with lancet arch pediments. There are six more windows at the upper section of the southern wall. The same arrangement can be seen on the eastern, western and northern walls. All upper windows are leaded. The mihrab and minbar of the mosque are simple and made of marble(Photograph 13-14). There is a domed fountain in the courtyard supported by l



Photograph 12: Kurşunlu Mosque Quad
(Hasözhan, M., 2016)



Drawing 15: Kurşunlu Camisi Vaziyet Planı
(Özbek, Arslan, 2008)



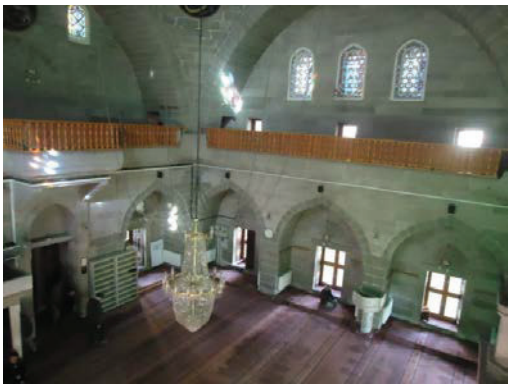
Drawing 16: Kursunlu Mosque Ground Floor Plan
(Ülgen, A., S., 1989)



Drawing 17: Kursunlu Mosque Section
(Ülgen, A., S., 1989)



Photograph 13: Kurşunlu Mosque Interior
(Hasözhan, M., 2016)



Photograph 14: Kurşunlu Mosque Interior
(Çopuroğlu, H, 2016)

ancet arches on eight (mimarsinaneserleri.com, 2017).

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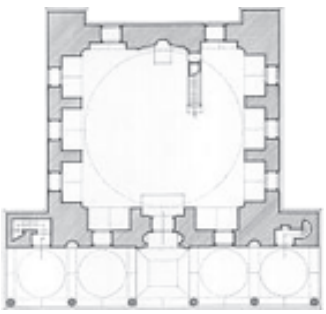
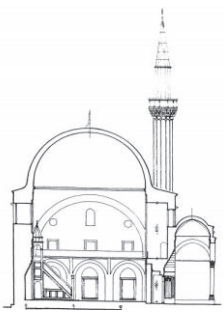
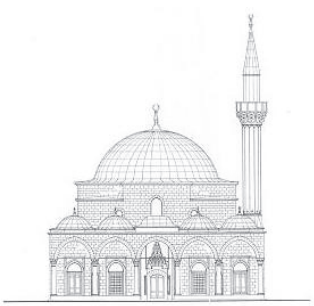
Comparison of the Structures

The study is done on 5 mosques that Mimar Sinan built on different periods. Through these mosques, Sinan shows the developments in his architectural approach stage by stage. The attention and diligence he paid to the selatin (built for sultans) mosques is possible to observe in his smaller work. Each one of his works have been a small scale trial piece for him to test his new ideas for his next selatin mosque.

The plans of the Bali Pasha (1548) and Hadım İbrahim Pasha (1551) mosques, which are observed to be constructed in close dates, are similar to each other. In both mosques the main space is covered with a single half-dome. The main carrier walls of the main enclosed space are thick stone walls. The calmness and simplicity of the spaces is striking. It is observed that this simple language is also reflected in the plan charts. It is possible to see in both sections of the sections the work of thinning the bearing body walls. The Rüstem Pasha Mosque (1561), which was constructed following these, was created by covering the single room with a half dome in the same way. Unlike Bali Pasha and Hadim Ibrahim Pasha, however, there are four delicate columns that help in carrying the dome. At the same time selatin mosques can be seen as a sub-scale of the plan schemes of these mosques. In fact, this situation; Both in terms of the development of the diagrams and in his other works of value that Sinan gave to selatin mosques in every work.

Close to the time of his death, Mimar Sinan also constructed a piece in his hometown Kayseri. Kurşunlu Mosque is among Sinan's farthest work from Istanbul, the capital of Ottoman Empire. The planning scheme of Kurşunlu Mosque is the same with Bali Pasha, Hadım İbrahim Pasha Tekirdağ Rüstem Pasha and Rüstem Pasha Mosques. In this context, Sinan's architectural approach remains the same, even if cities change. Even more, it is identical to the plan typology and carrier system of Tekirdağ Rüstem Pasha Mosque. Bali Paşa, Hadım İbrahim Paşa, Rüstem Paşa Camii are covered with a half dome. In both Tekirdağ Rüstem Pasha and Kurşunlu Mosques, it can be seen that a single space is covered by a single dome. The carrier main walls were attempted to thin down and lighten up by using window spaces on the interior. The most significant difference between Tekirdağ Rüstem Pasha and Kurşunlu Mosque from other similar work is the portico sections added to the narthex. Tekirdağ Rüstem Pasha and Kayseri Kurşunlu Mosques are their twins in every way. Tekirdağ Rüstem Pasha Mosque is placed as an example close to the capital city. On the other hand, Kurşunlu Mosque is among the rare examples in the rural parts of the Ottoman Empire. As a great architect in his master years, Mimar Sinan's humble approach in the five mosques is a proof that the architect did not only develop himself in the architectural schemes but also as a person too.

As an architect who exceeds himself in every one of his work, Mimar Sinan's approach in Bali Pasha, Hadım İbrahim Pasha, Tekirdağ Rüstem Paşa, Rüstem Paşa Mosques and Kurşunlu Mosque greets us as a humble example of classical Sinan schemes in a faraway land of the Ottoman Empire.

NAME	DATE	PLAN	SECTION	FAÇADE
Bali Paşa	1548			

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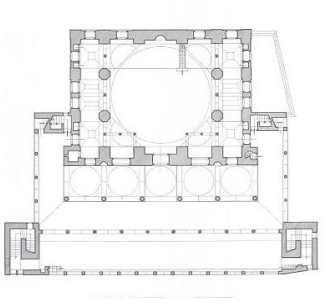
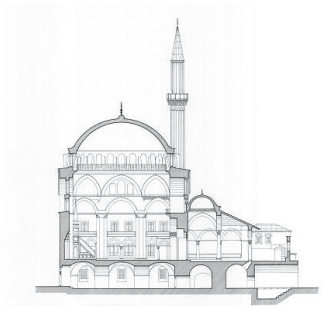
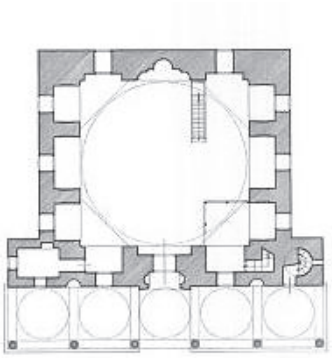
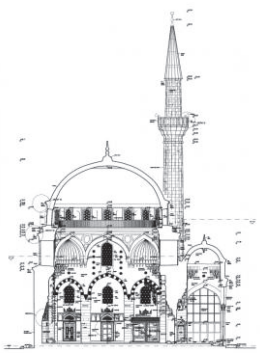
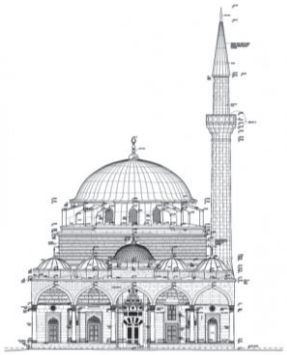
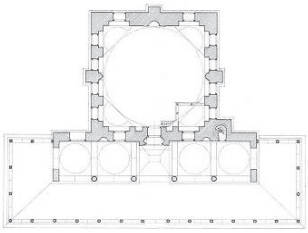
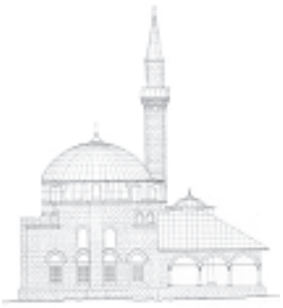
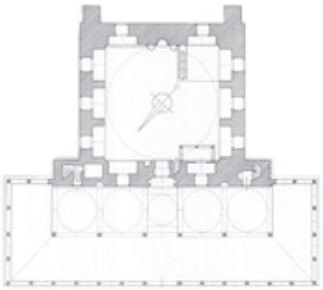
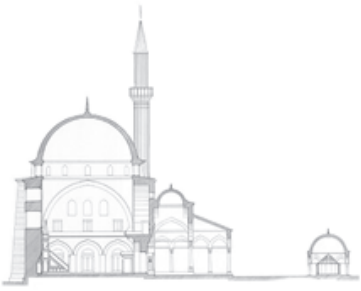
Rüstem Paşa	1561			
Hadım İbrahim Paşa	1551			
Tekirdağ Rüstem Paşa	1552-1553			
Kurşunlu	1586			

Result

In many oumental structures across the Ottoman Empire, such as mosques, manufacturing facilities, bridges, dams and more, Mimar Sinan acted in various capacities, such as designer, builder, design/builder. It was also observed that in constructions that he was not directly present, he managed to leave his mark through his approvals and interventions or by the education he provided to the architects that learned from him. In fact, Mimar Sinan's influence on his pupils was so great that some of the works done by his pupils are attributed to Mimar Sinan as well. The largest discussion about this subject is on how it was possible to see Mimar Sinan's works across the incredibly vast domains of the Ottoman Empire. During his period, Mimar Sinan designed and personally attended most of the works. But it is also known that in projects that were on the far ends of the Empire, the design of the

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piece was created in a single center by Mimar Sinan and was managed by architects guided by Sinan. This is understood from the official records of the period.

Four of the five works inspired by Mimar Sinan are in Istanbul (payitaht) and one of his works is Kurşunlu Mosque in Kayseri. The distance of Kayseri and the capitol Istanbul, the fact that it was built during Mimar Sinan's master years and still having a very humble layout makes Kurşunlu even more significant.

Selatin mosques has been seen to give direction in terms of developing small scale structures. Within this period, five works of Sinan that rank among his more humble pieces have interesting attributes. These are the Bali Pasha, Hadım İbrahim Pasha, Tekirdağ Rüştem Pasha, Rüstem Pasha and Kurşunlu Mosques. Looking at their plan schemes, it can be seen that the main walls that define the single main space and carry the dome transform into narrower and more elegant carriers. Another common attribute of these four mosques is to have a narthex covered by 5 small domes right in front of the main space. But it is clearly visible that Kurşunlu has exactly the same scheme with Tekirdağ Rüstem Pasha Mosque. Similar to the Tekirdağ Rüstem Pasha Mosque, Kurşunlu Mosque has a portico instead of the narthex. Looking at the plan and sections, it can be seen that Kurşunlu Mosque is planned to be similar to the other four mosques. Each of the five buildings in the remote settlement of the Ottoman Empire and Payitaht, which is a small town of Anatolia and carries classical period Sinan works, has an important place among Sinan's works.It is hoped that the study will contribute to future studies to be done on this subject.

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ABOUT THE CONCEPT OF TIME BETWEEN PHYSICS AND MATHEMATICS

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In this paper I consider the concept of time in a general way within physics and in relation to mathematics. I focus then the attention on quantum mechanics, with its particularpeculiarities, examining the temporal asymmetry, the Prigogine's position and the time-reversal operator of Wigner. I conclude considering the theme of the temporal asymmetry in relation to decoherence and irreversibility.

Keywords: Time, Quantum Mechanics, Irreversibility, Decoherence, Physics, Mathematics, Symmetry/Asymmetry, Education.

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ACCESSIBILITY FOR INCLUSION AND WELL-BEING IN THE CLASSROOM

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Abstract: This paper is a discussion of technology and teachers preparation about classroom management, differentiation and inclusion. Recently the role of teaching and educating the youth has become more difficult then in the past. In the classroom leave all togheter: students with different approaches to learn, students with disabilities and special needs or dyslexia. Every student needs a specific approach to have a good experience at school. The role of teachers is central to promote inclusion, access, creativity for all and also well-being in the classroom. Every student deserve a teacher who understand the power of UDL (Universal Design for Learning) and Technology that allows to every student to overcome their difficulties determinated by their disabilities. Technology can support teachers to teach more inclusively and represent a tool to promote effective learn for all. Technology solutions, in fact, allow to personalize the approach to learning and make the teaching and learning process more interactive and immersive. When students are more engaged they are more motivated and, consequently, they perform better.

Keywords: Accessibility, Inclusion, Special Education, Technology

Introduction

Nowadays educating the youth has become more difficult then in the past: classroom management is a challenge that many teachers constantly face (Carruba, 2016). They must be ready to guide all students in the class, also students with disabilities or difficulties, to be able to learn, to work hard and become their best version, to take part to the lesson and the teaching-learning process, to be motivated and interested.
Schools must be inclusive and able to promote social equity: to achieve these goals, schools deserve teachers able to include all students, to promote a context where everyone can be active and pro-active, to find solutions to overcome their students' difficulties determinated by their disabilities. The role of teachers is getting harder especially considering the complexity of today's society. In today's difficult situation, classroom management can be a solution to support teachers to teach in the best way and represents a set of effective strategies to guide the class and promote the interests of all students also in order to respect the values of the Universal Design for Learning (Carruba, 2016). Theachers, as more studies have shown, play a fundamental role in the cognitive, social and emotional development of their students and thanks to classroom management strategies they allow every student to really learn and to improve their skills. A positive classroom environment encouraging effective teacher-student relationships.
Evertson and Weistein (2016) describe the classroom management as a set of actions to support every students in the learning process. They explain five actions that allows teachers to manage successfully the classroom:

1. developing supportive relationships with and among students;
2. organizing the activity and giving clear instructions;
3. using group management and cooperative learning methods;
4. employing appropriate interventions to support students with behavior problems;
5. promoting an ongoing interaction between teachers and their students.

The classroom management is not only a way to teach but, as Kounin wrote, give to teachers a set of strategies to promote students' engagement based on these techniques:

- withitness (teachers' ability to know what was going in classroom);
- overlapping (being able to present a new topic while preventing misbehaviors);

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- momentum and smoothness (to be able to "roll-with-the-punches" and to keep on a plan or course action);
- focus group (the ability of teacher to engage the whole class).

In addition, in effectively managed classrooms it is necessary to establish:

- clear rules and procedures;
- disciplinary interventions;
- teachers-students relationships;
- mental set (that includes two aspects: 'withitness' and 'emotional objectivity') .

All these strategies allow teachers to catch students' interest e promote learning.
In the classroom, nowadays, we have students that live continuously in a digital context and spend more time using technology in their daily living. In recent years, digital skills has become important also in the schools.
How is possible use technology solutions in the classroom during the lesson?
How technology can support teachers and students in the teaching-learning process?
How technology can promote inclusion and can support students with disabilities or difficulties?

These questions moves the pedagogical reflections about the partnership technology- education.
Technology and Special Education can work together having focus on:
- users experience;
- accessibility;
- classroom and learning context design;
- creativity for all.

Furthermore, technology allows moreover to differentiate the activities according to specific students' need. Using technology, teachers can help students with disabilities, students with dyslexia, students that have different approaches to learning. That's why it is important to apply different technology tools for education so that each teaching style can match each individual learning style.
Nowadays, technology is present in schools but, as some studies prove, often teachers didn't receive a correct training and so they're unable to use these tools in the most appropriate way; on the other side, also students are able to use technology for their free time, but lack the essential skills to apply technology to the learning process.
Technology changes the way to learn if teachers use it with an inclusive approach.
When students with disabilities thanks to technology overcome their difficulties, they feel better in the classroom and, it works good also for teachers. Technology could provides innovatives solutions for mobility, hearing speech and other everyday needs and support students with disabilities enjoy the most active role in the classroom.
Every school deserve technology but not because it is the New or because it is fashionable... but because it could be the future for the inclusion.

Materials and Methods

This research focuses on:
1. Classroom management;
2. Differentiation and Universal Design for Learning;
3. Special needs, Technology and inclusion in the classroom.

Using technology for inclusion every schools could be a place for social equity and allow students, also with disabilities or disturb, to really learn, to be able to develop transversal life skills, to find opportunity to be active and feel well in every context.

Goals of the study:
- Analysis of education technology policies and legislation in Italy;
- Analysis of teacher competences and knowledge on the use of educational technology for increased inclusive education;
- Comparative studies with UK and USA about AT;
- Know-how Neuroscience: how technology impacts on the whole learning process and the perception of

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self-competence in students with disabilities including learning disabilities;
- Analysis of accessible technology.

Methodology:
- Research tools: questionnaire and interviews;
- Population: primary , middle and secondary schools, Universities, teachers, parents, students (In Italy)
- About comparative studies in USA and UK: personal experience and research collected.

Results and Discussion

In the field of education, the well-being of students is a necessary condition to make them feel included, accepted, part of the class and therefore ready to learn.
Expected results:
- Identify educational technology suitable and effective for students with disability;
- Identify educational technology to supports teachers in implementing inclusive education;
- Identify mobile apps relevant for inclusive education and classify them according to different factors: disability, activities(writing, reading, calculating, daily life...etc etc);
- Best practices on how to use educational technology as a facilitator tool in inclusive education.

Technology isn't the only solution to difficulties we are facing in schools nowadays, but might be one of the solutions that teachers can apply in their didactical activities. Technology is a good way for, and it is therefore important for teachers to learn to use it. Technology is not very widespread in schools: this happens because teachers lack the right tools (or maybe an internet connection), because they lack the right skills or just ignore the full potential of technology. In the hands of a well-trained teacher, technology, allows to achieve a school opened to everyone, also for students with disabilities or specific needs.
In recent years more researcher in different discipline has become interested in technology. One need only think, for example:
- Psychology and human and computer interaction;
- STEM (Science, Technology, Engineering and Math) education and the lack of competitiveness;
- Cultural anthropology and relationship technology / “homo faber”;
- Education and technology for learning;
- Special Education and technology for inclusion.

One charpter in my research talk about iPad for inclusion. Nowadays more italian schools use iPad in the classroom. Sometimes thanks to some teacher who loves technology or has understand the power of technology in the teaching-learning process.

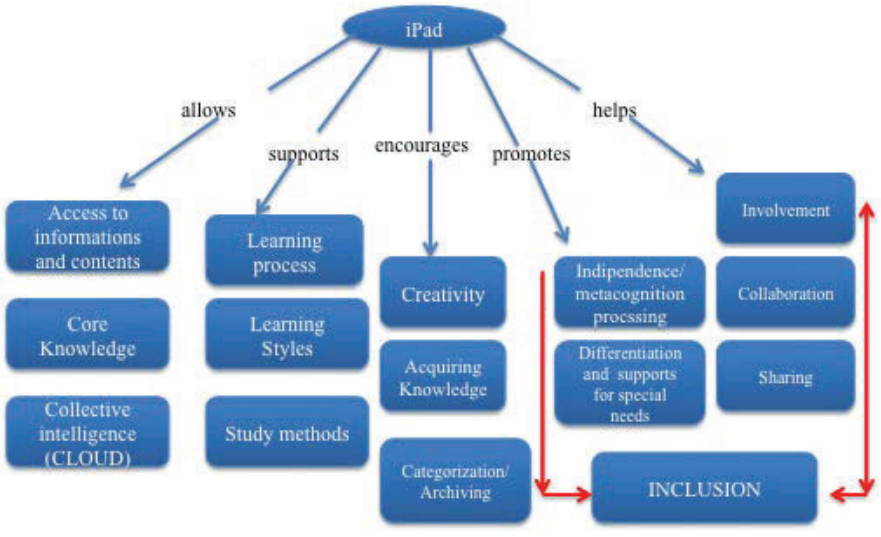

Fig. 1 Ipad inclusive and pedagogical approach

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Samples:
- 2 classes of Primary School;
- 2 classes of Middle School;
- 2 classes of Secondary School.

The team chooce the classes using this prerequisites:

- teachers used iPad for 2 years at least;
- teachers have good preparations in classroom management;
- in the classroom there's students with special needs;
- Teachers started a collaboration with our Research Center (CeDisMa), to be sure they have the same pedagogical approach about inclusion.
- Project started with a meeting when I explaned to all teachers Accessibility session in the iPad (visual impariments, hearing impaiments, motor disability, dyslexia and other). Pratical session to introduce iPad to support all students, including students with disabilities.
- Training Areas:
- Presentation of the contents during the teaching-learning process;
- Taking notes;
- Making concept map;
- Using creativity;
- Monitoring/ Considering/ Evaluating.
- The Tools to support theachers during the project are:
- Teachers' Inclusive lesson plan template;
- Monitoring plan for students;
- Guidelines that help them in using the tools (including icon tools).

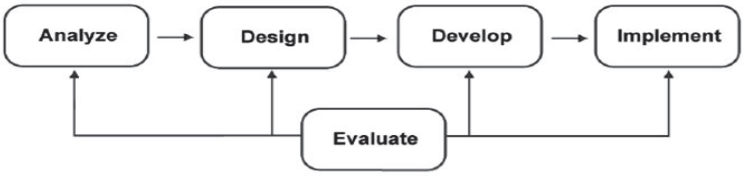

Fig. 2 Reference model ADDIE

This is a model borrowed from Engineering and Instructional Design, that fits really good in the teaching-learning process through technology. Also teachers, in fact, need to identify customers (students) needs.

Current State:

- 61 Teachers' Inclusive lesson plan template received as below:
  30 from Primary School
  23 from Secondary School
  8 from Upper Secondary School;
- 698 Monitoring plan for students received as below:
  416 from Primary School
  180 from Secondary School
  102 from Upper Secondary School

Sythesis about the analisys of data collected until July 2017:

1. Both Teachers and Students feel more competent during the teaching- learning when schools use inclusive approach;
2. iPad isn't the only solution to difficulties we are facing in schools nowadays, but might be one of the best

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solutions that teachers can apply in their didactical activities;
3. Accessibility section allows all students, also with special needs, to differentiate and to customize the contents as they deserve;
4. Accessibility section allows all teachers to meet students needs and to avoid to prepare the same content in more different ways. One tool, more ways to learn.

Conclusion

In the classroom live all togheter:
- students with different approaches to learn;
- students with disabilities;
- other special needs;
- Learning disabilities or dyslexia.

Every student needs a specific approach to have a good experience at school. The role of teachers is central to promote inclusion, access, creativity for all and also wellbeing in the classroom.
Every student deserves a teacher who understands the power of UDL and Technology that allows to every student to overcome their difficulties determinated by their disabilities.
Technology can support teachers to teach more inclusively and utilize a tool to:
- promote effective learn for all;
- allow to personalize the approach to learning:
- make the teaching and learning process more interactive and immersive.

When students are more ingaged they are more motivated and, consequently, they perform better.
Also students with disabilities or disturb deserve to be included, motivated, supported and to have a chance to enjoy their life. Despite disabiliry or disturb.
In the field of Special Education, researchers and teachers deserve a technological and digital competence to improve their students' with special needs skills to use technology in the school, at home, and also in daily living. Using technology allow teachers to be able to support their students, also students with disabilities in an inclusive and innovative way. The integration of technology into science curricula is a way to enhance or support student learning (Hoda et all, 2016) and for teachers who must learn how to implement and promote productive use of these in the classroom (Lawless & Pellegrino, 2007). In the Mishra & Koehler' vision (2006) , technological and digital competence is a fundamental skills for teachers to be successful and promote inclusion.

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ADAM SMITH'IN AHLAK ANLAYIŞI: SAĞGÖRÜ MERKEZLI OKUMA DENEMESI

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A.Smith, genelde iktisadi alandaki teorileriyle iyi bilinmekle birlikte ahlak meseleleri üzerinde de ciddi tartı şmaları bulunan bir düşünürdür. Çalı şmada onun ahlak anlayı şı , sağgörü kavramı merkezinde tartı şı lacaktı r. Sağgörü olarak karşı lanan 'prudence' kavramı , İ lkçağ felsefesinde 'phronesis' kavramı ile kökenini bulan, Cicero vası tası yla 'prudentia' olarak Ortaçağ içerisinde varlı ğı nı devam ettiren, ahlak felsefesinde hangi durumda nası l eyleyeceğimiz konusunda kaynak olan bir erdemdir ve uzun bir yol izleyerek Smith felsefesine kadar ulaşmı ştı r. Diğer taraftan, A. Smith problemi olarak adlandı rı lan ve filozofun iki temel eseri olan *Ahlaki Duygular Kuramı* ile *Milletlerin Zenginliği* arası ndaki yaklaşı m farklı lı ğı ndan kaynaklanan durum, söz konusu kavramı n nası l ele alı nacağı üzerinde sorun teşkil etmektedir. Çünkü her iki eser bağlamı nda, bir ekonomik insan ile ahlaki insan karşı karşı ya durmaktadı r. Aynı şekilde kavramı n ahlaki bir içerikle düşünüldüğü eser olan *Ahlaki Duygular Kuramı* , yine genel Smith problemi içindeki ikircikli tavrı devam ettirmektedir. Dolayı sı yla çalı şmanı n amacı , her iki eserde 'prudence' kavramı nı n kullanı m bağlamları na odaklanmak suretiyle Smith düşüncesindeki çelişkileri göstermeye odaklanacaktı r.

Keywords: phronesis, prudence, Adam Smith, ahlak felsefesi

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AGRESİF VERGİ PLANLAMASI İLE BAĞIMSIZ DENETİM KALİTESİ ARASINDAKİ İLİŞKİ: BORSA İSTANBUL ÖRNEĞİ

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Vergiden kaçınma, vergi mükelleflerinin kanunla belirlenmiş olan sınırlar içerisinde kalarak vergi matrahını minimize etme çabasıdır. Vergi kaçakçılığı ise, mükelleflerin vergi kanunlarına aykırı bir biçimde yükümlülüklerini yerine getirmemeleri durumudur. Buna bağlı olarak vergiden kaçınmanın herhangi bir müeyyidesi söz konusu değilken, vergi kaçakçılığı vergi kanunlarınca suç olarak kabul edilmiştir. Vergiden kaçınma çerçevesinde mükelleflere birtakım indirim istisna ve muafiyetler tanınmış olup bunlar kanunen indirilebilecek giderler ve kanunen indirilemeyecek giderler olmak üzere hükme bağlanmıştır. Vergiden kaçınma ve vergi kaçakçılığı ile ilgili olarak agresif vergi planlaması da vergi literatüründeki önemli kavramlardan biridir. Agresif vergi planlaması mükelleflerin yasal sınırlar içerisinde kalmak koşuluyla vergi avantajları elde etme gayretidir. Bu yönüyle vergiden kaçınma ile benzer bir nitelik gösteren agresif vergi planlaması yöntemi idarenin söz konusu avantajları kabul etmemesi yönüyle vergiden kaçınmadan farklı bir nitelik taşımaktadır. Vergilerin kamu gelirleri içerisindeki önemi göz önüne alındığında vergiden kaçınma ve vergi kaçakçılığının olabildiğince önüne geçilmesi başka bir ifade ile en aza indirilmesi ülke ekonomisi açısından büyük bir önem taşımaktadır. Söz konusu amacın gerçekleştirilebilmesi ise, ancak etkin bir denetim mekanizması ile mümkündür.

İşletme ile menfaat grupları arasındaki çıkar çatışmalarının giderilmesinde önemli bir rol oynayan finansal bilginin güvenilirliğinin sağlanması, işletmeler tarafından hazırlanan finansal bilgilerin denetimi ve bu denetimin kalitesinin yüksek olması ile mümkün olabilmektedir. Bu durum, kamu düzeni ve makroekonomi açısından bir zorunluluktur. Karar almada kullanılan finansal tabloların güvenilirlik derecesini gösteren bağımsız denetim kalitesi, literatürde temel olarak, bağımsız denetçinin denetlediği şirketin finansal tablolarındaki bir yanlışlığı tespit etme ve bu yanlışlığı raporlama olasılıklarının bileşimi olarak tanımlanmaktadır.

Bu çalışmada, agresif vergi planlaması ile bağımsız denetim kalitesi arasındaki ilişki tespit edilmeye çalışılmıştır. Bu amaçla, 2005- 2015 yılları arasında Borsa İstanbul' da imalat sektöründe işlem gören şirketler çalışma kapsamına dahil edilmiştir. Araştırmada, bağımlı değişken olarak agresif vergi planlaması ölçütü; bağımsız değişkenler olarak ise denetim kalitesi göstergeleri kullanılmıştır. Yapılan yatay kesit lojistik regresyon analizi sonucunda, bağımsız denetim kalitesinin, şirketlerin agresif vergi uygulamaları olasılığı ile negatif bir ilişki içinde olduğu tespit edilmiştir.

Keywords: bağımsız denetim kalitesi, agresif vergi planlaması, vergiden kaçınma, vergi kaçakçılığı

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AN EMPIRICAL INVESTIGATION OF GREEN PURCHASING AND ENVIRONMENTALLY FRIENDLY BEHAVIOUR

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Abstract: The worldwide environment consciousness has increased in healthcare sector while globalization has led to major trend of medical products all over the world. Due to an increasing recognition in environmental impact, hospitals are more precision towards when their purchasing decisions making. The propose of this paper is to demonstrate the importance of green purchasing practices and analyze the effect of environmentally friendly behaviors of healthcare personnel on the purchase process of the public hospital. This study have intended to understand the healthcare personnel behavior to purchase green products in context of a developing country; Turkey. Data were collected from survey of healthcare enterprise in Istanbul and analyzed using SPSS 22. A usable responses were collected with the help of a questionnaire survey using the convenience sampling approach. The analysis result confirms that the ecological awareness of healthcare personnel are significant in determining their hospital's purchase. The results show that green purchase behavior was significantly related with environmentally friendly behavior in public hospital. The research findings provide useful insights for healthcare sectors in Turkey to adopt green purchasing practices.

Keywords: Environmentally Friendly Behavior, Green Purchasing, Hospital.

Introduction

Today the environmental issue has become an important issue among hospitals as well as consumers. The environmental concern has led to an increase in consumers' demand for environmentally friendly products. Hospitals have responded by introducing a variety of green initiatives such as green medical products and equipment. They can develop sustainable marketing strategies targeting these consumers (Kanchanapibul et al. 2013). It is clear that the ways in which consumers choose goods and services have both direct and indirect effects on the environment (Lai and Cheng, 2015). The promotion of environmentally friendly and green purchase behavior is one of the ways to minimize the environmental impact.

The concept of green purchasing is gaining increasing attention among academicians as well as practitioners. The increasing attention towards protection of the natural environment and environmental issue has changed the consumer purchasing preferences (Yadav et al. 2017). The green purchasing has expanded rapidly in the developed nations, but with time this concept is also getting its foothold in the developing nations such as Turkey. The present research has used the theory of planned behavior framework to understand the consumers' behavior towards purchasing green products in the different sectors. In the purpose of this study to evaluate a relationship between the healthcare personnel behavior and purchase green products in Turkey. The analysis findings supported that the ecological awareness of healthcare personnel are substantial in the determination of hospital's purchasing decisions. The results show that there are a positive correlation between green purchase behavior and environmentally friendly behavior in public hospital.

The rest of this paper is organized as follows. Section 2 reviews more relevant literature. Section 3 includes research design, data collection and hypotheses are developed. Also, data analysis is presented including validity and reliability test and hypotheses testing. Section 4 discusses the analysis result and green purchasing implementation in hospital. Finally, we draw conclusions and highlight possible future work in section 5.

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Literature Reviews

Purchasing of environmentally friendly products and avoiding of purchasing products, which are harmful to environment, calls green purchasing (Chan, 2001). Consumers' green purchase behavior and their willingness to purchase green products, which is called intention, are the most often indicators of the green purchasing measurement.

In recent times, environmental consciousness has been increased dramatically across to the world. Because of the social and territorial problems as well as consciousness of consumers, the importance of ecology and natural balance has been discussed from the 1980s to the day-to-day process. In our changing world where technology is rapidly developing, modern companies should keep up with approaches to conservation of the environment. Worcester (1993) determined that the pollution and other environmental damage are impacted on their daily life according to 69 percent of the general public. He demonstrated his survey that the public was demanding action by companies and by governments on environmental issues. Another study recommends than consumer awareness of environmental troubles has been growing rapidly in this decade (Cartel et al., 2000).

According to a survey, which held among USA university students, environmental sensitivity vary with age, so, younger people are more sensitive to the environment than the elderly ones. Further results states that women are more interested in environmental issues, education level is positively related to environmental attitudes and behaviors, and people living in cities have more environmental concerns than living in rural areas (Straughan et al., 1999). So organizations not only have to produce more services and contribute to economic development but also have to pay attention to their services and products into conformity with environment. Consumers are closely interested in both purchasing and consuming environmentally friendly goods, furthermore, details of the production process using scarce resources and the waste assessment become an important indicator. As long as the consumers' sensitivity to environmental issues grows, companies' starts to initiate environmental friendly programs, which is called "proactive environmental programs", these programs mainly focus on developing reusable products, conserving energy, reducing and recycling wastes, developing environment first orientation on their corporate culture and codes so on (Handfield et al., 1997; Min et al., 2001). Environmental sensitive management enhanced financial performances of enterprises and values of shares outstanding (Klassen et al., 1996). Due to consumers' this environmental sensitive behaviors, businesses which discharge the duties and responsibilities, and sustaining practices that better protect on nature will be able to survive in the future.

Green logistics is also to be organized sensitively to the environment activities of supplier, distributors and customer. Green logistics involves four main functions such as green purchasing, green product and materials management, green distribution and marketing and lastly reverse logistics. Waste management, such as reducing and recycling of the production related wastes and reclamation of recycled wastes, is also an important part of the green purchase decision making (Min et al., 2001; Sarkis, 2003). Green purchasing refers to manufacturing, buying, packaging, distributing, reusing or disposing an environmentally preferable raw material, product or service. It also means buying a service or product which affects human health or the environment less or poses lower risk compared to its competitor which is used for the same function or purpose (Clinton, 1998).

Over the last decades to explain consumer's environmental purchasing behavior, there are various new articles about green purchasing and related subjects such as green production, green acquirement so on in the literature. Green supplies construction and impacts become a popular subject among researchers, and their journals have been published on several high profile journals such as, journal of purchasing and supply management, transportation research and other journals. Most of them analyzed the correlation between the consumer or personnel behavior and purchasing green products in different markets. Schlegelmilch et al. (1996) assessed the strength of relationship between the measures environmental consciousness and pro-environmental purchase behavior. They stated that attitudes were the most important predictor of pro-environmental purchase behavior. There had been relatively small approaches to classify consumers especially their levels of green purchasing behavior. Follows and Jobber (2000) have tested a consumer model using covariance structural analysis for environmentally responsible purchase behavior and values that are fundamental to explain attitude formation. Individual consequences, taking the personal implications of consumption into account, had been found to be just as important in predicting intention as the environmental consequences of a product. Companies green purchasing effects their performances. Furthermore, green purchasing not only, effects firms net income, but also, effects the

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cost of sold goods as long as, the firm has been controlling its size, leverage so on (Carter et al., 2000). It was determined the influence of consumers' environmental sensitivity on product choices in another study (Seitz et al., 2001). They found the behavioral factors played a major role in purchasing environmentally sensitive packaged products.

A survey has been held on US firms, which have greater environmental risks. That survey presents empirical results to purchasing department professionals about environmental friendly oriented purchasing strategies, in order to reduce their risks (Min et al, 2001). Empirical results mainly oriented to practicing green purchasing, green purchasing's effects on supply chains, waste management and regulation compliance. In addition, a structural equation model for ecological consumption orientation has been modelled by using previous green purchase orientation (Kim et al, 2005). According to the model, believing about consumer effectiveness vary on social value orientation. As a result of that, social value orientation influence green purchasing orientation. Another survey has been held on young consumers' of Hong Kong, in order to figure out their green purchase behavior. According the Hong Kong survey; young peoples' main aim for green purchasing is social influence which is followed by, environmental concern, self-image in environmental production and sensed environmental responsibility (Lee, 2008). Green supply adoption has five parameters such as, effectiveness, purchase pricing, organizational concerns, health-safety and other partners (Salam, 2008).

A structural model states the relation between environmental performance and the purchasing performance. According to the model, environmental performance has a positive impact on purchasing performance, moreover, green performance vary on both green supply assessment degree and applying level of green collaboration (Large et al, 2011). Young generations' green purchasing behavior's in the context of the influence of ecological affect and ecological knowledge has been examined, and empirical results showed that both the ecological affect and ecological knowledge were very significant on their green involvement and purchasing orientation (Kanchanapibul et al, 2013).

Dubey et al. (2013) argued that green purchasing behavior positively affects the customer satisfaction and market share in manufacturing companies of India. They analyzed their article the theoretical framework and obtained the result that there was a positive correlation between the market pressure, leadership, regulatory framework and quality management. Joshi and Rahman (2015) reviewed 53 empirical articles related to attitude - behavior inconsistencies in the context of green purchasing on green purchase behavior from 2000 to 2014. They have put forward two main reasons that affect consumers' green purchasing behavior; Consumer's environmental concern and functional attributes of the products. Yadav and Pathak (2016) analyzed the consumers' environmental purchasing behavior markers using the theory of planned behavior in emerging markets. The findings described that TPB fully supported the consumers' intention to buy green products which in turn influences their green purchase behavior. In contrast to the others, Schlossberg (1991) and Winski (1991) have argued that there is a weak correlation between consumers' behavior on environmental issues and converting these behaviors into real purchasing behavior.

Liobikien et al. (2017) states the differences between green purchase and their determinants, with subject to, Lithuanian and Austrian data sets. That study recommends that Lithuanian data sources requires to encourage for green purchasing, for practicing environment friendly behavior. The green purchasing intention of the consumers are significantly affected by environmental behaviours and eco-label and cultural values (Chekima et al, 2016). Furthermore, packaging and advertising strategies of the products are the main factors of the consumers' purchasing orientation. As a result of that, packaging and advertising should emphasize individuals' positive effects on particular environmental issues and their green purchase orientation (Lai et al, 2015).

Research Design and Data Collection

In this paper, questionnaire survey has been used to comprehend the green purchasing in healthcare sector. Sample was taken from the public hospital in İstanbul. The survey was executed from January to May 2017. Questionnaire is asked to selected healthcare personnel such as doctors, nurse, and administrative staff in hospital. They are in best position to give opinion on the strategic aspects related to green purchasing in healthcare sector in Istanbul. The questionnaire is devised as "five point Likert scale". Besides, face to face survey method is implemented for administration of the questionnaire. For the purpose of carrying out statistical analysis individual responses are conducted from 1 through 5 accordingly. Furthermore, questions asked to respondents regarding environmentally friendly behaviors related with green purchasing by using 5 point Likert scale.

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Collected data are collated both in SPSS 22 and analyses by using an exploratory factor analysis. We employed the principal components analysis with varimax rotation. This contributes to determine the presence of meaningful patterns between the original variables and extract the major factors. Principal component analysis with varimax rotation is employed in order to clarify the dimensions of environmentally friendly behaviors and green purchasing in hospital. Some variables are allocated as an effect of the demographic findings. Since the objective of the questionnaire was to collect the healthcare's personal attitudes, six demographic variables were investigated, namely, gender, age, level of education, income, jobs and operation time of job.

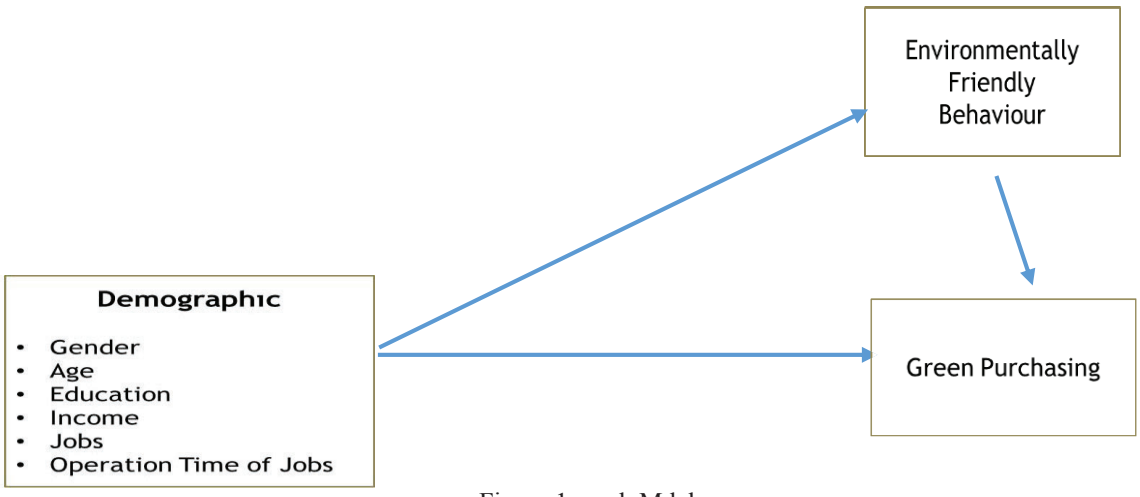

Figure 1 earch Mdel

Results and Discussion

The profile of respondents includes gender, age, education, income, jobs, and operation time of jobs. The gender has minimal next to less than eleven percent difference; 44.7% male and 55.3% female. The respondents' age is mostly between 20 -30 years old (22.4%), 31-40 years old (24.7%), 41-50 years old (27.1%), 51-60 years old (25.9). Regarding educational attainment; 11.8% graduated a high school, 18.8% graduated a vocational school and 40% had a bachelor degree, 29.4 % had a master degree. In this study, all of the participants are healthcare personnel, moreover, majority of the participants have bachelor degree from different universities and institutes.

In terms of jobs, 38.8% of respondents are nurse, 26.1 % of respondents are doctor, and 34.1% are administrative staff. Healthcare personnel major payment scale lies either in 1500-2000 or 2501-3500 intervals. Furthermore, 38.8% of the participants have been working more than 11 years, as a result of that, employees works long periods in this public hospital.

Table 1: Preliminary characteristics

Measure	Value	Frequency	Percent
Gender	Female	47	55,3
	Male	38	44,7
Age	20-30	19	22,4
	31-40	21	24,7
	41-50	23	27,1
	51-60	22	25,9
Education	High School	10	11,8
	Vocational school	16	18,8
	University	35	40
	Master	25	29,4
Income	1500-2500	18	21,2
	2501-3500	20	23,5
	3501-4500	16	18,8

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	4501-5500	10	11,8
	5501-6000	9	10,6
	6000 and over	12	14,1
Jobs	Nurse	33	38,8
	Doctor	23	26,1
	Administrative staff	29	34,1
Operation time of job	Less than 1 year	12	14,1
	1-2 years	9	10,6
	3-5 years	17	20
	6-10 years	14	16,5
	11- 15 years	17	20
	16 and over	16	18,8

For green purchasing implementation, wherever applicable, Cronbach's coefficient (Alpha) is calculated. It is used to calculate internal consistency of responses and reliability in this survey. Here, statistical tests are conducted to prove the reliability and validity of the items measured. First, a Cronbach's alpha test was performed on all the constructs to assess the reliability of the collected data. Items are mainly considered to be valid if their alpha factor exceeds a level of 0.70. The Cronbach's alpha coefficient of this study is 0,812. On this scale, they are determined to have a high reliability.

Table 2: Descriptive statistics

	N	Mean	Std. Error of Mean	Std. Deviation
Environmentally friendly behaviors	100	4,2094	0,6226	0,57396
Green purchasing	100	3,5588	0,9943	0,91674

Table 2 provides a brief summary of the responses. The mean and standard deviations are calculated to explain the current situation for environmentally friendly behaviors and green purchasing. The means show in Table 2 are in range 3,55 – 4,20. It points out that public hospital in Istanbul have already implemented actions to integrate green purchasing implementation. The standard error mean describe in range 0,62 - 0,99 and standard deviations define in range 0,57 – 0,91.

Table 3: Green Purchasing Frequency

Green Purchasing		**1**	**2**	**3**	**4**	**5**	**Total**
It is considered how this product will affect both the patient and the hospital when purchasing a product	Frequency	1	4	16	26	38	85
	Percent	%1,2	%4,7	%18,8	%30,6	%44,7	%100
Our hospital is purchasing reusable products.	Frequency	5	14	30	22	14	85
	Percent	%5,9	%16,5	%35,3	%25,9	%16,5	%100
Our hospital chooses to purchase products that are not over-packed.	Frequency	4	17	17	30	17	85
	Percent	%4,7	%20	%20	%35,3	%20	%100
	Frequency	7	13	12	18	35	85

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Our hospital checks the signs and symbols on the environment when purchasing products to see if they are environmentally friendly.	Percent	%8,2	%15,3	%14,1	%21,2	%41,2	%100
Our hospital is cooperation with suppliers who are ISO 14001 certified.	Frequency	8	11	28	18	20	85
	Percent	%9,4	%12,9	%32,9	%21,2	%23,5	%100
Our hospital chooses suppliers by setting environmental criteria in the procurement process.	Frequency	4	19	21	23	18	85
	Percent	%4,7	%22,4	%24,7	%27,1	%21,2	%100

According Table 3, some questions which are "our hospital is purchasing reusable products" and "our hospital is cooperation with suppliers who are ISO 14001 certified", explain that unstable rates are so high. Healthcare personnel support that hospital is considered how this product will affect both the patient and the hospital when purchasing.

Table 4: Correlation between environmentally friendly behaviors and green purchasing

Green Purchasing	**r**	**p**
G1:It is considered how this product will affect both the patient and the hospital when purchasing a product	0,473**	0,0005
G2:Our hospital is purchasing reusable products.	0,555**	0,0005
G3:Our hospital chooses to purchase products that are not over-packed.	0,219*	0,44
G4:Our hospital checks the signs and symbols on the environment when purchasing products to see if they are environmentally friendly.	0,431**	0,0005
G5:Our hospital is cooperation with suppliers who are ISO 14001 certified.	0,89	0,42
G6:Our hospital chooses suppliers by setting environmental criteria in the procurement process.	0,191	0,80

**. Correlation is significant at the 0.01 level (2-tailed).
*.Correlation is significant at the 0.05 level (2-tailed).

Table 4 has been examined whether there is a relationship between environmentally friendly behaviors and green purchasing in public hospital. In the correlation analysis, we found that G1-G2-G4 have a significant positive impact. Furthermore, Correlation coefficient (r) appear to be significant at the 0.01 and 0,05 level and in the same direction of the relationship. In this context, thirteen hypotheses in Table 5 below has been provided and has been analyzed by using different analysis methods. T test and Anova analysis has been carried out to find out, whether there is any statistical difference between demographical characteristics and environmental friendly behavior of the survey participants. The accepted hypothesize states that, there is a statistically meaningful difference between demographical characteristics and environmental friendly behavior with respect to income, occupation, operation time of occupation variables. On the other hand, this hypothesis has been rejected based on gender, age and education variables. Furthermore, survey participants' demographical characteristics against green purchasing orientation has been examined as well. As a result of the analysis, there is a statistically meaningful difference between income, occupation and green purchasing variables. Correlation analysis shows that there is a relation between environmental friendly behavior and green purchasing

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Table 5: Results of Hypotheses

Hypotheses		Results
H1	Gender - The environmentally friendly behavior	Not supported
H2	Age - The environmentally friendly behavior	Not supported
H3	Education - The environmentally friendly behavior	Not Supported
H4	Income - The environmentally friendly behavior	Supported
H5	Jobs - The environmentally friendly behavior	Supported
H6	Operation Time - The environmentally friendly behavior	Not supported
H7	Gender - Green purchasing	Not supported
H8	Age - Green purchasing	Not supported
H9	Education - Green purchasing	Supported
H10	Income - Green purchasing	Supported
H11	Jobs - Green purchasing	Supported
H12	Operation time - Green purchasing	Not supported
H13	The environmentally friendly behavior - Green purchasing	Supported

Conclusion

Growing consumer awareness of the environmental and social impacts associated with product consumption facilitates penetration. The statistical analysis confirmed that environmentally friendly behavior of healthcare personnel have a significant impact on green purchasing. Our results also showed that they have a higher degree of theoretical knowledge of ecology. However, all the respondents point out strong bond with ecological study were likely to be deeply involved in green purchasing. The study explains that personal affective response is a key motivation to actually become involved in green purchasing.

The objective of this paper was to analyze how green purchase is related to environmentally friendly behavior in public hospitals. It is very important to promote the environmental awareness particularly in Turkey. The high correlation with significant reliability is evidence to support the verification of the hypothesis. This highlights the importance of creating favorable conditions in terms of availability which may facilitate and ease hospital's decision of buying of green products. Healthcare personnel encourage that hospital is decided how this product will affect both the patient and the hospital when purchasing medical equipment. In the purpose of this study to evaluate a relationship between the healthcare personnel behavior and purchase green products in Turkey. The analysis findings supported that the ecological awareness of healthcare personnel are substantial in the determination of hospital's purchasing decisions. The results show that there are positive correlation between green purchase behavior and environmentally friendly behavior in public hospital.

In addition, the findings revealed that income and jobs have a significant positive effect in the environmentally friendly behavior. Results point out that education, income, jobs have a significant positive effect in the green purchasing. It is imperative that businesses adopt environmental implementation. In order to maintain the consumer society, hospitals need to focus on delivering satisfaction. As long as the environmental ideology is dominant, the green purchasing will be prosperous with a greater number of consumers. Future research might be conducted by extending the research into general environmental attitudes and green purchasing, which may be indicated by comparing public, university and private hospitals

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Ancient Kartvelian Scripts of Crete (2): The Disc of Phaistos

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Abstract: The paper studies the structure of a pre-Greek script of the Phaistos Disk (PhD).
1. The direction of reading the PhD texts is from left to right.
2. Rotations of pictographic PhD signs determine their phonetic readings as words and as words read in reverse order, also as initial or final syllables.
3. Throughout the region of the Aegean area, Asia Minor, Mesopotamia, SW Asia and Egypt only PhD script uses acrophony in its writing system, which initiates phonetic presentation of speech units into the general process of script development.
4. PhD pictographic signs are polyphonemic in the system of the script, but their use in inscriptions is unambiguous.

Keywords: PhD script, reading directions, the algorithm for decipherment PhD texts, paradigmatic and syntagmatic structures of the scripts.

Introduction

My paper presents the analysis of the structure of one of the Ancient Kartvelian writing systems of Crete – the syllabic-logographic script of the Disc of Phaistos (PhD script).

J.Chadwick wrote: "No account of writing in Crete would be complete without a mention of the famous Phaistos Disk… a disk of baked clay …inscribed on both sides with a text which runs spirally from the rim to the centre… "But the most remarkable feature of the disk [script] is its method of execution. Each sign was separately impressed on the soft clay by means of a punch or type cut for the purpose… this use of standard forms was a remarkable anticipation of the invention of engraving and printing some thirty centuries later in Europe…"; and he also noted: "Civilization in Crete was incomparably older than in Greece; and even in the Late Bronze Age it was still more advanced. Legend told of Athens's subjection to King Minos of Crete; here was the alien civilization which held the Greeks in thrall…" (Chadwick, 2014, p. 19-20; 8). He certainly meant the first books in Europe printed by Johann Guttenberg, and some years later by William Caxton in 1460ies and 1470ies.

The dating of PhD script is supported by shorter inscriptions of the same script that have reached us: *the Malian Stone Block* inscription that is dated back to 1800-1700BC, the inscription on the *Alkalokhori bronze* axe dated back to the 16th century BC, and that on the *Phaistos Vase* dated to 1400-1300BC. The script of Phaistos Disk is thus proved to have been in use for about 500 years since the first quarter of the 2nd millennium.

The language of the PhD texts was declared to be neither Indo-European nor Semitic. It was considered impossible to *decipher* PhD inscriptions because they were supposed to belong to some extinct culture and language. G.Ipsen (1929, 1-41) wrote that reading the Disk inscriptions depended on the favour of the situation, and the disk itself was dumb.

PhD and LA scripts have been deciphered by a mathematician G.Kvashilava.[14] The deciphered inscriptions are proved to be the instances of the scripts for writing down an *ancient Kartvelian language*; more appropriate term - namely Common Kolkhian - has been suggested recently to denote the period of the ancient Kartvelian times of PhD and LA scripts. The term denotes Laz, Megrelian and Meskhian group of Kartvelian languages after Svan had split off in the 3d millennium BC.

[14] The whole material of G.Kvashilava's decipherment was published in Georgian and English in 2006–2017, mostly in: *Studies in History and Ethnology*, Ivane Javakhishvili Institute of History and Ethnology, Tbilisi; in: *Kartvelology*, the Institute of Oriental Studies, and in: *Issues in Linguistics*, Ivane Javakhishvili Tbilisi State University.

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It should be underlined that all language forms deciphered by G. Kvashilava are in full correspondence with the Common Kartvelian phonemic and morphologic structures reconstructed and presented by Th.Gamkrelidze and G.Machavariani (1965) in their large-scale research on the typology of Common Kartvelian.

The pictographic PhD inscriptions are *hymns* or *prayers* addressed to the Great Mother Goddess Rhea-Cybele (side A of the Disc), and Korybantes (side B) asking for protection from disaster and calamity. In this respect the inscriptions of the Disc are instances of *literary texts*.

Each separate sign of the Disc is printed with a gold stamp (a punch) of repeated use. The stamps are generally considered to be the inheritance of Mesopotamian culture but their use in Cretan inscriptions for printing texts is unique.

It is important to note here that the pictographic signs of the Phaistos inscriptions are logographs of the *words of fully vocalic (not reduced) syllables* – two syllables in a word and, which is also important, the vowel of the last syllable is also of *a full vocalic quality* (see about this in: Gelb, 1965, p. 155-158).

About the direction of reading of PhD inscriptions

The direction of reading of PhD inscriptions caused some disagreement and uncertainty; the declared decisions were sometimes changed to the opposite ones. So it was a demand to study the direction of reading of the PhD inscriptions in detail. It was certainly not simple to find out what rules regulate the direction of reading the Disc, because its pictographic signs rotate taking one to four different positions along the spiral line on the Disc. E.g., *PhD29* – a lion's head is presented in four positions, *PhD31* – a bird of prey – in three positions, *PhD8* - a hand takes two positions, *PhD33* – a fish has one position only. The regular rotations function in other PhD script inscriptions, too: the same *PhD33* (a fish) takes two positions on the Phaistos vase, and *PhD32* (a dove) is horizontal, differently from its vertical position on the Disc, etc.

G.Kvashilava's study showed that special characteristic features determine the direction of reading of the disc inscriptions (Kvashilava, 2008). Firstly, on both sides of the Disc the beginning of the texts is marked with special symbols: in the centre of the spiral line of side A there is a *rosette* – a symbol of the sun and the beginning (Ad de Vries, 1981, p. 436), and in the centre of side B of the Disc there is *a spiked helmet* – a symbol of the moon, also implying the beginning. According to these symbols the reading of the Disc texts begins from inside of the spiral – from left to right.

Besides, the general symbolic meaning of any movement along the spiral line from inside out means evolution, creation, but the movement from its outer point to inside implies regeneration and destroy. It is impossible to imagine that the texts of religious or ritual character like Disc texts imply regeneration and destroy. Symbolic meanings of the signs in the centre of the spiral on both sides of the Disc and the spiral itself as a symbol imply that the direction of the PhD inscriptions is from inside out.

Also: very simple division marks – vertical lines or bars break up the texts into words, and a special sign – the vertical line with five dots on it indicates the end of the inscriptions on both sides of the Disc. It could be now concluded that the direction of reading of the Phaistos Disc inscriptions is defined as left-to-right by division marks, symbolic meanings of certain signs in the centre of the spiral and of the spiral line itself.

About the algorithm of reading PhD Inscriptions (G.Kvashilava)

It was mentioned here that pictograms of both PhD texts always change their positions along the spiral line: they are positioned either *horizontally* or *vertically*. Besides, *horizontally placed* pictograms change their positions: they are looking left or right, and *vertical pictograms* are directed upward or downward from the spiral. It should be noted here that *most pictograms* of the PhD inscriptions are printed on the Disc *vertically upward looking.*

G.Kvashilva (2008, p. 253-254) has presented an algorithm for the phonetic reading of pictograms in different positions; it is valid for all PhD inscriptions without exceptions. It will be seen that the pictographic signs denote the phonetic forms of words as well as syllables. The rules of the algorithm are briefly presented below:

1. *Horizontally* printed pictograms function as *logograms*:

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a. If directed from *left to right* (the 'initial' position) a horizontal pictogram is read as *a word*. PhD31 a bird of prey is read as [*kərə*]);

b. In the right-to-left horizontal position a pictogram is read in reverse – the last syllable of the word read first, and the first syllable read last. Thus positioned PhD31 sign is read as [*rəkə*] (meaning 'a horn').

2. *Vertically* printed pictograms are *syllabic signs*:

a. If a sign is *upward* oriented from the spiral line it is read as the *first syllable* of the word. The PhD31 is read as [*kə*]. The vast majority of PhD pictograms on the Disc are printed in this position.

b. If a vertical pictograph is positioned downward from the spiral, the second syllable of the word is read. (This position is omitted for PhD31 in this inscription).

G.Ipsen wrote that the Disc was a 'real script' (meaning that the pictograms were phonic signs), and the inscriptions should be read as speech units; "… this is not the result of historical development, but *unique* (*einmaliges)* and *remarkable achievement* …independent from other scripts." G.Ipsen also notes that the Old Egyptian and Old Mesopotamian scripts prove their originality by the fact that they wrote words. But here [in *this real* script] *pictographs denote syllables and words…"* (Ipsen, 1929, p. 10-11; 15).

G.Kvashilava's algorithm shows how the phonic reading of 'speech units' is achieved, and how pictograms are read as *words, words in reverse*, *initial* or *final syllables* of *fully vocalic language* according to the positions of the signs along the spiral line.

The left-to-right positioned horizontal pictograms of the Disc are: PhD2 - a head of a Korybas, PhD31 - a bird of prey, PhD29 – a lion's head, PhD25 – a boat, and - on the Phaistos Vase and Malian Stone Block: PhD32 – a dove, PhD33 – a fish, and PhD14 – a yoke. They are read as full words.

Pictograms printed horizontally from right to left are read in reverse: PhD15 – an axe, PhD31 – a bird of prey, and, certainly, one of the positions of PhD29 – a lion's head.

For pictographs that are printed vertically down from the spiral line, as e.g., PhD44 – a man's head, PhD 28 – a leg of an ox, also PhD31 and PhD29 in the same position, second syllables of words are read.

All other signs on the disc are vertical upward-looking, they are acrophonic – the initial syllables of words are read in these cases. It should be underlined here that this four-variant phonic readings of words with changing order of syllables is made possible by the special and rare phonic structure of *language*. The problem will be discussed below.

The exceptional character of this word-syllabic writing shown in the algorithm is of the particular interest, namely: pictographic signs are *paradigmatically* characterized as polyphonemic, because *the system* allows *four phonemic* readings for each pictogram. But the system is also equipped with strict rules of rotation which govern the particular sign-position in *inscriptions,* and *syntagmatic* functioning of each sign thus allows *only one position* and, consequently, *only one phonemic reading* for each pictographic sign in a written text. This *unambiguous* ('point-by-point' or *one-to-one*) equivalence between phonemic units and their pictographic presentations in the inscriptions of Cretan Kartvelian scripts is quite an exception from the general tendency.

Such a univocal syntagmatic structuring of the correspondence between written signs and their phonic quality logically implies that PhD script (and with it also Linear A) is *not borrowed* - unlike the widely spread practice of borrowing scripts in those far-off times. It is clear that such *strictly defined writing system of writing was specially created for one definite language* – the ancient form of Kartvelian with its full-vocalic word structure – and so the scripts are original. *The unambiguous correspondence between the phonemic units and graphical signs has been traditionally preserved through the whole history of Kartvelian scripts up to modern Kartvelian (Georgian) alphabet.*

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About Acrophony in PhD

Acrophonic reading of vertically positioned pictographs in PhD inscriptions has been already mentioned, and below some more details will be given about it.

Acrophony implies a special use of initial syllables of words in writing. Script theoreticians consider the use of acrophony to be an *exceptional and special inner feature* of script systems, which has brought important results for the general development of script: it is the first and the most important step for introducing *phonic* or '*speech*' elements into ancient pictographic writing.

Pictography indicates nothing about the phonic character of the language of the script, which often causes indeterminacy and vagueness of understanding inscriptions of ancient scripts (Neumann, 1958, p. 156-158). *The sense of the inscriptions was to be guessed and interpreted* in accordance with cultural, professional or individual habits of an addressee: *phonetic reading was disregarded.*

This insufficiency was overcome in the Cretan writing system of the PhD script with introducing *acrophony* as the special means of *indicating phonetic qualities* of pictographic signs in PhD script: syllabic signs and the syllabic structure of words were thus introduced into pictography, and *the visual perception* of the inscription was changed by the *process of phonetic reading*. With acrophony the process of *reading* the signs of ancient scripts was begun, and the possibility of *understanding* of the contents of written texts *fully* became possible.

According to I.J.Gelb, G.Ipsen, G.Neumann, The principle of acrophony is a special structural feature that marks out the PhD script (Ipsen, 1929, p. 41; Neumann, 1958, p. 156-158). Acrophony is extremely rare in ancient scripts: employing this principle of phonetic reading as a feature of the system of scripts is *quite a unique quality* of Cretan scripts initiated in the PhD script.

There is no doubt that introducing acrophony into a writing system was made possible by *the preliminary phonemic analysis* of the language. The phonic qualities had been abstracted from visual features of pictograms, and now a speech unit – a logogram had been broken up into syllables. The result is a principal transformation of pictographic writing into a word-syllabic script. This most complex process is not only carried out, but also demonstrated in the PhD inscriptions. No other example of the *purposeful and systematic* use of acrophonic writing has been attested yet in ancient script systems.

As a result of employing acrophony in PhD writing, the process of the *unambiguous correspondence between writing and speech* was introduced into the process of script development. *Acrophony introduced syllabic structure into the pictographic writing; with it the phonetic reading was begun: and, finally, the unambiguous correspondence between written units and speech sounds was introduced into the general process of script development. Such unambiguous correspondence has been preserved in Modern Georgian.*

About Anagrams in PhD script

One more unique feature of PhD script is the explicitly *anagrammatic structuring* of its system (paradigmatics) and its inscriptions (syntagmatics – horizontal correspondences).

Considering anagrams to be the important poetic attribute of old Indo-European poetic texts – smaller hymns, odes, and later – epic, F. de Saussure analyzed the vast material of Indo-European poetry studying its use and structure. But, as he wrote to A.Meillet, this process was like trying to explain the historical string of events *the starting point of which we know nothing about*.[15]

Because my paper endeavors to show that the system of the Phaistos Disc script is structured on the principle of anagrams, and the system of its texts is based on anagrammatic transpositions, this poetical device will be compared to the device of *alliteration,* and then discussed in more detail below.

The ancient poetic devices of *alliteration* and *anagram* seem to be similar in their functioning, because, generally speaking, they both are phonic devices for repeating some sounds in poetical texts. But it is important that I now present a brief analysis of *dissimilarities* of these devices, and show how different their functions are.

[15] F. de Saussure's (1977) texts are quoted according to V.V. Ivanov's Russian translations.

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The phonetic device of *alliteration* implies the commencement of a word group with the same consonant sound (letter) or a syllable in verse (Wilpert, 1964). It is well traced in the old Germanic verse as a necessary phonetic repetition of the *stressed consonant of the initial syllables* of words *'independently from their meaning'*. The rhythm and the alliterated initial syllables are connected up in verse (Saussure, 1977, p. 641), which means that in an alliterated system, the number of repeated consonants (or syllables) is defined *by the number of the stressed words*; *unstressed syllables cannot be alliterated*, and the process of alliteration is *not dependent on the meaning* of these words (Gamkrelidze and Ivanov, 1984, 161-162; 838-839). Alliteration structures a kind of 'initial rhyming' in verse which connects all stressed words in the text by means of phonetic similarity.

According to F. de Saussure, *alliteration* is a poetical device that creates emotional effect; it a *musical organization of sounds, serves phonetic harmony and beauty of verse* (Saussure, 1977, p. 640) echoing *stressed initial consonants* of a line in verse. The choice of the repeated initial consonant is *motivated only phonetically* to achieve the definite poetical effect of phonic harmony.

Some words should be added here about old Indo-European phonological system that was characterized by the *morphologically relevant dynamic word stress* that formed inflectional and derivational oppositions in the language system by shifting from one syllable of the word to another. This process naturally caused the *weakening or loss* of a vowel of the unstressed syllable in a word resulting in consonant clusters typical for Indo-European. F.de Saussure (1977, 644) called them 'coarse'. As already mentioned above, the number of alliterating syllables in a verse line (a strophe) is determined by the number of stressed words independently from their meaning.

We have to discuss *the device of anagram* now. It functions first and foremost as a *semantic* device: it will be shown below that anagram is burdened with semantic functions more complicated than, e.g., unmotivated naming of objects of the outer world in language. Paradoxically, the semantic role of anagrams *is to avoid the direct naming* of certain words in the text: the names of ancient deities (Gods or Goddess), of heroes or a person to whom the text is dedicated, places and areas - some important and significant information about the religious rites that are of special value for the community *should not been named directly*. The motives for such concealment could often be *religious, cultural or traditional* demands caused by *reverence, fear, taboo* or, lastly, by the author's own inclinations or wish.

The stimulus for anagrammatic writing could have also been the religious beliefs according to which addressing God in prayers, also hymns, prayers, prophesies, or invocations would not achieve the aim if the texts do not *contain the syllables* of the name of God. The burial hymns are also the examples of a wider use of the device with the anagrammatic use of the name of the diseased (Saussure, 1977, p. 639-342).

According to F. de Saussure, one more specific quality of ancient Indo-European poetic texts is *more-than-one* necessary (*voulues*) repeating *(retone*) of the key-word (mot-cle') that is presented in some disjointed (transposed) phonetic forms (Kholodovich, 1977, p. 667). The necessity of repeating or imitating the key-word with the disjointed form *more than once* in the text should be underlined here. It was this principle of alliterative repetition with semantic implications that was called *anagram* by Saussure (Gamkrelidze and Ivanov, 1984, p. 838).

It could be concluded that the whole process of creating anagrams is stimulated by culturally conditioned *need of the concealment of certain names, and - the equal need for* the semantic and phonetic hinting, 'imitation', or reference to *them.* F.de Saussure (1977, p. 642) suggested that the motives for creating anagrammatic texts could have also been purely poetical like it is for creating *rhyming,* or assonance.

Anagram is also a *phonetic* device, firstly because its semantic functioning is carried through with the phonic means. But unlike alliteration, anagram is not a mere skillful phonic play with sounds. Its phonetic functions are of quite a definite character.

These are, namely:

(1) changing the order of the syllables of a key-word in the text. The order of the syllables are often *given in reverse*, or the order might be changed in some other way;

(2) as a result of such phonic transposition the initial key-word is *covered up* (sometimes the new word is received);

(3) with this *newly ordered sequence* the phonic forms of the initial word is repeatedly referred to in the written or oral text,

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and *(4)* thus the significance of the key-word is certainly preserved and underlined.

Finally, *(5)* it is important that *every syllable* of a word can be potentially involved in re-ordering the syllables of a key-word (Saussure, 1977, p. 640).

Such kind of writing was called by Saussure '*phonic writing'*; and a great difference between *alliterative writing* and the *phonic* writing was underlined by him.

It is clear that the privilege of employing such process of transposition of the syllables belongs to the language *of phonic harmony* (*phonic symmetry*), i.e. the language with (1) *full vocalic character of syllables* that are 'carefully pronounced', (2) with the quality of *even and full syllabic structure of words* and (3) *even number of syllables in words* (Saussure, 1977, p. 640). Such are the features of the *phonic harmony* of the language system. Without the above mentioned qualities creating anagrams in a language could not have been possible.

Repeating of the syllables of the sacred name to which a hymn is dedicated (semantic functioning) and *phonic writing (phonetic functioning or phonetic harmony)* are the two features that are named by Saussure as characteristic to anagrammatic device. Phonic writing and creating anagrams should be allowed by the phonic qualities of the language.

Phonic harmony or phonic symmetry *of a script (or an inscription)* is achieved as the result of conscious and deliberate phonetic analysis of the word structure (Saussure, 1977, p. 639-645).

If every syllable – all of them being of the same full vocalic quality – of the word can be used in creating phonic symmetry of words or of the text it should be concluded that such phonic clusters do not depend on the verse, its feet or stress placing, and the given poetic (anagrammatic) form is structured independently from the rhythmic scheme of the verse (Saussure, 1977, p. 639): it is based on another principle. Saussure insisted that the poet - the creator of such poetry - was fully occupied with the phonic analysis of words which was his usual pursuit. From ancient Indo-European times poet's concern was the study of phonic qualities of words, and his writings - be it hymns or epic poetry - were a syllabic poetry presented with careful difference between full vowels in syllables.

We have already mentioned that *the PhD script is a script of a full vocalic language system*: all vowels of words always retain their full quality and remain evenly vocalic when transposed. This is the ideal ground for changing the order of syllables of words, and crating the device of anagram.

The PhD script system is the archetypal example of employing the most rare and outstanding features of *acrophony and anagram* as the basis for structuring its ancient and *unique* script system, *and the hymn – prayers of the Disk are the oldest and fullest attested examples of anagrammatic texts.*

The whole character and unique features of *a very rationally structured* PhD script are the result of the careful phonetic analysis of the language that was carried out by the highly intelligent and brilliant author of the script.

The rotation of 45 pictographic signs in the inscriptions of the PhD script are properly exposed by in G.Kvashilava's algorithm created for reading PhD pictorial inscriptions; the rules for reading rotated visual signs given in the algorithm also provide the basis for systematic analysis of script structure.

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Conclusions

The features of PhD script system are:

(1) introducing phonic reading to pictographic signs as described above;

(2) introducing acrophony is one of the most important stimulus for the general development of script;

(3) creating the most economic word-syllabic script with the rotation of its 45 pictographic signs;

(4) structuring the one-to-one correspondence between written signs and phonic units (words or syllables);

(5) using anagrammatic writing in PhD inscriptions and displaying the most consistent use of the ancient phonic device of anagram in hymns. It can be supposed that the Disc texts display the oldest use of systemic use of anagrammatic principle in texts until no older examples of such are discovered.

The following should be added: (6) Most of the inscription signs are the attributes of the Great Mother Goddess: a lion's head, a boat, an axe, an eagle, a rosette, a child, a skin, a head of a Korybas, a column, a cave, a fish, etc; that is why it was clear from the very beginning that the PhD texts were the dedicated or addressed to the Great Mother of Gods;

(7) all the above-mentioned features of PhD script attest to the originality of the PhD system: such strictly structured and sophisticated script devices cannot be used adequately for different language systems.

(8) some features of the PhD script, like: (a) direction of reading, (b) one-to-one correspondence between phonic elements of the language and its written signs, and (c) the full vocalic character of its phonetic system have been preserved through other Karvelian scripts up to Modern Georgian Mkhedruli script.

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Benzetilmiş Yaşlandırma Test Cihazları Ve Bazı Sektörlerde Kullanımı

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Harici ortamlarda kullanılan malzeme ve materyallerin dış etkenlere karşı dayanıklılığını ön görmek amaçlı çeşitli yaşlandırma testleri yapılmaktadır. Bu testlerde doğal dış ortama maruz bırakılan ve dış ortamın etkilerinin benzetildiği teknolojik test cihazları kullanılmaktadır. Doğal ortamda yapılan testlerin süresi ve ekonomik maliyetleri göz önünde bulundurulduğunda hızlı gelişen endüstri koşulları için test sürelerinin ve maliyetlerin azaltılması amacıyla hızlandırılmış yaşlandırma testleri ortaya çıkmıştır.

Kullanılan test cihazları malzemelerin karşılaşacağı dış ortam koşullarını taklit etme esasına dayalı olarak geliştirilmektedir. Bu çalışmada malzeme ve malzeme yüzeylerindeki yaşlanmayı yapay ortam koşullarını sağlayabilen (hızlandırılmış yaşlandırma) test cihazları incelenmiştir.

Dolayısıyla optimum kullanım süresini sağlamak için üst yüzey işlemleri ve üst yüzey katman özellikleri üzerine yapılacak olan araştırma ve geliştirme süreçlerinin önemi gittikçe daha da artmaktadır. Ahşap ve ahşap esaslı malzemelere veya odun plastik kompozitlere uygulanan üst yüzey işlemleri malzemelerin kullanım ömrünün uzamasını doğrudan etkilemektedir.

Bu çalışmada malzeme ve malzeme yüzeylerindeki yaşlanmayı yapay ortam (hızlandırılmış yaşlandırma test cihazları) koşullarında sağlayabilen test cihazları incelenmiştir. Cihazların kullanımı, teknik özellikleri ve uygulama alanları hakkında tanıtıcı bilgilere yer verilerek konu ile ilgili araştırmacıların dikkatine sunulmuştur. Ayrıca bilimsel literatüre kısmen de olsa katkı sağlaması amaçlanmıştır.

Anahtar kelimeler: Yapay yaşlandırma, yüzey katmanı, test cihazları.

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$CaO-Al_2O_3-SiO_2$ (CAS) ESASLI CAM-SERAMİKLERİN ASİT KOROZYONU

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Özet: Mevcut çalışmada, doğal hammaddelerden ve atık malzemelerden üretilen $CaO-Al_2O_3-SiO_2$ (CAS) esaslı cam-seramik numunelerin korozyon davranışlarının incelenmesi amaçlanmıştır. Numunelerin hazırlanmasında yumurta kabuğu, mermer tozu, zeolit, pomza ve saf alümina tozları ağ.% 57,5 SiO_2, 27,5 CaO, 15 Al_2O_3 CAS stokiometrik bileşimini sağlayacak şekilde kullanılmıştır. Tartımları yapılan CAS bileşimleri 250 devir/dk hızda 6 saat sulu ortamda homojenizasyona tabi tutulmuş ve ardından 24 saat süreyle etüvde kurutulmuştur. Etüvden alınan CAS esaslı tozlar alümina potalar içerisinde 1450°C'de 2,5 saat süreyle ergitilmiş ve grafit kalıba dökülerek şekillendirilmiştir. Kırma-öğütme-eleme işlemleri sonrasında <45µm altı CAS cam tozları hidrolik presle şekillendirilip 1000-1200°C sıcaklık aralığında 1, 3 ve 5 saat süreyle sinterlenerek CAS cam-seramikler üretilmiştir. CAS esaslı cam ve cam-seramik numunelerin korozyon dayanımını belirlemek amacı ile hacimce %10'luk HNO_3 çözeltisinde 100°C sıcaklıkta 2 saat süre ile bekletilmiş, oda sıcaklığına kadar soğutulduktan sonra saf su içinde yıkanmış ardından vakumlu fırında 100°C de kurutulup ağırlıkları tartılmıştır. Korozyon dayanımı, ağırlıktaki toplam değişim hesaplanarak belirlenmiş olup; bunun için oluşan ağırlık kaybı başlangıç ağırlığına oranlanarak % cinsinden hesaplanmıştır.

Anahtar kelimeler: CAS, cam-seramik, korozyon

Abstract: In the present study, it was aimed to investigate the corrosion behaviour of $CaO-Al_2O_3-SiO_2$ (CAS) based glass-ceramic samples produced from natural raw materials and waste materials. Eggshell, marble dust, zeolite, pumice and pure alumina powders were used to prepare CAS stoichiometric composition of 57.5% SiO_2, 27.5% CaO, 15% Al_2O_3 in the preparation of the samples. The CAS compositions precisely weighed then homogenized at 250 rpm for 6 hours in an aqueous medium and then dried for 24 hours. Dried CAS based powders were melted in alumina crucibles at 1450°C for 2,5 hours and poured in to the graphite moulds. After crushing-grinding-sieving processes, CAS glass powders that under 45µm granular size were shaped by hydraulic press. Obtained compacts were sintered for 1, 3 and 5 hours at 1000-1200°C temperature range to produce CAS glass-ceramics. In order to determine the corrosion resistance of CAS-based glass and glass-ceramics samples, samples kept in a 10% HNO_3 solution for 2 hours at a temperature of 100°C. After cooling to room temperature, they were washed in pure water and dried at 100°C in a vacuum oven and then weighed. Corrosion resistance is determined by calculating the total change in weight. The resulting weight loss for this was calculated as a percentage of the initial weight.

Keywords: CAS, glass-ceramic, corrosion

Giriş

Son yıllarda özellikle SiO_2'ce zengin bazı endüstriyel atıkların cam sektöründe kullanılması uygulama alanı bulabilmektedir. Cam üretiminin bir sonraki adımı olan cam-seramik üretiminde de bu atıkların kullanımı mümkün olabilmektedir. Örneğin uçucu kömür külleri yüksek miktarda başlıca cam ağ yapıcılardan SiO_2, Al_2O_3 ve CaO içerirler ve bu sebeple bu atık malzeme cam-seramik üretiminde hammadde kaynağı olarak kullanımına iyi bir aday olabilmektedir. Son yıllarda yakma fırınları uçucu külleri, çelik uçucu külleri, termik santral uçucu külleri vb. endüstriyel atık malzemelerden cam ve cam-seramiklerin üretimi bu atık malzemeleri çevre için daha güvenli hale getirilmesinde önem arz etmektedir. Endüstriyel atıkların cam-seramik üretimiyle geri dönüştürülmesi, atıkların hacminin azaltılması ve ağır metallerin etkisizleştirilmesi için oldukça etkili bir yöntemdir (Bayrak, 2009). Genel olarak seramik malzemeler metallere oranla yüksek sıcaklıklarda kimyasal etkilere ve aşınmaya karşı

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daha dayanıklı ve kullanım yerine göre metal parçalardan daha düşük yoğunluğa sahiptir. Bu avantajlarına karşın geleneksel seramik malzemelerin tokluk ve sürekliliklerinin düşük olması kullanım amaç ve alanlarını sınırlamaktadır. Bu durumu düzeltmek için, seramik malzemelerde mikroyapının geliştirilmesi ile mekanik özelliklerin iyileştirilmesi yoluna gidilmektedir. Mekanik özellikleri iyileştirilmiş ve endüstriyel uygulamada metallerin yerine kullanılmaya yönelik ileri teknoloji seramikleri içerisinde en önemli grup cam-seramik malzemelerdir. Kullanılacağı yerin hizmet şartlarına göre geliştirilen cam-seramikler çoğunlukla saf malzemelerin karıştırılmasıyla üretilmekle beraber, doğal kayaçlardan (bazalt) ve metalurjik atıklardan da (curuf, uçucu kül) üretilebilmektedir. Kimyasal bileşim açısından, atık malzemelerin büyük çoğunluğunda baskın olan oksitler, SiO_2, Al_2O_3 ve CaO'dur. Bu atıklarda çok az miktarda da alkaliler ve demir gibi flakslayıcı oksitler bulunmaktadır. Bu atık malzemeler CAS sisteminin temel hammaddelerini içerirler (Raupp-Pereira, 2006)

Mevcut çalışmada yüksek korozyon dayanımına sahip olduğu bilinen CAS ($CaO-Al_2O_3-SiO_2$) esaslı cam-seramiklerin üretilmesi ve üretilen bu cam-seramiklerin özelliklerinin korozyon, kırılma tokluğu ve mikro sertlik testleriyle incelenmesi amaçlanmıştır.

Deneysel Çalışmalar

Doğal hammaddelerden zeolit ve pomza ve atık malzemelerden ise yumurta kabuğu ve mermer tozu kullanılarak % 57,5 SiO_2, 27,5 CaO ve 15 Al_2O_3 stokiometrik bileşiminde CAS kodlu 4 farklı karışım hazırlanmıştır. Tartımı yapılan karışımlar bir bilyalı değirmende kuru olarak 24 saat süreyle öğütülerek homojenizasyon işlemi gerçekleştirilmiş, bunu müteakip bu karışımlar alümina potalar içerisinde 1450^oC sıcaklığa çıkılarak 2,5 saat süreyle ergitilmiş ve grafit kalıplara dökülmüştür. Bu işlemin sonrasında alınan dökümler 600^oC'ye ön ısıtılmış bir fırında gerilim giderme tavlamasına tabi tutulmuştur. Pres-sinter yoluyla üretimi gerçekleştirilecek olan CAS esaslı cam-seramikler, bu nedenle 45 µm tane boyutunun altına kırma, öğütme ve eleme işlemleriyle indirilmiştir. Sonrasında ise tek eksenli pres yardımıyla yaklaşık 115 MPa basınç altında 2 g'lık tartımlar alınarak çelik bir kalıpta preslenerek CAS peletleri elde edilmiştir. Üretilen CAS peletleri 1000-1200^oC sıcaklık aralığında 1, 3 ve 5 saat süreyle sinterlenmiş ve CAS cam-seramikleri elde edilmiştir (Şekil 1). Numunelere 15 saniye süre ile 1000 g yük altında gerçekleştirilen sertlik ölçümlerinde çatlak oluşumu sağlanmış; çatlak boyu ve iz genişliği ölçülerek kırılma tokluğu değerleri hesaplanmıştır. CAS1, CAS2, CAS3 ve CAS4 kodlu bileşimlerden hazırlanan cam ve cam-seramik örneklerin korozyon dayanımını belirlemek amacı ile numuneler başlangıç ağırlıkları tartıldıktan sonra hacimce %10'luk HNO_3 çözeltisinde 100^oC sıcaklıkta 2 saat süre bekletilmiştir. 2 saat süre sonunda numuneler oda sıcaklığına kadar soğutulduktan sonra saf su içinde yıkanmış ardından vakumlu fırında 100^oC de kurutulup ağırlıkları tekrar tartılmıştır. Korozyon öncesi ve korozyon sonrası mikrosertlik ölçümü yapılarak sertliğin nasıl değişim gösterdiği incelenmiştir. Elde edilen CAS cam-seramiklerinin sertlik değerleri 50 g yük altında 30 sn bekleme süresinde Vickers sertlik değeri cinsinden (HV) ölçülmüştür. Korozyona uğratılan CAS esaslı cam-seramik numunelerin korozyon sonrası XRD ve SEM-EDS analizleri yapılarak korozyon dayanımları incelenmiştir.

$$\mathbf{L} = \frac{\mathbf{Wo-Ws}}{\mathbf{Wo}}.\mathbf{100} \qquad (1)$$

Formül (1)'de; L= Ağırlıktaki toplam değişim (%), Wo= İlk tartım ve Ws= Son tartım'ı ifade etmektedir.

Deneysel Sonuçlar ve İrdelemeler

Korozyon Testi Sonuçları

CAS1, CAS2, CAS3, CAS4 kodlu camların 1000-1200^oC arasında 1-5 saat sürelerde sinterlenen cam-seramik numuneler; hacimce %10 NHO_3 sıvı çözeltisi içerisinde 100^oC'de 2 saat süre ile korozyon testine alınmıştır. Oluşan ağırlık kaybının, korozyon öncesi ağırlığa göre oranı (%) cinsinden hesaplanmış ve sonuçlar Tablo 1'de verilmiştir. CAS1, CAS2, CAS3 ve CAS4 kodlu cam-seramiklerin asidik çözeltideki ağırlık kayıpları sırasıyla % 0.43-6,69, % 0.39-4,41, % 0.53-9,69 ve % 0.29-5,77 arasında tespit edilmiştir. Korozyon dayanımı sonuçlarına göre; en yüksek korozyon direnci 1050^oC sıcaklıkta 1 saat süre ile kristallendirilen CAS2 kodlu bileşimde % 0,2956, en düşük asidik direnç ise, 1200^oC sıcaklıkta 5 saat süre ile kristallendirilen CAS3 kodlu bileşimde % 9,6943 ağırlık kaybı olarak tespit edilmiştir.

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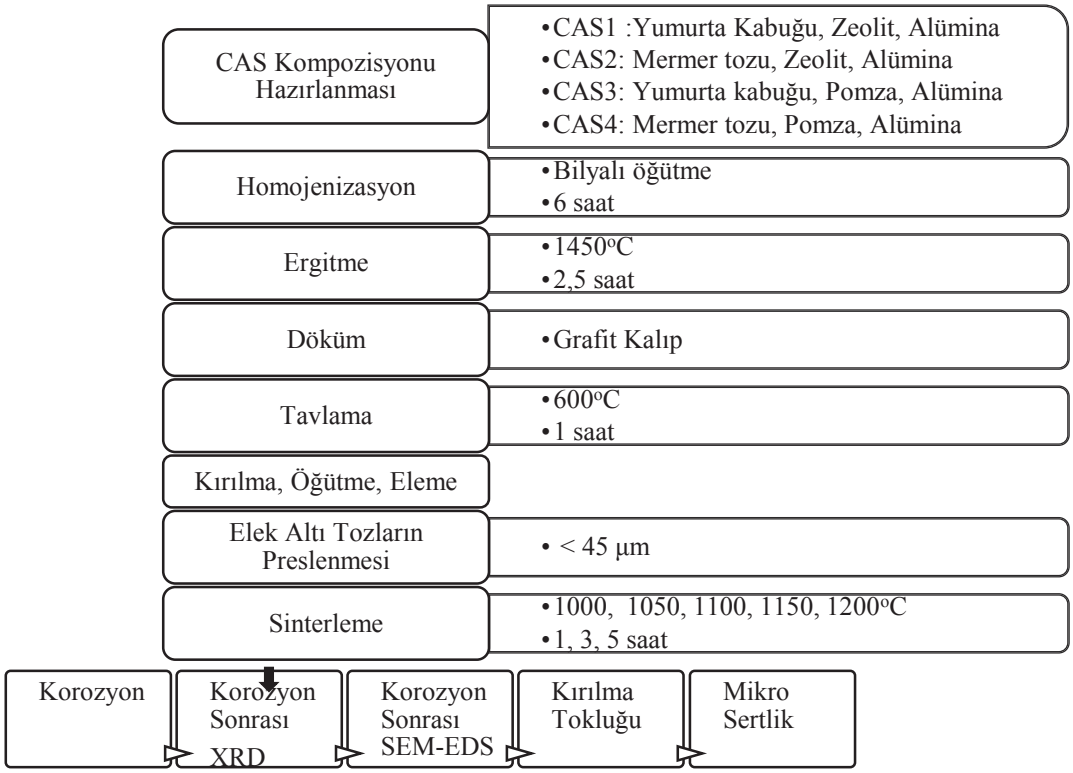

Şekil 1. CAS cam-seramik üretim akış şeması

Tablo 1. CAS kodlu cam-seramiklerin korozyon testi sonuçları

	Isıl İşlem Şartları		Ağırlık Kaybı (%) Bileşim CAS1	CAS2	CAS3	CAS4
Korozif Ortam (HNO_3)	1000°C	1 saat	0,5723	0,3952	0,7695	0,5800
		3 saat	0,4301	0,4388	0,5348	0,7049
		5 saat	2,4875	2,6377	1,5951	1,3115
	1050°C	1 saat	0,6835	0,5823	0,7097	0,2956
		3 saat	1,0985	0,6194	0,5880	0,5143
		5 saat	0,9715	0,6557	0,6784	0,6483
	1100°C	1 saat	2,8823	0,6887	0,6243	0,5055
		3 saat	1,0521	1,0923	0,7123	0,6007
		5 saat	2,1531	1,2517	0,7855	0,3940
	1150°C	1 saat	1,4832	0,9399	0,7158	0,5743
		3 saat	1,1757	1,8210	1,1303	0,6610
		5 saat	2,6211	2,3505	0,9071	0,6664
	1200°C	1 saat	4,5774	0,8263	6,8085	4,5016
		3 saat	5,7141	4,4132	8,3006	5,7673
		5 saat	6,6890	4,0606	9,6943	5,7731

Cam-seramikler kristal fazlarının yanı sıra yapısında bir miktar kalıntı fazda içerirler. Cam-seramiklerde kimyasal etkileşim ilk olarak bu kalıntı cam fazlar ile gerçekleşmekte ve cam-seramiklerin korozyon dayanımı özelliklerini belirlemede bu kalıntı cam fazlar; kristal fazlarla birlikte aynı derecede öneme sahip olmaktadır. Literatürde gerçekleştirilen çalışmalarda, cam-seramikler için artan ısıl işlem ya da sinterleme sıcaklık ve süreleri ile beraber korozyon dayanımının arttığı rapor edilmiş olsa da gerçekleştirilen çalışmada artan sinterleme sıcaklık ve süreleri ile beraber korozyon dayanımının düştüğü gözlemlenmiştir. Bu duruma sebep olarak üretilen cam-seramik örneklerinin artan sinterleme sıcaklık ve sürelerinde yoğunluğunun azalması gösterilebilir. Sinterlemeler düşük sıcaklıklarda gerçekleştirildiğinde çekirdeklerin sayısında bir artış olmaktadır. Bu durum ise ince tanelerin oluşmasına izin vererek tane sınır alanında bir artışa sebep olmaktadır. Böylece fiziksel ve mekanik özellikler daha iyi sonuçlar sergilemektedir. Bununla birlikte yüksek sinterleme sıcaklıklarında çekirdeklerin sayısı azalmaktadır.

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Bu esnada çekirdek büyüme hızı artarak kristal boyutunda bir artışa sebep olmaktadır. Bu nedenle de fiziksel ve mekanik özellikler zayıflamaktadır. Öte yandan etkisi son derece küçük olmakla birlikte, hacim-sıcaklık ilişkisi açısından amorf yapı kristalin yapıdan daha fazla bir spesifik hacim kaplamaktadır. Cam belirli bir sıcaklığa ısıtıldığı zaman hacmi ilk önce artar ve daha sonra kristallenme meydana gelir ve bu da spesifik hacimde bir düşüşe neden olmaktadır. Dolayısıyla yukarıda belirtilen nedenlere dayanılarak kalıntı gözenek boyutunun sıcaklığa bağımlı olduğu söylenebilir. Bu nedenle üretilen cam-seramiklerin yoğunluk değerleri artan sinterleme sıcaklıklarıyla beraber azalma göstermiştir (Raupp-Pereira, 2006). Literatürde yapılan araştırmalarda (Hong, 2007) sıcaklık ve sürenin artmasıyla birlikte tane boyutunda artma ve tane sınırlarında azalma gözlenirken; mevcut çalışmada korozyon dayanımının azalmasının sebebi artan poroziteye bağlı olarak yüzey alanının artışı gösterilebilir.

Mikrosertlik Testi Sonuçları

Tablo 2.'de CAS kodlu bileşimler için ölçülen mikrosertlik değerleri verilmektedir. Tablo 2.'de verilen sertlik değerleri göz önünde bulundurulduğunda; CAS kodlu cam-seramikler için mikrosertlik değerleri 790 ila 1105 $HV_{0.05}$ arasında değişim göstermektedir. CAS kodlu bileşimler içerisinde 1000ºC'de 3 saat sinterlenen CAS2 kodlu cam-seramik numunelerde en yüksek sertlik değeri (1105 $HV_{0.05}$) tespit edilmiştir. CAS1 kodlu cam-seramik numunelerde en yüksek mikrosertlik değeri 1050ºC'de 3 saatlik sinterleme sonucunda elde edilen örnek için 1034 $HV_{0.05}$ iken; en düşük sertlik değeri 827 $HV_{0.05}$'lik sertlik değeri ile 1200ºC'de 3 saat sinterlenen numunededir. Üretilen CAS2 kodlu cam-seramik numuneler içerisinde en yüksek sertlik değeri, 1000ºC'de 3 saat sinterlenen numune için 1105 $HV_{0.05}$ olarak ölçülürken; en düşük sertlik değeri 1200ºC'de 1 saat sinterlenen numune için 846 $HV_{0.05}$'dir. CAS3 kodlu cam-seramiklerden en yüksek sertlik değeri 1050ºC'de 3 saat sinterlenen numunede 965 $HV_{0.05}$ olarak bulunurken; en düşük sertlik değeri 1200ºC'de 1 saat sinterlenen numunede 790 $HV_{0.05}$ olarak ölçülmüştür. CAS4 kodlularda ise en yüksek sertlik değeri 1050ºC'de 3 saat sinterlenen numune için 972 $HV_{0.05}$ olarak bulunurken, en düşük sertlik değeri 800 $HV_{0.05}$ olarak 1200ºC'de 1 saat sinterlenen numunede ölçülmüştür.

Tablo 2. CAS cam-seramiklerin korozyon öncesi ve sonrası ölçülen mikrosertlik değerleri

Sıcaklık (ºC)	Süre (saat)	Mikrosertlik Değerleri ($HV_{0.05}$) Bileşim							
		CAS1		CAS2		CAS3		CAS4	
		Önce	Sonra	Önce	Sonra	Önce	Sonra	Önce	Sonra
1000	1	981	211	937	120	946	216	938	308
	3	1001	-	1105	-	887	-	912	-
	5	874	-	1017	-	916	-	910	-
1050	1	1004	230	990	310	901	139	939	167
	3	1034	-	1047	-	965	-	972	-
	5	924	-	1055	-	905	-	958	-
1100	1	934	187	965	243	887	54	882	237
	3	987	-	954	-	872	-	932	-
	5	925	-	1017	-	944	-	898	-
1150	1	944	202	1000	234	921	123	940	58
	3	897	-	909	-	889	-	921	-
	5	904	-	977	-	876	-	955	-
1200	1	892	127	846	64	790	89	800	140
	3	827	-	914	-	824	-	826	-
	5	893	-	890	-	848	-	810	-

CAS esaslı cam-seramik numunelerin korozyon sonrası sertlik değerlerindeki değişimin ölçülmesi amacı ile her bileşim ve sıcaklıkta bulunan sadece 1 saat sinterlenmiş numuneler sertlik testine tabi tutulmuştur ve ölçümler sonucunda büyük ölçüde sertlik azalması gözlenmiştir. Sertliğin azalmasının asıl sebebi korozyon deneyi esnasında CAS esaslı cam-seramik numunelerin yüzeyinde bulunan kristalin fazın amorf yapıya dönüşüm göstermesidir.

CaO-CaF_2-Al_2O_3-SiO_2 sistemine CaF_2 katkısı yerine kademeli olarak B_2O_3 katkısı yapılarak hızlı pişirme uygulamaları için hazırlanan cam-seramik sırlar, kimyasal kompozisyon olarak ağ.% 23,5 CaO, 42,8 Al_2O_3, 33,7 SiO_2 olarak hazırlanmıştır. Bu bileşime harici olarak CaF_2 ve B_2O_3 katkıları ilave edilmiştir. Hazırlanan bileşimlerin sinterlenebilme kabiliyetinin değerlendirilebilmesi amacıyla üretilen fritler tek eksenli presle

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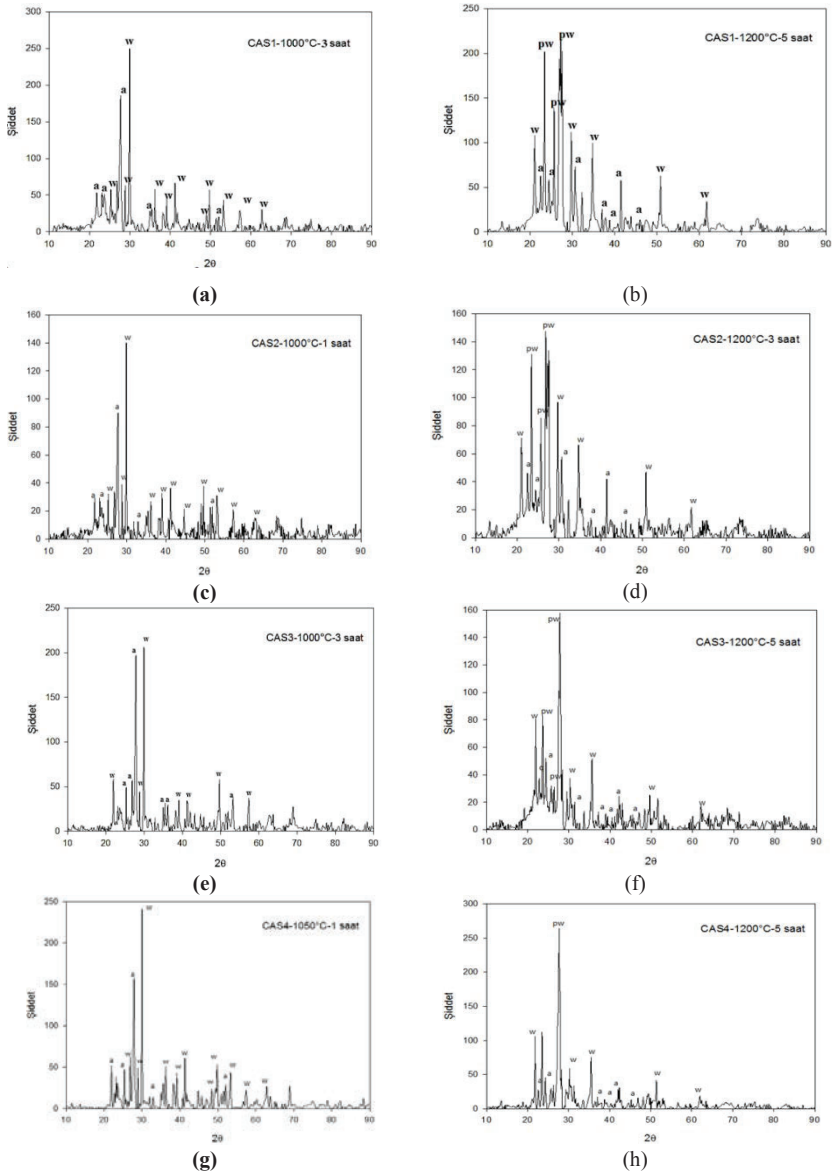
preslenmiş ve 1180ºC sıcaklıkta sinterlenmiştir. Elde edilen cam-seramik kompaktların mikrosertlik değerleri 676,4-876,6 HV aralığında tespit edilmiştir (Banijamali, 2013). Değişen miktarlardaki TiO_2, CaF_2 ve ZrO_2 çekirdekleyicilerinin CaO-Al_2O_3-SiO_2 sisteminin sinterlenme kabiliyeti, kristalizasyonu, mekanik özellikleri ve kimyasal direncine olan etkisini konu olan çalışmada, ağ.% 23,53 CaO, 42,84 Al_2O_3 ve 33,63 SiO_2 bileşimi kullanılmıştır. Döküm yoluyla üretip sonrasında öğütme işlemleriyle uygun boyutlara (<75 µm) getirilen CAS cam tozları 30 MPa basınç altında tek eksenli preste şekillendirerek 850-1200ºC sıcaklık aralığında 1 saat süreyle sinterlenmiştir. Üretilen cam-seramiklerin mikrosertlik değerleri 540-613 HV aralığında tespit edilmiştir (Banijamali, 2009). Zhang ve ark.'nın atık pencere camlar ve sentetik kristallendiriciler kullanarak düşük maliyetli bir yöntem ile wollastonit cam-seramiklerin üretimini esas aldığı çalışmasında, 850-1000ºC aralığında sinterlenen kompaktların mikrosertlik değerlerinin 469-586 HV aralığında olduğu belirtilmiştir (Zhang, 2013). Das ve arkadaşları 40 g yük altında gerçekleştirmiş oldukları Vikers sertlik testinde 5,29-5,94 GPa aralığında sertlik değerlerine ulaşmışlardır. Nano silika katkılı numunelerde gehlenit fazından dolayı daha yüksek sertlik değerlerine ulaşmışlardır (Das, 2013). Mevcut çalışmada ise en düşük 800 HV sertlik değeri yaklaşık 7,85 GPa değerine tekabül etmekte olup, doğal hammadde ve atıklar kullanılarak üretilen CAS cam-seramiklerin daha yüksek sertliğe sahip olduğu tespit edilmiştir.

Korozyon Sonrası Faz Analizleri



Şekil 2.a CAS1-1000ºC-3 saat, b. CAS1-1200ºC-5 saat, c. CAS2-1000ºC-1 saat, d. CAS2-1200ºC-3 saat, e. CAS3-1000ºC-3 saat, f. CAS3-1200ºC-5 saat, g. CAS4-1050ºC-1 saat ve h. CAS4-1200ºC-5 saat sinterlenen asidik korozyona tabi tutulmuş cam-seramiklere ait XRD analizleri (a-anortit, w-wollastonit, pw-pseudowollastonit)

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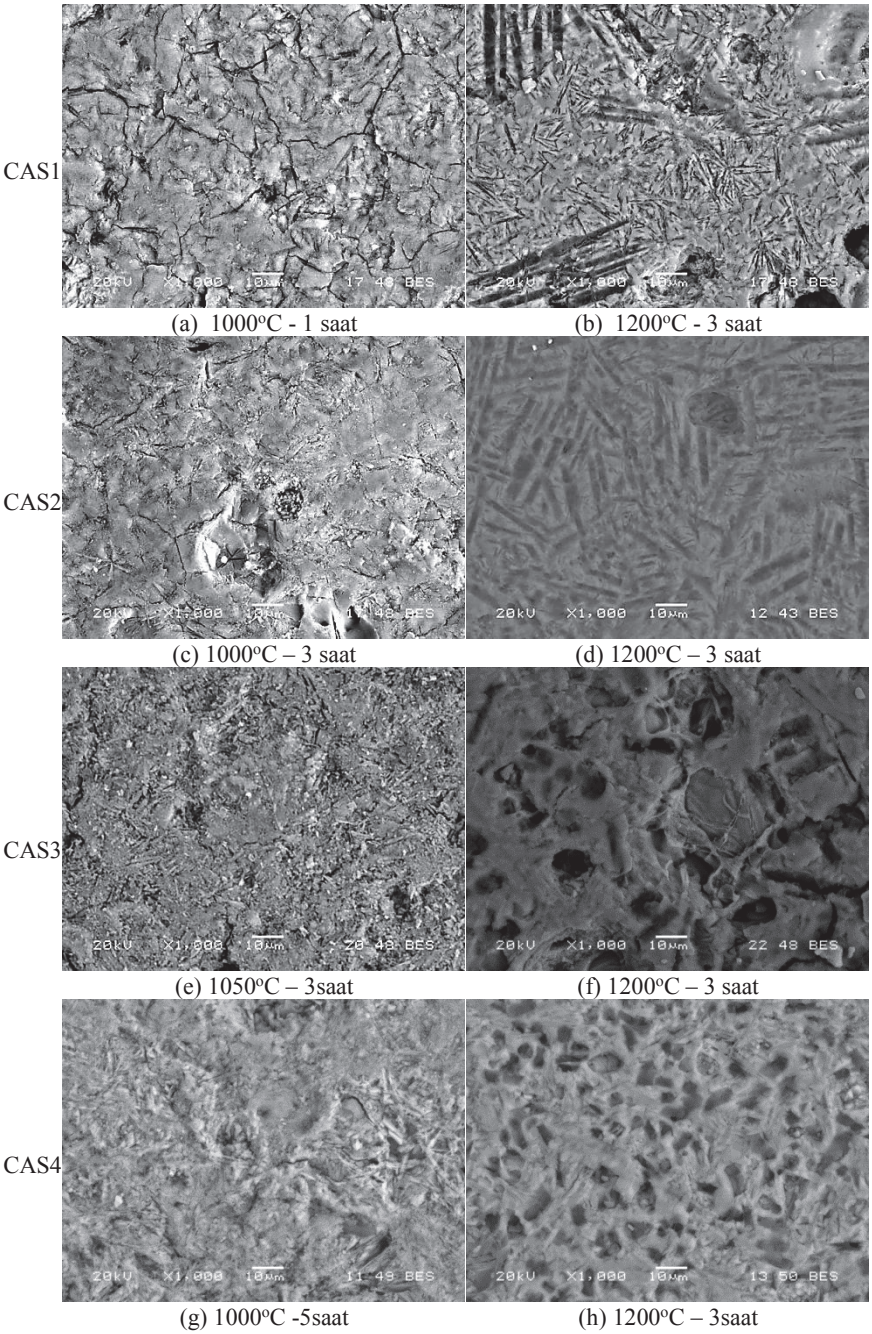
Farklı sıcaklık ve sürelerde sinterlenen CAS kodlu cam-seramiklerden en yüksek ve en düşük korozyona uğrayan örneklerin XRD analizleri Şekil 2'de verilmiştir. XRD analizlerinde cam-seramiklerin yapısındaki baskın fazların anortit, wollastonit ve pseudowollastonit fazları olduğu tespit edilmiştir (Aydın, 2017). Ayrıca yapılan XRD analizleri sonucunda yapıda amorflaşmanın meydana geldiği bu amorflaşmanın da korozyon sonucunda dış yüzeylerde oluştuğu düşünülmektedir. Korozyon öncesi ve sonrası yapılan XRD analizleri sonucunda fazlar yapıda aynı kalmıştır.

Korozyon Sonrası Mikroyapılar

CAS kodlu cam-seramiklerde korozyon testi sonrası en az ve en çok korozyona uğrayan numunelerin 1000X büyütmedeki geri saçılan elektron mikroskobu görüntüleri Şekil 3'de verilmiştir. Mikroyapılarda amorf cam matris içerisinde farklı boyutlardaki düzensiz kristallerin homojen olarak dağılmış olduğu görülmekte iken, bu kristallerden iğnemsi formda olanları wollastonit, çubuksu ve yuvarlak formda olanları ise anortit kristallerini temsil etmektedir.



Şekil 3. CAS1-CAS4 kodlu farklı sıcaklık ve sürelerde sinterlenmiş numunelerin HNO_3 asidik korozyonu sonrası mikroyapı görüntüleri

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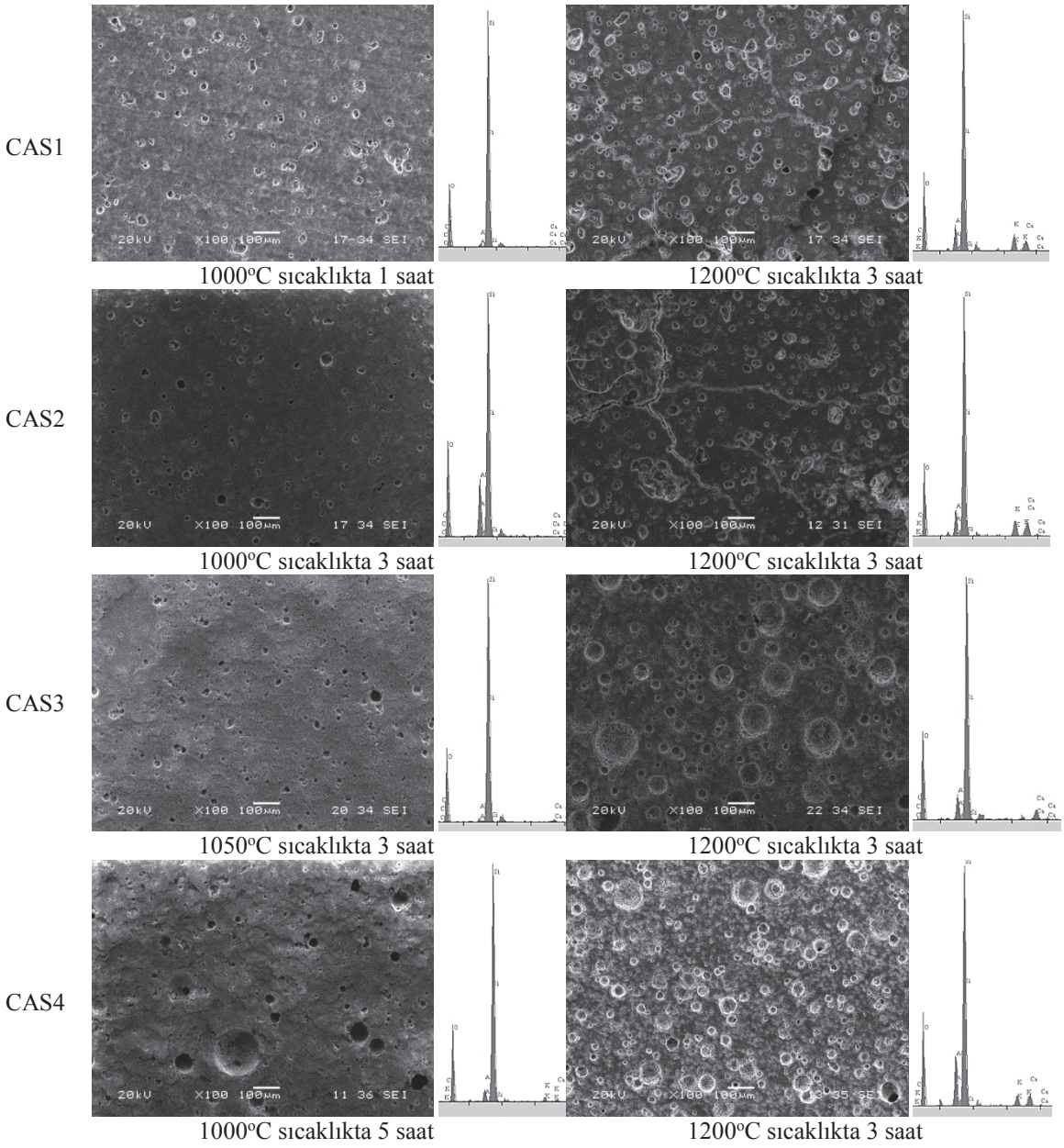
CAS kodlu bileşimlerden hazırlanan cam-seramik numunelerin HNO_3 asidik çözeltisi içerisinde 100ºC'de 2 saat korozyon testine tabi tutulduktan sonraki SEM ve genel EDS görüntüleri Şekil 4'de verilmiştir. Şekillerde CAS1-CAS4 kodlu sol tarafta en az korozyona uğrayan, sağ tarafta ise en çok korozyona uğrayan numunelerin düşük büyültmelerdeki SEM mikroyapı ve genel EDS analizleri verilmiştir. Numunelerde camın asit ile etkileşimi sonucu yüzeylerde düzensiz pullanmalar ve mikroporozitelerin oluştuğu görülmektedir. EDS analizinde CAS bileşiminde mevcut olan Si, O, Al, Ca elementleri belirlenmiştir.



Şekil 4. CAS1-CAS4 kodlu cam-seramiklerin en az korozyona uğrayan (sol) ve en çok korozyona uğrayan (sağ taraf) numunelerin korozyon sonrası 100X büyütmedeki SEM görüntüleri ve genel EDS analizi

Mevcut çalışmada CAS esaslı cam-seramikler ağ. %57.5 SiO_2, 27.5 CaO, 15 Al_2O_3 bileşiminde üretilmiş olup; korozyon sonrası yapılan EDS analizi sonucunda yapıdaki Ca ve Al elementlerinin yüzdesinde başlangıç kompozisyonuna göre ciddi bir azalma olduğu tespit edilmiştir. Bunun sebebinin ise CaO'in bazik karakterli, Al_2O_3'nın amfoterik karakterli olması nedeniyle asidik ortamda çözünmesi gösterilebilir. SiO_2 asidik karakterli bir bileşik olduğu için HNO_3 çözeltisi ile yapılan asidik korozyon testi sonucunda EDS analizlerinde Si elementinin yapıda bulunan diğer elementlere göre çözünme oranının az olduğu tespit edilmiştir. Bu durum 3 saat kristalizasyona tabi tutulan numunelerdeki anortit fazının artmasının korozyon dayanımını arttırması ile

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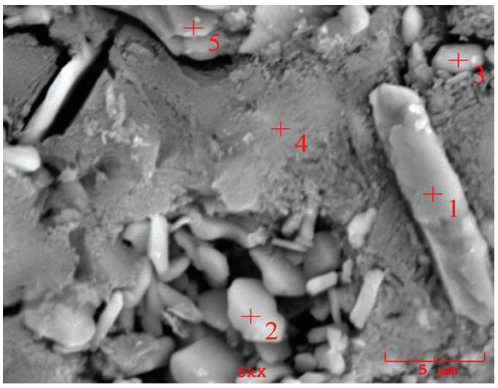
açıklanabilir. 1 saat kristalize edilen numunelerde oluşan Wollastonit fazının korozyon dayanımı değerleri ise daha düşük çıkmıştır (Kurama, 2009).

Şekil 5'de 1000ºC'de 3 saat süreyle sinterlenen CAS2 kodlu cam-seramiğe ait korozyon sonrası SEM görüntüsü ve noktasal EDS analizleriyle beraber verilmiştir. Noktasal EDS analizlerinde belirlenen farklı morfolojilerdeki yapılarda genel olarak Ca, Al, Si ve O elementleri baskın olarak tespit edilmiş olup, belirlenen elementler hazırlanan CAS kodlu bileşimleri oluşturan temel elementlerdir. EDS analizlerinin tamamında Ca elementi yüzdesinin önemli ölçüde azaldığı gözlemlenirken, bu durum yapıdaki CaO'nun bazik karakterli olmasından dolayı asidik çözelti içerisinde çözünmesinden kaynaklanmaktadır.



Element	ağ. %	Element	ağ. %
O	39.976	O	41.535
Al	55.868	Al	52.267
Si	4.119	Si	6.050
Ca	0.037	Ca	0.147

1 2

Element	ağ. %
O	37.309
Al	39.493
Si	23.057
Ca	0.142

3

Element	ağ. %
O	32.701
Al	6.676
Si	60.408
Ca	0.215

4

Element	ağ. %
O	38.297
Al	59.031
Si	2.618
Ca	0.054

5

Şekil 5. 1000°C'de 3 saat sinterlenmiş CAS2 kodlu cam-seramiğin korozyon sonrası mikroyapısı ve 1-5 kodlu noktaların EDS analizleri

Kırılma Tokluğu Testi Sonuçları

CAS esaslı cam-seramiklerin kontrollü kristalizasyon ısıl işlem sıcaklık ve süresine göre, kırılma tokluğu değerleri Tablo 3'de gösterilmektedir. Tablodan görüldüğü üzere, CAS esaslı cam-seramik numunelerde 1000ºC ve 1100°C sıcaklıklarda yapılan kristalizasyon ısıl işlemi sonucunda işlem süresinin artışına bağlı olarak kırılma tokluğu değerleri artış göstermektedir. XRD çalışmalarında 1000ºC ve 1100°C'de yapılan ısıl işlemlere bağlı olarak kristallenme miktarının arttığı, buna karşılık amorf yapının azaldığı gözlemlenmiştir. Kristallenme miktarı arttıkça kırılma tokluğu değerleri artış göstermiştir. 1000°C sıcaklıkta yapılan ısıl işlemlerde ise 1 saat sürede bile kristallenmenin tamamlanmış olması, süreye bağlı olarak faz yüzdelerinin değişmesi sebebiyle kırılma tokluğu değerleri önemli ölçüde değişim göstermemiştir. Yine 1000°C'de yapılan işlemlerde işlem süresinin artmasına bağlı olarak 1100°C sıcaklıklarda yapılan ısıl işlemler sonucunda elde edilen numunelerin kırılma tokluğu değerlerinden daha düşük çıkmıştır. Bunun sebebinin, 1000°C'de yapılan ısıl işlemlerde faz yapısında görülen değişimlerden kaynaklandığı düşünülmektedir.

Tablo 3. CAS esaslı cam-seramiklerin ısıl işlem sıcaklık ve süresine bağlı olarak kırılma tokluğu değerleri

Sıcaklık (ºC)	Süre (saat)	Kırılma Tokluğu, MPa.m$^{1/2}$			
		Bileşimler			
		CAS1	CAS2	CAS3	CAS4
1000	1	1.8803	1.9344	2.4115	2.0910
	5	2.4579	2.3843	3.0518	2.1549
1100	1	2.2111	2.5546	2.5195	2.3452
	5	2.2221	1.9565	2.1492	2.4927

Yapılan literatür incelemelerinde camsı amorf yapıların kırılma toklukları değerleri 1-2 MPa.m$^{1/2}$ arasında değişirken; cam-seramik malzemelerin kırılma tokluğu değerlerinin 2.5-4 MPa.m$^{1/2}$ arasında değiştiği görülmüş olup (İpek, 2005), CAS esaslı cam–seramik numunelerin kırılma tokluğu değerleri kontrollü kristalizasyon ısıl işlemi sıcaklık ve sürelerine bağlı olarak 1.8 ile 3.05 MPa.m$^{1/2}$ değerleri arasında değiştiği görülmüştür (Tablo 3).

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Lusvarghi ve arkadaşları tarafından gerçekleştirilen çalışmada cam–seramik kaplamaların kırılma toklukları 2.6–2.75 arasında değişen değerlerde iken, (Lusvarghi, 2007, Lusvarghi, 2005), bu değerler 900 ve 1000°C'lerde 30 ve 45 dakika arasında değişen sürelerde gerçekleştirilen kontrollü kristalizasyon ısıl işlemleri sonrası ulaşılan kırılma tokluğu değerleri, CAS esaslı cam-seramik numunelerin kırılma tokluğu değerleri ile uyum içerisindedir.

Genel Sonuçlar

Atık hammadde kaynağı olarak yumurta kabuğu ve mermer tozu, doğal hammadde kaynağı olarak zeolit ve pomza ve stokiometrik bileşimin tamamlanması için ayrıca saf alümina ilave edilerek CAS esaslı 4 bileşim hazırlanmıştır. 1450°C'de ergitilip dökülen, sonrasında kırma-öğütme-eleme işlemleri sonrası <45 µm tozlar tek eksenli bir pres yardımıyla şekillendirilerek CAS kodlu peletler üretilmiştir. 1000-1200°C'lerde 1-5 saat süreyle sinterlenen CAS cam-seramiklerin kırılma tokluğu, asit korozyonu ve korozyon sonrası mikrosertlik testleri gerçekleştirilmiştir. Ayrıca korozyon testi sonrası faz analizi ve mikroyapı özellikleri incelenmiştir. Gerçekleştirilen deneysel çalışmaların sonuçları şu şekilde özetlenebilir.

1. Üretilen CAS esaslı cam-seramiklerin, korozyon sonrası XRD analizleri sonucunda anortit ($CaAl_2Si_2O_8$), wollastonit ($CaSiO_3$) ve pseudowollastonit ($CaSiO_3$) fazlarından oluştuğu tespit edilmiştir. 1000-1150°C'deki mikroyapılarda, iğnemsi yapıda wollastonit kristalleri, çubuksu ve yuvarlak şekilde ise anortit kristalleri oluşmuştur. 1200°C'de sinterlenen CAS numunelerinin SEM görüntülerinde rastlanan parçalanmış formdaki kristallerin ise pseudowollastonit fazına ait olduğu düşünülmektedir.
2. CAS kodlu cam-seramiklerin HNO_3 çözeltisi içerisinde korozyon testi sonrası XRD analizlerine göre silika (SiO_2) fazının oluştuğu tespit edilmiştir. Cam-seramiklerin mikroyapılarında çubuksu şekilde wollastonit kristalleri ile tabakalı yapıda anortit kristalleri oluşmuştur. Oluşan kristallerin tane boyutu kristalizasyon sıcaklığının yükselmesiyle beraber artış sergilemiştir.
3. CAS kodlu cam-seramiklerin korozyon öncesi sertlik miktarı 800-1000 $HV_{0,05}$ arasında iken; korozyon sonrasında bu değerler 50-300 $HV_{0,05}$ arasında ölçülmüştür. CAS esaslı cam-seramik numunelerinde korozyon sonrası yaklaşık olarak %10 sertlik azalması gözlenmiştir. Sertliğin azalmasının asıl sebebi dış yüzeydeki kristalin fazın amorf yapıya geçme eğilimidir.
4. CAS kodlu cam-seramiklerin % 10 HNO_3 çözeltisi içerisindeki korozyon testine göre; CAS1-CAS4 kodlu numunelerde tespit edilen ağırlık kayıpları sırasıyla % 0.43-6.69, %0.39-4.41, %0.53-9.69 ve %0.29-5.77 arasındadır. En yüksek korozyon direnci 1050°C sıcaklıkta 1 saat süre ile sinterlenen CAS2 kodlu bileşimde %0.2956, en düşük asidik direnç ise, CAS3 kodlu 1200°C sıcaklıkta 5 saat sinterlenen numunede %9.6943 olarak tespit edilmiştir.

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CARDIAC ARRYTHMIA CLASSIFICATION BY TSOM

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Abstract: In this article we use the TSOM algorithm which is an extension of the SOM map to the temporal and spatial domain. This extension is based on biologically inspired approaches related to data coding and processing. TSOM is formed using spatio-temporal processing algorithms and allows to incorporate integrator memory to preserve the temporal context of the input signals, TSOM is experimented in the field of cardiac arrhythmia recognition (ventricular pathology) from (Holter) long periods of ECG signal recordings, in order to evaluate its performance for such time variable and to prove that biological models are capable of giving good results , the results of the analysis are demonstrated with experiments.

Keywords: MIT-BIH database, ECG signal, TSOM (Temporal Self Organizing Map).

Introduction

The rates of mortality relative to cardiovascular diseases are high. According to the (Who, 2010), cardiovascular diseases are one of the most important causes of mortality in the world. Sudden death represents the half of deaths that have cardiac origins, the average age is between 50 and 60 years old but it can occur at any time. The mechanisms of this sudden death are principally ventricular arrhythmias with a percentage of 75% where the presence of extra systole is considered as an eventual predictor. An ECG signal is frequently used in clinic practices by cardiologists in order to determinate the origins of cardiac anomalies.

The presented work in this paper proposes classification of PVC (Premature Ventricular Contraction) beats, and is organized as follows:

In the first section, we introduced the problematic and then examined related works to classify cardiac arrhythmia in Section 2. The third section presents details works specialized in detection of the PVC pathology. The proposed approach is detailed in Section 4.

Our experimental results and a discussion are presented in Section 5. Finally, the conclusion is drawn and future work is suggested in the last section.

Related Works

In the literature, we find several techniques applying various methods, the aim of which is to simplify the reading of an ECG signal; we have been interested in the following works:

In (Lagerholm, 2000), combined the basic Hermite functions with a Kohonen self-organization map to obtain a high performing classifier (with a 1.5% degree of misclassified beats). A neuronal classifier presented in (Christov, 2004), with 26 descriptor parameters extracted from two ECG derivations presented at its input. It uses the entire

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MIT-BIH database. They achieved a specificity of 99.70% and a sensitivity of 98.5%. In (Chazal, 2004), they used the morphological and temporal descriptors of the ECG signal and the heart rate to classify the beats. The results obtained were of a specificity of 98.8% and a sensitivity of 77.7%. (Messaoud, 2005), gave a fuzzy approach to the classification of cardiac arrhythmias of the atrial fibrillation family. (Chalabi, 2009), combine two models of neural classifiers for the automatic identification of cardiac arrhythmias. The first is a combined Kohonen network (SOM-LVQ) to be supervised (SOM: Self Organization Map and LVQ: Learning Vector Quantization), the second is a Radial Basis Functions (RBF) network. The ECG signals used in the study are taken from the MIT-BIH database. The results obtained are satisfactory with average recognition rates of 95.90% for the LVQ network and 92.56% for the RBF. The predictibility rates per individual are 100% for 19 ECGs out of 28 studied for both algorithms.

(Hendel, 2009), proposed a system to aid in the diagnosis of four very common cardiac arrhythmias which are: Ventricular beat, Auricular beat, Right Branch Block, and Left Branch Block in addition to the normal beat. They first started by locating the QRS, P, and T waves and calculating the temporal and morphological parameters that characterize a beat using mainly the wavelet technique. Then the implementation was done through a self-organizing Kohonen card which is responsible for determining the type of beat according to its characteristics, which gave them a classification rate of 95%. In (Triqui, 2012), artificial neural networks (PMC multi-layer perception network and SOM map) were used in classification and discrimination. The classification experiments are presented using the MIT-BIH database and the results have a sensitivity of 82.20%, a specificity of 95.18% and a classification rate of 92.78%.

Characterization of the ECG Signal

The ECG signal is characterized by different waves [Figure 1].

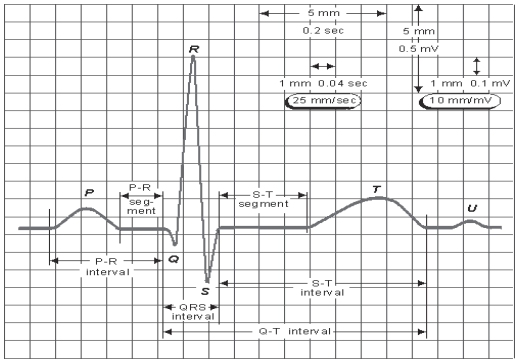

Figure 1: The diffeent wave electrocardiogram (ECG) signal.

The right choice of the parameters of the input vector classifier is very important. Analysis data is recommended to see the degree of membership of each parameter for each class (Normal, PVC, Other).

Classification

Until now, the success of capture and classification of temporal information with neural networks has been limited. Our methodology adds a spatio-temporal coupling of the self-organization map (SOM) (Kohonen, 1990) [Figure 2]. A Spatio-temporal coupling is based on the progressive waves of activity that begin at each winning node and are naturally attenuated over time. When these travel waves reinforce each other, temporal waveforms of activity are created which are then used to improve the ability of a knot to win the next competition. The methodology gracefully manages the temporal notion.

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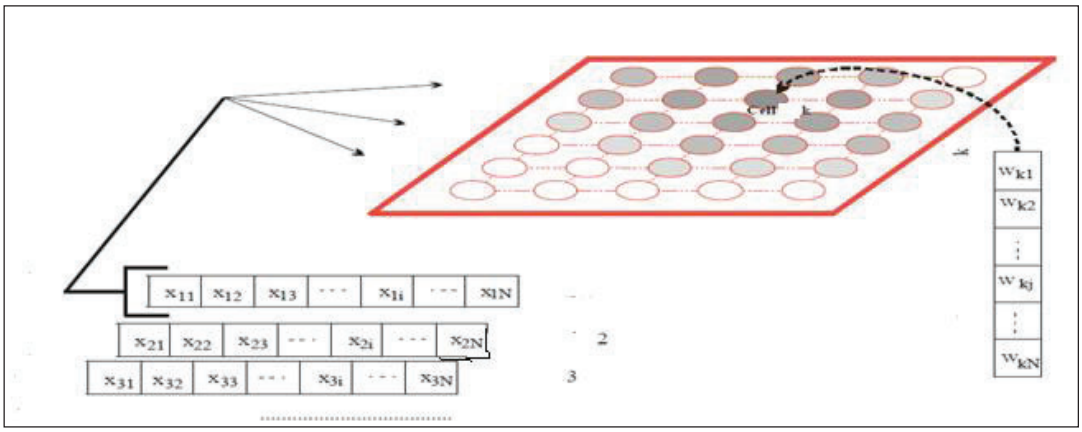

Figure 2: The Kohonn card.

In our study, we used the temporal self organizing Map (TSOM) to provide a more reliable diagnosis, enabling doctors to facilitate the interpretation of an ECG in patients with risky cardiac pathologies.

Temporal Self Organizing Map (TSOM)

The temporal self organization map (TSOM) explored by S. Durand and F. Alexander in (Durant, 1996), integrates a cortical column model, SOM learning and separate temporal links to create a Temporal Kohonen Map, (Reljin, 2003), (Ben Salem, 2007), (Baretto, 2001). The TSOM is split into super-units that are trained via the SOM learning algorithm. Winning units from each super-unit activate and then decay. Temporal links are made between the currently firing node and any node which has an activity above a threshold. Thus there can be multiple links created for each activation, allowing for the pattern to skip states. In (Wiemer, 2000), has developed even more the TSOM model by giving an influence to temporal information in the process of the self organization map SOM.

The contribution of TSOM compared to SOM is the transfer of the temporal distance between stimuli in a space distance. This transfer is ensured by the phenomenon of the dynamic propagation of neuronal activations in the waves form allowing the signals current and passed to interact space-time lies in the map SOM. The TSOM tests to break up, like SOM, the training in a sequence of discrete stages (Salhi, 2009).

Within a framework biologically the TSOM algorithm reveals how dynamic neural networks can self-organize to integrate spatial cues in a temporal context (Wiemer, 2003).

TSOM algorithm is based on the expression of the time information in the map distances. This mapping is done using a propagation wave. The winner neuron feedforward in t−1, Following the presentation of a stimulus st−1, causes propagation of a wave in the map. The wave propagates to the next time step, and will be presented a stimulus st.

The propagation velocity v is a constant defined in early learning, it can transpose isi(t), the time difference between st and st-1, in a distance on the map given by:

$$d = isi(t) * v \quad (1)$$

This information is used to influence the topographic organization.
The particularity of TSOM is after determining the winner of the feedforward, the algorithm calculates a deviation TSOM winner called lateral interaction. This is caused by the wave propagated to the previous time.

The lateral interaction [Figure 3], deflects the winner neuron closer to the wave propagated. Depending on the position of the wave relative to the winner neuron and neuron previous winner, the deviation will be two possible effects:

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-Away current winner neuron to neuron previous winner (segregation).

-Or closer (integration)

Parameters κ and σk determine lateral interaction influence of the temporal topology on the learning process. These two parameters define the curve of the interaction function [Figure 3]; determine also the rate of decay of influence: κ defines the strength of the lateral interaction at short distances, while σk determines the extent to which the interaction disappears.

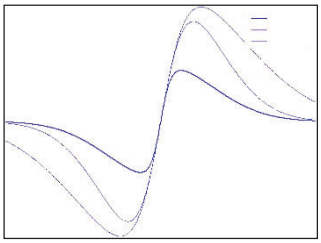

Figure 3: The latera interaction function.

Experimentation

The ECG signals used in this work are the actual recordings of the database MIT-BIH. These signals are sampled at the frequency of 360 Hz. two American cardiologists have made annotations on these signals and who made the diagnosis for these recordings, and each cardiac cycle has been annotated by them. These parameters are essential for learning and classification evaluation.

The parameters used were calculated using an algorithm developed and implemented in the LTSI laboratory at the University of Rennes 1 France. This algorithm is based on the technique presented by (Tompkins, 1985, Pan, 1985) was applied to the MIT-BIH data base (MIT BIH ,1992).

The right choice of the parameters [Table1] of the input vector classifier is very important. For this three-dimensional geometric data analysis is recommended to see the degree of membership of each parameter for each class (Normal, Ventricular, Other).

Table 1: Parameters of MIT-BIH data base.

Parameters	Signification
1	The moment of detection of the peak R
2	QRS onset
3	QRS offset
4	Last RR interval
5	Beat begin
6	Beat end
7	Iso electric level
8	Amplitude pic to pic
9	ST level

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Table 2: Number of normal and abnormal beats for each signal.

recorder	N	PVC	Others	Total
106	1500	517	0	2017
116	2273	109	0	2382
119	1535	442	0	1977
200	1815	773	0	2588
205	2574	68	0	2642
208	1681	1216	44	1941
214	2013	235	0	2248
219	2083	57	3	2143
221	2022	393	0	2415
234	2733	3	5	2741

From this basis [Table 2], and with the help of a domain expert (cardiologist), we used the classiffieur TSOM to see the parameters constituting the ventricular pathology [Figure 4] clustered in the same region, and the doctor can tell if the patient is reached or not after the display of the card obtained.

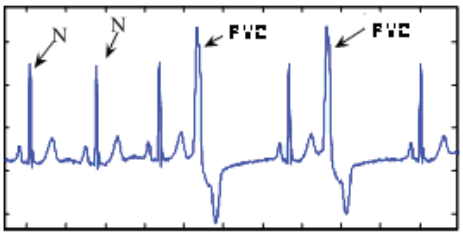

Figure 4: ECG of a sbject which has premature ventricular contractions (PVC).

Architecture

The network designed for the classification of heart beats is a Temporal Self Organizing Map (TSOM) consists of 10 * 10 artificial neurons

- The input vector S=[s1 s2 … s9] represents 9 parameters characterizing a heartbeat of the data base LTSI [Table1], which have been linked to all neurons in TSOM map.

- The external connections of the neuron i with the input vector S is materialized by a synaptic weight vector Mi = [mi1 mi2 …mi9] whose weights are assigned randomly to the top.

-each neuron i of the map is related to all other neurons map: interaction between neurons. wik the internal connections of the neuron i with its neighbors are performed by assigning synaptic weights.

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Learning Network

A learning phase is essential for the card reaches a certain power of generalization and recognition during this stage of training, the network used TSOM adapts to different classes targeted in the study. This phase is to modify the weight of external connections between neurons of the cards and inputs to move towards an optimal adaptation of the network.

In a formal way, the TSOM algorithm is as follows:

- Initialize the weight vectors of neurons with random values according to a uniform distribution in the interval [0, 1]. The values of the stimuli are processed by the network also bounded on the same interval.

- It takes a stimulus vector sn in the data set, the winner neuron feed-forward is determined by

$$kff(n)=argmaxk(wk(n).sn) \quad (2)$$

The stimulation of a neuron is inversely proportional to the Euclidean distance between the stimulus sn and wk (n), the weight vector of neuron k at time n.

- The kff(n−1) neuron activated by the stimulus sn-1 has led to the propagation of a wave in the map. This wave propagates for a time:

$$Isin = isi\ (sn-1,\ sn) \quad (3)$$

Isin * v is a distance d at which the wave is propagated. The coordinates of the two "neurons Wave" (rounded to contact the nearest integer) are calculated as follows :

$$k\tilde{}\pm(n) = kff(n-1) \pm v.isin \quad (4)$$

- the interaction between the wave neuron closest kff(n) causes a deflection Δint (n) of kff (n).

k- ˜(n) is the wave of the neuron k˜±(n) nearest kff(n) .

$$k = k\tilde{}(n) - kff(n) \quad (5)$$

k is the difference between the coordinates of two neurons. The interaction between the winner neuron and the wave is expressed by the interaction function [Figure 3], or κ and σk are the parameters of the simulation were detailed at the top of this paper:

$$f(k) = K \tanh\left(\frac{k}{K}\right)\exp\left(-\frac{k^2}{2\sigma_k^2}\right) \quad (6)$$

- f(k) function calculates Δint (n),

- Δnoise (n) is the noise generated at step n. It comes from a normal distribution centered at 0 and the function σnoise (n) parameter, which is a decreasing function over time, which stabilizes reached a given number of iterations, expressed by The following equation:

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$$\sigma_{noise}(n)=\sigma_0\left(\frac{\sigma_f}{\sigma_0}\right)^{n/n'_f} \quad if\ n\leq n'_f \qquad (7)$$

With σ_0 represents the initial intensity of the noise, and σf the final intensity of the noise, and nf the number of iterations of learning.

- The position of the neuron learning is determined by the winner neuron feedforward and two deviations calculated:

$$klearn\ (n) = round(kff\ (n) + \Delta int\ (n) + \Delta noise\ (n)) \quad (8)$$

- The learner neuron adjusts its weight vector, to move towards the stimulus vector sn, with a learning rate α:

$$\Delta wklearn\ (n)\ (n) = \alpha.(sn - wklearn\ (n)\ (n)) \qquad (9)$$

Experiment Results

In order to evaluate the learning and robustness capacities of the two models, we have tested them for the recognition of heartbeats patients. We take (10500) as the basis for learning and (11600 beats) as base test. The results are reported in the table below [Table 5].

For TSOM algorithm, we used the same parameters proposed by (Wiemer, 2003), which are as follows:

V=1, k=5,

$\sigma_k=\sigma_0=1.5,$

$\sigma_f=0.1,\ \alpha=0.01,$

$n'_f=100000$

A learning rate $\alpha=0.01$, which determines how a neuron adjusts its weight when presented with a stimulus. This parameter is influenced by the number of iterations of the learning that we have set a 100000. Since long learning enhances the spatial convergence, and also related to the number of neurons in the TSOM map.

Evaluation Method

The evaluation of TSOM classifier was made by calculating the specificity (Sp), sensitivity (Se) and the correct classification rate (CC)

Se = Tp / (Tp + Fn).

Sp= Tn / (Tn + Fp).

CC= (Tp + Tn) / (Tp + Tn + Fp + Fn).

with:

Tp (True positive): number of cardiac cycles presenting a "PVC" recognized as "PVC".

Tn (True negative): number of cardiac cycles that do not have the "PVC" recognized as "Normal"

Fp (False positive): number of cardiac cycles not having a "PVC" recognized as "PVC ".

Fn (False negative) number of unrecognized cardiac cycles "PVC".

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The results obtained are summarized in [Table 3], [Table 4], [Table 5]:

	Learning	Test
Normal	100	97.01
PVC	99	95
Global Rate (%)	99.5	96.05

Table 3: Percentage recognition rate of the TSOM classifier.

	Normal	PVC
Normal	97.1	6.9
PVC	96.05	2.7

Table 4: The confusion matrix of the SOM classifier.

	CC	Se	Sp
Rate recognition	96%	87.71%	100%
Accuracy (%)	96%		

Table 5: Performance of the TSOM classifier.

We obtained a recognition rate equal to 96% by the classifier TSOM, better results than the classification in the literature; because the spatio-temporal interaction between inputs can capture more data information from an ECG signal.

Conclusion

In this paper, we proposed a system for the diagnosis of cardiac arrhythmias very common (PVC), based on the TSOM algorithm , which adds a spatio-temporal coupling the self-organizing map (SOM), the coupling is based on the wave activity which start node and each winning are naturally attenuated over time. When these waves travel mutually reinforcing wave fronts temporal activity that are created, which are then used to improve the ability of a node to win the next competition. This Methodology gracefully manages the temporal concept and is explained by use of the approach of space-time encoding data as input to a spatio-temporal classification. The TSOM approach was applied in an experiment with long periods of ECG data containing cardiac activity, and gave good results. Note that in the medical field, any expert requires any automatic method for the diagnosis to justify its decisions, a feature absent in several techniques mentioned in the literature, The method we present, gives a diagnostics which allows doctors to facilitate the interpretation of the ECG, while providing precision and minimal time calculation to give the diagnosis of patients with cardiac pathology at risk.

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CHEMICAL MODIFICATION, CHARACTERIZATION, AND HEAVY METAL ADSORPTION OF CELLULOSE-BASED NATURAL FIBERS

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Abstract: The introduction of heavy metal ions into aquatic environment by industrial waste, agricultural waste, and natural disposals is a major environmental concern. Several methods such as precipitation, reverse osmosis, and bioremediation have been used for removal of heavy metals from wastewater and environmental samples but such techniques are expensive, time-consuming, or results in yielding toxic chemicals. Alternatively, adsorption is a preferred method as it combines both environmental and economic advantages. This paper presents the development of adsorbents by chemical modification of cellulose-based natural fibers. Cotton fibers, which are rich in cellulose, were modified by tethering different ligands (including cystamine and polyamines) and measured their efficacy in removing heavy metals (such as Cd(II), Cu(II), Hg(II), Pb(II), and Zn(II) ions) from stimulated contaminated water. The fibers were characterized by FTIR, SEM, EDS, and TGA and their efficacy for removal of heavy metals was investigated using stimulated polluted water with either Cd(II), Hg(II), or Pb(II) metal ions. The results show that the metal-removal capacity of cystamine-modified cotton increased by ~200% and of polyamines-modified cotton by ~400% for Cd(II), and Pb(II) metal ions.

Keywords: Heavy Metals, Cotton, Wastewater, Adsorbent, Natural Fibers, Cellulose.

Introduction

The introduction of heavy metal ions (such as Pb, Hg, Cd, Cu, Zn, Ni, Co, Fe) into the aquatic environment from industrial, agricultural, and natural disposals is a major environmental and health concern. Each year, millions of tons of these metals are released into the environment by one or the other of the abovementioned artificial processes alone (Hubicki & Kołodyńska, 2012). Although most of these metals are required by the plant and animal bodies in low amounts, they can become harmful if present in increased amounts. Lead exposure, for example, can severely damage internal body organs and cause health issues such as kidney and brain damage, and anemia (Pagliuca & Mufti, 1990). Exposure to mercury can lead to health issues such as kidney damage, pneumonia and lung damage, and disorders such as dyslexia and attention deficit hyperactivity disorder (ADHD) (Weiss & Landrigan, 2000), while exposure to cadmium released into the atmosphere by industries causes cadmium(II) to accumulate in the digestive organs in the body and harm the kidneys and respiratory tract (Friberg, 1985). The recommended limits for lead(II), mercury(II), and cadmium(II) in drinking water are 0.005 ppm, 0.0005 ppm and 0.003 ppm, respectively (Dabrowski, Hubicki, Podkoscielny, & Robens, 2004; Hubicki & Kołodyńska, 2012; O'Connell, Birkinshaw, & O'Dwyer, 2008).

Over the years, several techniques have been developed to remove heavy metals from the environment, such as ion exchange, adsorption, reverse osmosis, electrolytic reduction, precipitation, and solvent extraction (Hubicki & Kołodyńska, 2012). However, most of these techniques are either expensive or energy-demanding, thus great interest has been focused on using renewable natural fibers as adsorbents of heavy metals (Mosa, El-Ghamry, & Truby, 2011; Qu et al., 2009; Shukla, Pai, & Shendarkar, 2006; Xie, Jing, Zhao, & Zhang, 2011). Ideally, for a fiber to be an efficient adsorbent material, it should be rich in functional groups containing atoms such as oxygen, nitrogen or sulfur, which can coordinate with heavy-metal ions. One good example of such a natural material is cellulose, which is a linear homopolymer solid composed of D-anhydroglucopyranose monomeric units assembled via β-(1,4)-glycosidic bonds. Cellulose is mechanically strong, hydrophilic, biocompatible and biodegradable, and with lignin, it accounts for most agricultural crops (Mosa et al., 2011; Qiu & Hu, 2013). Thus, plant materials such as rice straw, cotton, and maize stalks were found to be good adsorbents of heavy metals, with cotton stalk having the highest binding capacity (Mosa et al., 2011).

Herein, we report on the chemical-modification of cellulose present in natural cotton fibers to enhance the cotton's efficiency in removing heavy metals form water. The cellulose in cotton was chemically tethered to nitrogen- and

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sulfur-rich ligands which have binding affinity to heavy metals such as lead and mercury; the ligands used were triethylenetetramine, tetraethylenepentamine, pentaethylenehexamine, and cystamine. The fibers were then used to remove heavy metals from synthetic polluted water where 100-400% increase in the metal-removal capacity of the modified fibers was observed in comparison to unmodified cotton fibers.

Materials and Methods

Materials and Equipment: The metal solutions used were at 100, 200, and 300 ppm mercury(II), lead(II) and cadmium(II) solutions, which were separately prepared using mercury(II) acetate, lead nitrate and cadmium chloride salts, respectively, with deionized water. Metal salts from BDH and/or Panreac (Barcelona, Spain). Acidic conditions (pH= 6.0 ± 0.1) were maintained for all metal solutions using HNO_3 (0.1 M). pH was measured using PerpHecT Basic Benchtop Model Orion 320 pH meter (Thermo- Orion, Loughborough, UK). Infra-red (IR) spectra were recorded using KBr discs on an FTIR spectrometer (from PerkinElmer, USA). Samples were shaken at 25 °C using a ThermoShaker Edmund Buhler KS-15/TH-15, Germany. Thermo-gravimetric measurements were performed on a TGA 4000 Thermogravimetric Analyzer (TGA) from PerkinElmer USA. All measurements were performed under N2 gas, and the temperature ramp was set at 10 °C/ min. Scanning Electron Microscope (SEM) was performed on a Tescan VEGA III LMU (Czech Republic) with Oxford Instruments EDS surface analysis capability. SEM-Resolution: 3 nm in High vacuum Mode (30 kV); Low Vac and BEI Resolution: 5 nm; Magnification 4 x 1,000,000X; EDS Detector Resolution: 127 EV; EDS Detector Size; 10 mm; EDS Detection range: Be to U with low sensitivity for atoms below Na. Metal analysis was carried out on Inductively Coupled Plasma (ICP) instrument.

Synthesis of Oxidized Cellulose: Cotton (20.00 g) was soaked in a solution of sodium periodate (10.0 g $NaIO_4$ in 1000 mL of deionized water) and stirred continuously at a temperature ~65 °C for 1 hour. After cooling to room temperature, the cotton was filtered, washed with ice cold deionized water, and dried under vacuum for 12 hours at room temperature.

Synthesis of Modified Cellulose: Oxidized cotton (2.000 g) was added to a solution (200 mL) of sodium carbonate (35 mM) and the ligand (45 mM). The mixture was allowed to stir for 24 hours at room temperature before it was filtered, washed with ice cold deionized water, and dried under vacuum for 12 hours. The ligands used were triethylenetetramine, tetraethylenepentamine, pentaethylene-hexamine, and cystamine ligands.

Adsorption of Metals: Samples (100 mg) of the modified and the unmodified cotton were incubated with a solution of the metals (5 ml) at different concentrations (5.0 ppm, 20.0 ppm, 50.0 ppm, 100.0 ppm, and 200.0 ppm) at pH=6.0±0.1 for 12 hours at 25 °C while being swirled using a thermoshaker. The sample solutions were then filtered to remove the cotton, and the concentration of the metal in the filtrate was then measure using ICP.

Results and Discussion

The synthesis (Saravanan & Ravikumar, 2015) of the modified fibers started with the oxidation of the cellulose in the cotton with aqueous sodium periodate ($NaIO_4$) to form the dialdehyde groups which were then reacted with the amino group of the ligands in basic solution to form the imino linkage with the ligands (Figure 1). Physical examination of the modified cotton showed no visible change on the mechanical strength of the fiber. A closer examination of the fibers surface using SEM showed that the fibers of the oxidized cotton and those of the chemical modified cotton had slightly more rough surfaces than that of the unmodified cotton as depicted in Figure 2.

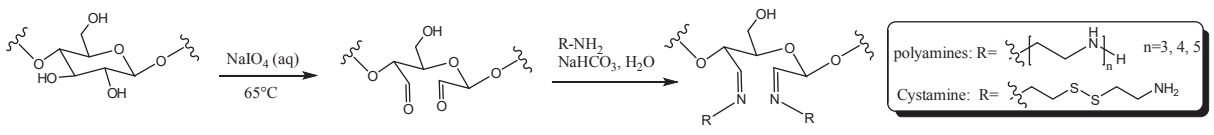

Figure 1. Synthetic scheme of the chemical modifications of the cotton fibers

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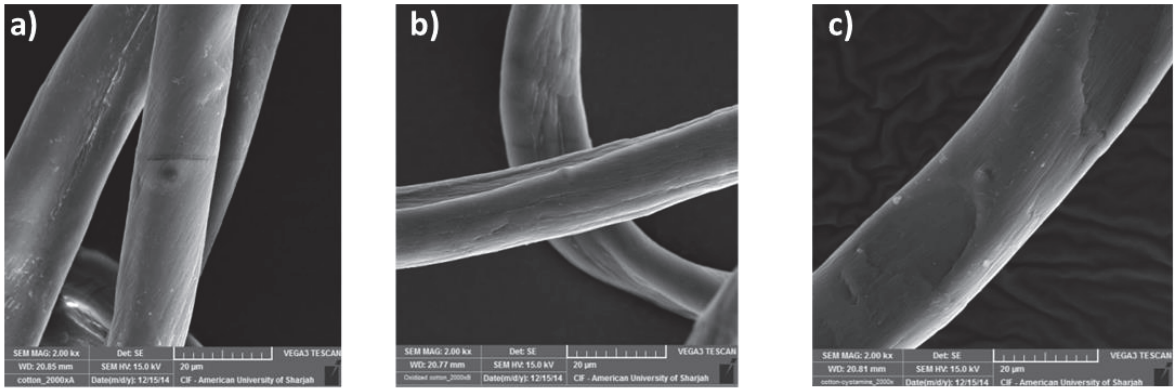

Figure 2. SEM images of the fibers' surface (2000x) of (a) unmodified cotton, (b) oxidized cotton and (c) cystamine-modified cotton

The changes in the IR spectra of the modified cotton indicated the attachment of the ligands to cellulose. Figure 3 shows the IR spectra of unmodified cotton, oxidized cotton, and triethylenetetramine-modified cotton fibers. The characteristic peaks of cellulose appear at 3300-3450 cm^{-1} due the stretching of O-H bonds and ~2900 cm^{-1} for the stretching of the non-aromatic C-H bonds. For the oxidized cotton spectra, along with these peaks, a new shoulder peak was observed at around 1737 cm^{-1} (Figure 3) due to the C=O bond stretch of the aldehyde along with peaks at around 1263 cm^{-1} and 810 cm^{-1}. These peaks disappeared when the ligand was attached and new peak appeared at ~3445 cm^{-1} (overlapping with that the OH band) corresponding to the stretching of N-H bonds in the ligand.

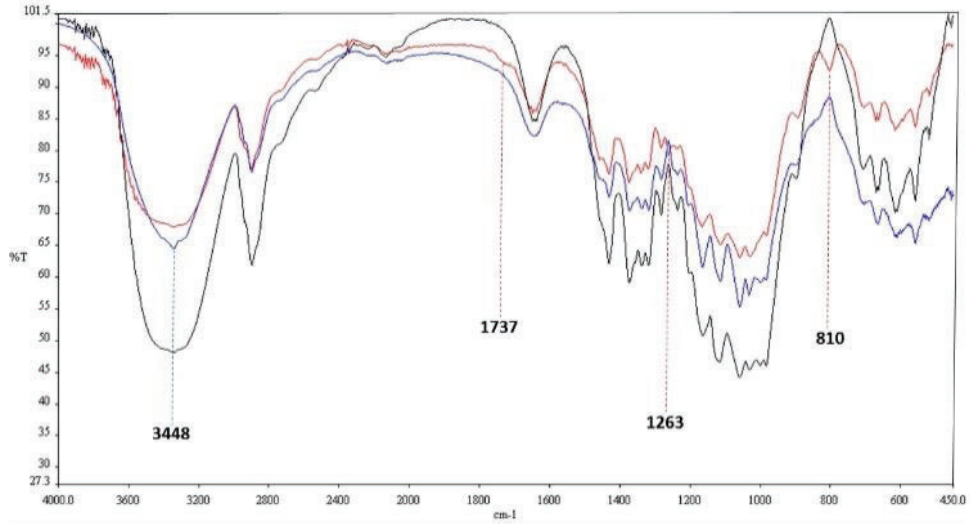

Figure 3. IR spectraof unmodified cotton (black), oxidized cotton (red) and triethylenetetramine-modified cotton (blue) fibers.

Furthermore, elemental analysis of the fiber surface using SEM-Energy Dispersive X-ray Spectroscopy (EDS) further supported the attachment of the ligand to the cotton surface. Figure 4 shows EDS spectra of unmodified cotton and cystamine-modified cotton fibers. The top spectra show the main elements present in cellulose fibers: carbon, hydrogen, and oxygen. After oxidation and attachment of the cystamine ligand, a new peak corresponding to sulfur appeared; the appearance of the peak was on the expense of the oxygen peak; the relative intensity of which decreased from 48.4% in the unmodified cotton to 45.7% in the cystamine-modified cotton.

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Figure 4. EDS spectra for (a) unmodified cotton and (b) cystamine-modified cotton fibers.

Thermal Gravimetric Analysis (TGA) of the ligand-modified cotton fibers showed that these were less thermally stable than the unmodified cotton fibers. The thermograms (Figure 5) of the fibers showed that unmodified cotton was stable up to 290 °C at which it started to decompose. However, all the modified fibers started to decompose at ~ 200°C and lost half their weight at ~365 °C. Cystamine-modified cotton showed a slightly different trend from the polyamine-modified fibers decomposing at a slower rate. The lower thermal stability of the modified fibers can be attributed to the weak imine bond which links the ligands to cellulose versus the C-C and C-O bonds present in the unmodified cotton (Saravanan & Ravikumar, 2015).

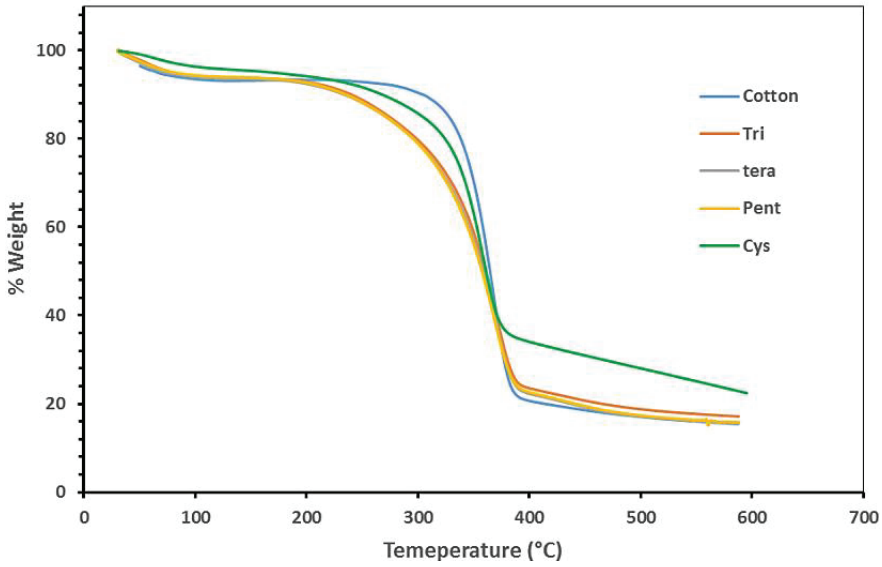

Figure 5. Thermal deomposition profiles of the unmodified cotton and the four different ligand-modified cotton fibers.

The ability of the modified fibers to remove metal ions from polluted water was evaluated through batch experiments where modified and non-modified fibers were soaked in solutions of different metals for 12 hours. Figure 6 shows the amount of Cd, Hg and Pb metal ion removed from 100 ppm solution using 20 g of fibers per one litter of solution. The fibers modified with the polyamines ligand removed about 50 % of Cd ions while fibers modified with triethylenetetramine and cystamine removed around 50% of Hg and about 90% of Pb; however, non-modified cotton removed only 22% of Cd, 45% of Hg and 43% of Pb.

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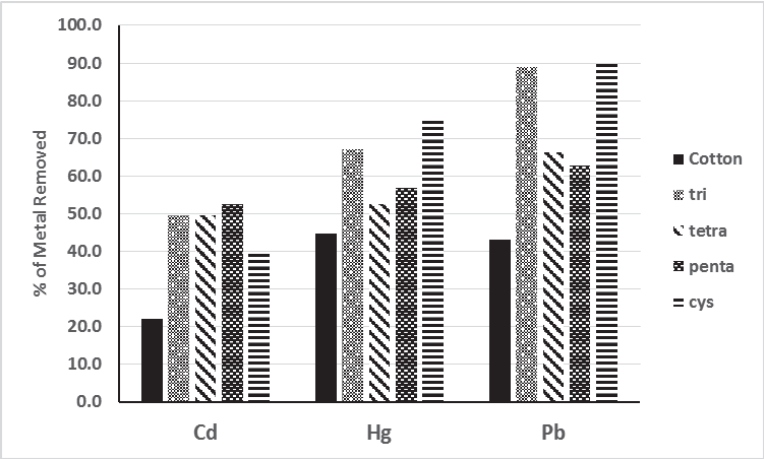
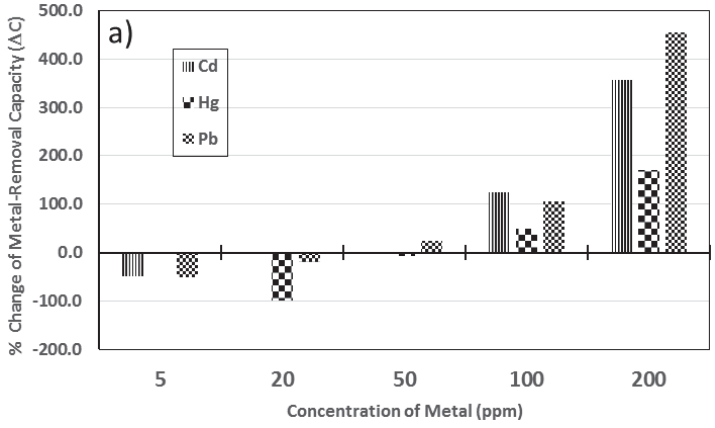


Figure 6. The % remoal of the metal at 100 ppm concentration using the modified fibers at 20 g/L ratio.

The efficacy of the modified fibers to remove the metals was dependent on the concentration of the metal in solution. Figure 7 shows the relative change in metal-removal capacity (ΔC) of cotton as it was modified with triethylenetetramine and cystamine, respectively. The percentage change of metal-removal capacity was calculated according to (1):

$$\Delta C = [(C_f - C_o) / C_o] \times 100 \qquad (1)$$

where C_f is the metal-removal capacity of modified fiber (mg/g of metal/fiber), and C_o is the metal-removal capacity of non-modified fiber (mg/g of metal/fiber). The results showed that the chemical modification of cotton with triethylenetetramine had negative or insignificant effect on the metal-removal capacity at metal concentrations lower that 100 ppm; as metal concentration increased to 200 ppm, the metal-removal capacity increased by 350% for Cd, 150% for Hg and 450 % for Pb. Chemical modification of cotton with cystamine had insignificant effect on the metal-removal at 5 ppm and 20 ppm concentrations. As the concentration increased to 50 ppm, the loading capacity of Cd increased by 200 % and then it decreased to 140% and 110% at 100 ppm and 200 ppm, respectively. An opposite trend, however, was observed of Pb-removal capacity which increased by 30% at 50 ppm, 130% at 100 ppm and 190% at 200 ppm.



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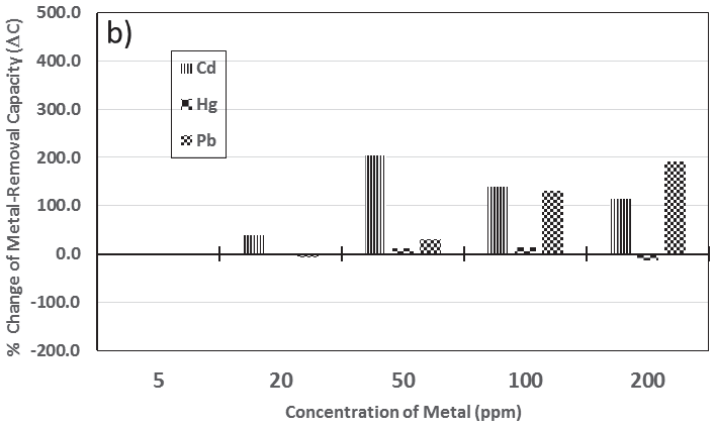

Figure 7. The % chae of the metal-removing capacity (DC) of the cotton fibers upon modification with (a) triethylenetetramine and (b) cystamine.

Conclusion

The results of this report showed that chemical modification of cellulose natural fibers would enhance their efficacy as adsorbent for metal ions from polluted water. Further development of the procedures and investigations of other ligands and fibers could provide valuable tool for remediation of wastewater contaminated heavy metals at a relatively low cost.

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COMPOUND WORDS FORMED WITH THE LEXEME -*WEAR* IN CONTEMPORARY FRENCH

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Abstract: The present paper deals with the presence of the compound words formed with the English lexeme -wear. The final corpus of found words contains 46 results. For our research, we analysed general periodicals, women's magazines and the AFM corpus run by the Czech National Corpus. After the theoretical introduction disclosing generalities on the notion of borrowing, on Anglicisms in French today, on the term -wear itself, we will focus on the presentation of our corpus. First, we will search for all the words found in the metalinguistic corpus, that is to say in general language dictionaries (such as *Le Petit Robert, Larousse, Trésor de la langue française, Wiktionnaire*) and other specialized dictionaries (*Le Grand dictionnaire terminologique*, a dictionary of Anglicisms). Next, we will discuss the equivalents and competitive words that exist in French and conclude with a presentation of the frequency and circulation of selected borrowings in press archives.

Keywords: compound words, -*wear*, French language, metalinguistic corpus

Introduction

Compound words – used "[…] for inventing terminology in the cases where the speaker intends to suggest that the denominated object, phenomenon, quality, action, concept is more complex while keeping its semantic unity […]" (Helcl, 1953); belongs to linguistic elements used for enrichment of the vocabulary of the target language. According to Tournier (2009), a compound word, in French *mot composé*, is a word consisting of several parts while at least two of the parts can be used separately. Niklas-Salminen (2015) speaks of a blend of two elements which can also be used as basis for derivation. The above-mentioned definitions are not contradictory. In both definitions, a compound word is a word combining two or more lexemes in order to create a new concept.

The subject of this article are compound words using the English lexeme -*wear*, which can be understood as loans from English, neologisms or neological loans, even if the word has not been included in the metalinguistic corpus yet (Fridrichová, 2012).

In English, *wear* is a verb, or a noun. *Online Etymology Dictionary* (online) introduces the origins of verb *wear* stating "Old English *werian*, to clothe, put on, cover up" and the meaning of noun *wear* as "action of wearing (clothes)" derived from verb *wear* in mid-15th century. The meaning "what one wears" dates back to 1560 and the dictionary adds that "to be the worse for wear" is attested from 1782; noun phrase wear and tear is first recorded 1660s, implying the sense "process of being degraded by use." *English Oxford Dictionary* (EOD, online) also distinguishes between *wear* as a noun and as a verb, specifying the noun as a mass noun. The basic definition for the verb is "have (something) on one's body as clothing, decoration, or protection". For the noun, the form which dominates our corpus, two basic definitions can be found, one of them matching the category of compound words examined in this article: "Clothing suitable for a particular purpose or of a particular type". Finally, the dictionary addresses the origin of the word: "Old English werian, of Germanic origin, from an Indo-European root shared by Latin *vestis* - 'clothing'."

In English, *wear* is also understood as a word suitable for creating further compound words, as can be seen in the usage note in EOD: "with modifier or in combination". In French, we have managed to find 46 lexemes created by using -*wear*. The words were acquired through random research in newspapers, magazines (mostly targeting women) and linguistic corpus Czech National Corpus (korpus.cz) between January 1 and May 31, 2017.

The goal of this article is, based on their presence in dictionaries, to introduce their general features and draw attention to words newly invented by journalists in French press.

Presence of compound words using *wear* in the French metalinguistic corpus

To acquire sufficient information on lexicalization of the discovered entries, it was first necessary to examine individual dictionaries of the French language and verify each lexeme. We will introduce presence of *wear*-based compound words in classic common dictionaries (*Le Petit Robert, Larousse* and *Trésor de la langue française*), in online dictionary *Wiktionnaire*, as well as in specialized dictionaries – terminology dictionary *Grand*

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dictionnaire terminologique and dictionary of Anglicisms *Dictionnaire des anglicismes* (Goursau, 2015).

The first dictionary examined was ***Le Petit Robert*** (PR). This dictionary contains a single standalone *wear*-based word, *sportwear* [spɔʀtwɛʀ] with one different orthographic variant, *sportswear* [spɔʀtswɛʀ]. According to PR, it is a masculine noun dating back to 1962, coming from American English based word *sportswear*, derived from *sport(s)* and *wear*, conveying the meaning of any sports clothing combining the qualities of comfort and elegance. The dictionary mentions use of the word as an adjective, giving the example of "des tissus sportwear" (textile used for sportswear). In the same dictionary, we can also find word "prêt-à-porter" (1951) referring to the original term coming from American English calque *ready-to-wear* (masculine noun), including *wear* as a verb.

As to ***Larousse***, this dictionary also includes compound word *sportswear* as a substantive with a single form, *sportswear*, which corresponds with the original English form, and the following definition: "Commercial term designating sports-style clothing". In addition, Larousse mentions term *wash and wear*, consisting of verbs wash and wear, meaning the following: wrinkle-free fabrics, relating especially to cotton fabrics, where ironing after laundering is not necessary. This term, however, is not included in our lexical corpus.

The information provided in ***Trésor de la langue française*** (TLF) is identical with the information in PR, *sport(s)wear* as a substantive and an adjective (at entry "sport") and calque *ready-to-wear*.

We were surprised by the very low number of the corpus words in ***Wiktionnaire***. This dictionary only included entries *streetwear* and *ready-to-wear*. Word *Streetwear* is introduced as a loan from English meaning "vêtement de rue" and includes synonym *skatewear*, without any further reference.

Another dictionary included in the research is ***Grand dictionnaire terminologique***. The dictionary is administered by *Quebec Board of the French Language* (L'Office québécois de la langue française) with the goal to create mainly French counterparts for English terminology used in Canada. It contains 12 expressions including *wear* and matching our corpus. Table 1 brings a summary of the results with recommended French counterparts (*terme privilégié*), along with the year of their introduction.

Table 1: Compounds using *wear* in *Grand dictionnaire terminologique* and their recommended French counterparts

Active wear	ensemble de détente (1989), vêtements plein air (1985)
Beach()wear	vêtements/tenue de plage (1985)
Casual wear	vêtements (de) sport (2003)
Homewear	vêtement/tenue de détente, vêtement/tenue d'intérieur (2002)
Loungewear	vêtement/tenue de détente, vêtement/tenue d'intérieur (2002)
Men's wear	vêtements pour hommes (1972)
Ready-to-wear	prêt-à-porter (1978), vêtement de confection
Sleepwear (nightwear: alternative term)	vêtement de nuit, lingerie de nuit (1982)
Sportwear	sportwear (1979)
Sportswear	vêtements sport (2003) vêtements de sport (1978)
Swim wear	vêtements de bain (1985), tenues de plage (1980)
Underwear	sous-vêtement (1978)

In the dictionary, both multiple-word variants with spaces as well as non-spaced variants can be found (*beach()wear* has both variants in one), and the only hyphenated word is *ready-to-wear*. Niklas-Salminen (2015) emphasized that the written forms of compound words vary even within individual dictionaries, such as in the following example: *leudit, lieu-dit, lieu dit*.
Examining suggested counterparts, we can notice that the French version of *sportwear* does not provide a French-based counterpart, simply copying the original word. The counterpart for *Casual wear* matches the counterpart for *sportswear*, i.e. "vêtements (de) sport". Expression "tenue(s) de plage" is suggested as a counterpart both for *swim wear* (in plural form) and for *beach()wear* (in singular form). Identical terms and introduction dates can also be seen in *homewear* and *loungewear*. Comparing the definitions in the original language (source: EOD), *loungewear* (written as a single word in EOD) means "casual, comfortable clothing suitable for wearing at home"; *home wear* (two words according to EOD) means "clothing worn in the home, typically of an informal, simple, or comfortable sort"; even if both concepts contain key words *at/in the home a comfortable*, unlike *home wear, loungewear* is not primarily intended for wearing at home. However, in the suggested French counterparts, this slight discrepancy is ignored.

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For *sleepwear*, an alternative term of the identical meaning is provided – *nightwear*. The oldest date for a counterpart goes back to 1972, introducing a term for *men's wear*, the newest is "vêtements (de) sport" (2003) for its English source *casual wear*.

Finally, we consulted ***Dictionnaire des anglicismes*** (2015) to encounter higher presence of the entries included in our corpus, 12 words in total. These entries are listed in Table 2, along with definitions in translation and the original, i.e. French counterparts. The original orthography is preserved.

Table 2: Compounds using *wear* in *Dictionnaire des anglicismes* with definitions and counterpart

Beach-wear	Vêtements de plage, fringues de plage, mode balnéaire
Casual wear	Tenue décontractée
Easy wear	Facile à porter
Friday wear	Custom according to which a company's staff can dress casually on Fridays/ Coutume selon laquelle le personnel d'une entreprise peut s'habiller de manière décontractée le vendredi
Homewear	Clothing that is worn at home/vêtement qui se porte à domicile; tenues d'intérieur
Menswear	Vêtements pour hommes (Men's clothes)
Ready-to-wear	Prêt-à-porter
Skatewear	Vêtements rue de skateur (Clothes street skater)
Slow wear	Fight against the frenzy of marketing, resource wastage; Combatting compulsive purchase without interest, buying poor quality clothing or buying clothes containing substances harmful to health / Lutte contre la frénésie de la commercialisation, le gâchis des ressources; lutte contre l'achat compulsif sans intérêt, l'achat de vêtements de mauvaise qualité ou encore l'achat de vêtements contenant des substances nocives pour la santé
Sportwear	Sports clothing that combines comfort and elegance / Vêtement de type sport qui allie le confort et l'élégance, vêtement sport, style sport
Streetwear	Urban style influenced by hip hop or rap music; Urban mode / Style vestimentaire urbain influencé par la musique hip hop ou rap; mode urbaine
Underwear	Sous-vêtements, dessous, lingerie

As we can see in the table, *Dictionnaire des anglicismes* includes the above-mentioned term *sportwear* (variant without -s), as well as expression *ready-to-wear*. Written variants vary from spaced terms, through hyphenated, to single-word entries. The latter version dominates (6/12), followed by spaced forms (4/12), with only two occurrences of hyphenated words in Goursau. A high number of entries includes brief definitions, at times accompanied with possible alternatives. *Slow wear, Friday wear, streetwear*, *sportwear* include more explicit definitions. *Slow wear* and *Friday wear* provide no French counterparts.

The data show that only 33 per cent of the corpus entries are present in the dictionaries addressed with the metalinguistic analysis. This means that 30 words cannot be found in any of the dictionaries, suggesting that, upon further research, they may be identified as neologisms.

Features and frequency of neological loans created with *-wear*

As mentioned above, 33 per cent of the words in the corpus are, in different proportion, present in the dictionaries, obviously this applies mainly to specialized dictionaries, i.e. in this case in the dictionary of Anglicisms and the terminology dictionary.

We therefore consider the remaining part of the lexemes in the corpus as neological loans from English and will try to describe them, define them and quantitate their frequency within contemporary French.

Closer examination revealed that some *wear*-based expressions represent or may represent names for brands, products, or certain ranges of products mainly in the field of fashion and beauty. Some names are also used in common language, i.e. they not only indicate a specific brand (proper names), but are also absorbed by common language to become common nouns: *bike(-)wear, body(-)wear, fight(-)wear, organic(-)wear, yoga(-)wear, fair(-)wear*, *cocoon(-)wear, running(-)wear*. This phenomenon, in linguistics known as *conversion*, is very common. On the other hand, other names showing rare or no occurrence in common language have been eliminated from further research: *Double wear*, *Fair wear*, *Hardwear, Knitwear, Long wear, Organic wear, Primal wear, Unikwear*. However, it might be interesting to address these terms in the future and see whether they have spread, been acquired by common language, and if they have turned into common nouns.

To quantitate frequency and the extent of spreading of individual loans, we partly applied a methodological concept introduced in project EmpNéo (Mudrochová, 2016; Hildenbrand, Kacprzak, Sablayrolles, 2016). For measuring

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of the frequency, we used online newspaper *20minutes.fr*, corpus AFM (a corpus administered by *Czech National Corpus*, korpus.cz) and search engine *Google.fr* (restricted to results within France and in French language). The research was held on July 10, 2017 (if not stated otherwise for a particular term).
The most spread words of the final corpus, based on examination of news portal *20minutes*, are (keeping the original written form) *surfwear* (14 occurrences), *morphing wear* (4 occurrences), *bodywear* (3 occurrences), and the following terms with a single occurrence: *sponsor wear*, *clubbing wear*, *urban wear*.
English word *surf*(-)*wear* is not present in OED. In *20minutes*, it is used on December 13, 2010 for the first time: "Sound of the beach ! Philips s'est associé à O'Neill, la marque de ***surfwear***, pour plancher sur un casque audio à l'attention des sportifs" (ex. 1). Corpus AFM includes 2 results for *surf wear* and 44 results for *surfwear*, while *Google.fr* shows 65,400 results. Adequate French counterparts appear to be "vêtements de surf" (19 references on *20minutes*, first of them dating back to 2006, and 241,000 references on *Google.fr*), "tenue de surf" (1 result from 2014 on *20minutes* and 76,100 results on *Google.fr*). It appears that French periphrases successfully compete with the English *-wear* form. However, it is necessary to bear in mind that word *surf* comes from American English (masculine noun from 1961 according to PR).
Morphing(-)wear is not present in OED. On *20minutes*, it was used in 2008 for the first time, with all the results referring to the same year and an article on an international fair of underwear held in 2008. "C'est la tendance forte de cette année 2008 : le «***morphing wear***». Soit utiliser la technologie des nouveaux matériaux pour «modeler» son corps" (ex. 2). *Morphing(-)wear* is therefore a kind of underwear which, thanks to the materials used, allows to form figure, especially with women. Corpus AFM returned no result for the required word, nor is the term very common on the internet (757 references). An adequate French counterpart appears to be "lingerie modelante" (nearly 5,000 results on *Google.fr*), or "sous-vêtement modelant" (853 results), with preference in favour of its singular form.
Body(-)wear can be found in OED along with its definition: "Any of various types of close-fitting clothing, especially underwear", and word origin: "1970s; earliest use found in The New York Times". In French press (*20minutes*) it was first used in 2012 in relation to introduction of a new underwear brand *David Beckham Bodywear*, and two years later (January 23, 2014) it was used to refer to a large range of underwear items: "Des bustiers et des bodies travaillés comme des articles de prêt-à-porter, des soutiens-gorges faits pour être vus et portés comme des tops: les dessous veulent plus que jamais prendre le dessus, comme avec ce body Sullivan orné des perles d'Onyx du spécialiste du «***bodywear***» Pain de sucre" (ex. 3). Three results can also be found in corpus AFM and on the internet, *body(-)wear* shows 138,000 occurrences. French counterparts, found only on the internet, are "lingerie de corps" (1,810,000 results), and "sous-vêtements de corps" with its plural form prevailing (168,000, *Google.fr*).

Urban(-)wear cannot be found in OED. On *20minutes*, its single occurrence dates back to 2016: "Une marque née de la rencontre d'un rappeur et d'un designer. Avnier, un blaze qui contracte « avant-dernier », est le jeune label streetwear, fondé par Aurélien Cotentin, alias le rappeur Orelsan, et Sébastian Strappazzon, styliste suisse, ex-semi-pro de BMX. Le pitch d'une griffe juste au milieu entre ***l'urban wear*** et le rangé" (ex. 4). Corpus AFM shows 12 occurrences written as *urban wear* and 6 results for *urbanwear*. *Google.fr* returns 23,100 references. *Urban(-)wear* is frequently used hand in hand with *street(-)wear*. It then refers to urban style of clothing, simple and modest in colours. Its French counterparts include "tenue urbaine" (39,900), "vêtements urbains" (35,100) and 8 results on *20minutes*, the first from 2006, and uses with adjective *citadin(e)*, referring however rather to chic urban fashion.
Clubbing(-)wear is not present in OED. *20minutes* shows 1 result from 2007 referring to *anti-clubbing* wear (i.e. contrasting with *clubbing* fashion): "Ses lunettes de soleil vintage sur le nez, cet insomniaque de 25 ans trimballe sa bonne humeur dans toutes les fêtes branchouilles de la capitale. Il cumule les mandats hype : RP pour Cindez, la marque de prêt-à-porter d'***anti-clubbing wear*** et DJ Selector" (ex. 5). One occurrence can be found in corpus AFM and 618 are returned by *Google.fr*. *Clubbing(-)wear* is generally understood as hot, almost vulgar wear inspired by go-go dancers and stripteasers working in clubs. In French, we can find words "vêtements de club" (129,000), "vêtements de club" (111,000).
Sponsor(-)wear is another term missing from OED, with a single result from 2014 on *20minutes:* "Avant un week-end prolongé aux Deux-Alpes pour célébrer l'ouverture du glacier et un shooting en Autriche pour son ***sponsor wear*** (Billabong), le rider de 21 ans, qui venait d'être élu rookie de l'année au Snowboard Garden Festival à Grenoble, s'est payé le luxe d'être le seul rider français invité au Frontline Raijam, en Suède, en attendant de reprendre la vidéo avec Almo dès le début de la saison" (ex. 6). Corpus AFM contains no reference and there can be only 89 found on the internet. The term refers to wear supplied by sponsors for individuals to wear them at public events. The French counterparts, neither much frequent, are: "vêtements sponsor" (281), "tenue sponsor" (64), "tenue de sponsor" (8), "vêtements de sponsor" (2), "sponsor habillement" (17), and variants with the French counterpart for *sponsor* (English loan, 1954, according to PR), i.e. "parrain", which are also rather considered as hapax legomena.

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Having introduced words occurring on *20minutes*, we will focus on terms present in AFM but not in the addressed press.
Terms occurring in corpus AFM include the following entries, with their frequency shown in brackets: *cocoon wear* (1), *ski wear* (1), *yoga wear* (2), *running wear* (2), *celebrity wear* (2), *conscious wear* (2), *snow wear* (1)/*snowwear* (3), *smart wear* (1)/*smartwear* (6), *fight wear* (2)/*fightwear* (3), *club wear* (3)/*clubwear* (4), *bike wear* (4).

Bike(-)wear is a word which in corpus AFM refers to a clothing brand. On the internet, however, it is partly used to speak about any item of clothing worn for cycling (251,000, *Google.fr*). Common counterparts are: "vêtements de vélo" (714,800), "vêtements de cyclisme" (401,000), "tenue de vélo" (214,000), "tenue de cyclisme" (85,300), "vêtements vélo" (54,800), "vêtements pour vélo" (50,000), "tenue cycliste" (47,300), "vêtements de cycliste" (38,100), "vêtements cycliste" (23,800), "tenue de cycliste" (18,600), "vêtements cyclisme" (16,900),"tenue vélo" (14,300), "tenue cyclisme" (5,780), "habillement vélo" (5,340), "habillement de vélo" (3,840), "habillement de cyclisme" (2,320), "habillement cycliste" (2,240), "habillement cycliste" (2,280), "tenue pour vélo" (1,930), "habillement cyclisme" (442) and other variants of tenue/habillement/vêtements pour cycliste/vélo/cyclisme.
Club(-)wear is included in *Wikipédia.fr*, providing definition "provocative, revealing, or fetish clothing that is worn to nightclubs featuring a sensual atmosphere with a very relaxed dress code." It is therefore an alternative term for *clubbing(-)wear*. AFM shows 4 results (written as *clubwear*): "Www.delicieuse-seduction.com, est un site consacré spécialement aux vêtements tendance ***clubwear*** , lingerie de charme, bijoux et accessoires , flirtant avec le côté charme sauvage, permettant de se sentir sexy et érotique" (ex. 7). On the internet, the term is very common, with 538,000 results.
Although f*ight(-)wear* is a lexeme used in brand names, in corpus AFM it also conveys the meaning of a clothing item designed for martial arts and combat sports in general. "J'aurais préféré un fight short tout simple. Mais il en faut bien pour tous les goûts. Ce ***fight wear*** nous donne un petit aperçu de la nouvelle ligne de combat Venum pour les femmes. On l'attend avec grande impatience!!! Restez connectées pour plus d'infos à venir sur la collection Venum MMA femme" (ex. 8). On the internet, there are 14,600 occurrences of this term, frequently accompanied by another word for more precise identification: *kobey fight wear*, *hunter fight wear*, *boxing fight wear*, etc. French counterparts are once again periphrases of the original English expression: "vêtements/tenue/habillement" "de combat/sport de combat", while "vêtements de combat" (498,000) shows the highest number of results.
Smart(-)wear can be found in many different contexts, referring to technology, system, but also to smart wearable items (smart glasses, rings, watches, underwear, etc.). *Smart(-)wear* can also be used as a standalone term, as a noun, as shown in the following example: "Recevez des notifications, contrôlez votre musique et bien plus depuis votre ***SmartWear***, tout en enregistrant toute votre vie où que vous alliez" (ex. 9). It is, however, frequently used as a pronoun: "les appareils SmartWear", "des innovations SmartWear" (comp. AFM). On the internet, we found 33,000 results, with French counterpart "vêtements connectés" reaching 202,000 occurrences. Other, less frequent variants are "vêtements intelligents", "tenue(s) intelligentte(s)".
Snow(-)wear can be found in AFM in two written forms, *snowwear* and *snow wear.* The spaced variant if even feminine, even if masculine forms prevail in terms created with *-wear:* "Nitro, Libtech, APO, Flow, Union, GNU, Oakley … de -10 à -20% sur le matériel et les accessoires de Snowboard, c'est en ce moment ! Avec des prix fixes pour la ***snow wear*** à part de 120€, vous avez de quoi vous équiper à petit prix avant les vacances de février !" (ex. 10). As obvious in the word, *snow(-)wear* denotes clothing designed for use in snow, especially suitable for winter sports. *Google.fr* returns 20,600 results. Again, the French counterparts show higher usage, especially "vêtements de neige" (665,000).
Conscious(-)wear is present twice in AFM. One of the occurrences can be seen in the example: "One One One Wear™ est une marque française au concept novateur, le « ***conscious wear*** », établie à Paris en 2007. Les thèmes développés par One One One Wear™ sont inspirés de l'Afrique, son peuple et sa culture, et de valeurs telles que la liberté, l'unité, et le respect des identités et des différences" (ex. 11). On *Google.fr*, the term is not very common (712 results), even though some companies have been using it or a range of their products, such as collection *H&M Conscious*. The term refers to clothing made with respect to environment, of modified and recycled materials. In French, counterparts use French words for *-wear*, such as "vêtements", "tenue", "habillement", sometimes with word "conscient", the literal translation of *conscious*. Individual variants, however, never reach the number of occurrences of the original English term.
Celebrity(-)wear, with two results in AFM, is defined as clothing supplied for free to celebrities and stars in order to promote the particular brand, as explained in the example: "Le "***celebrity wear***" consiste à donner gracieusement aux plus grandes stars des vêtements de la marque en pariant sur l'effet d'imitation sur les autres stars et leurs publics respectifs" (ex. 12). On the internet, there are 2,570 results for this term. In French, we failed to find an adequate counterpart, and the literal translation "vêtements de célébrités" (meaning rather *celebrity fashion*) refers generally to any clothing worn by popular people, not to a marketing strategy of design fashion giants.
Running(-)wear is present in AFM only in reference to fashion brand *Gore Running Wear*. However, on the

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internet, the frequency of the term conveying the meaning of clothing worn for running is rather higher (220,000 results). In French, there are several counterparts which literally translate the English term, such as "vêtements de course" (939,000), "tenue de course" (513,000), "tenue pour la course" (280,000), "vêtements pour la course" (167,000), "habillement de course" (61,500), in some cases with expression "à pied" to specify word "course". It is also possible to find variants with word "courir", with the number of results under 40,000.
Yoga(-)wear also returns two results in AFM, yet both refer to a proper name, i.e. to a brand (*Mika Yoga Wear*) and a family name (*Satya Yogawear*). On *Google.fr* we found 13,400 occurrences, oftentimes also in brandnames. In some cases, it is possible to encounter general term *yoga(-)wear*, i.e. clothing designed for yoga. Two French counterparts prove higher presence on the internet : "vêtements de yoga" (577,000), "tenue de yoga" (271,000). Other variants show occurrence on a comparable or lower level, such as "tenue pour faire du yoga" (14,300).
Ski(-)wear is one of not so many terms present in OED, written as *skiwear* and defined as "clothing suitable for wearing while skiing". On the other hand, the only result in AFM is written as two separate words, *ski wear*: "Les résultats de ces tests, ainsi que le guide d'achat des chaussures et du ***ski wear*** , sont là pour vous aider à voir plus clair dans l'offre pléthorique de matériel" (ex. 13). The number of occurrences on the internet is over 35,300. The most common French counterparts (research carried on July 15, 2017) are: "tenue de ski" (238,000), "vêtements de ski" (66,000). Variants including expression "pour skier" are less common.
Cocoon(-)wear is the last word found in AFM. As we can see in the example: "Ma P'tite Culotte propose aujourd'hui trois gammes dédiées à la femme : Lingerie , ***Cocoon wear*** et Maillot de bain ! " (ex. 14), *cocoon(-)wear* is used to refer to collection of *Ma P'tite Culotte* (referring to a home-worn casual clothing between sports wear and sleep wear). Even though the presence on the internet is low (125 results), it is now starting to be used not only in reference to the given scale, but is also spread as a general term conveying the above-mentioned meaning. In French, we can find counterparts "tenue/vêtements (de) cocoon(ing)", most frequently written as "tenue de cocooning" (91,600; July 15, 2017).

Although the remaining words of the corpus failed to be found both on *20minutes*, or in AFM, they are lexemes with a certain frequency on the internet, according to the research carried out with *Google*. Their overall presentation and frequency on *Google.fr*, along with possible counterpart in French can be seen in Table 3.

Table 3: Words with no occurrence on *20minutes* and in AFM

Word with wear	***Frequency on Google***	***Counterpart***
everyday(-)wear	74,8	tenue/vêtements de tous les jours
jean's(-)wear	58,6	tenue/ vêtements de/en jean(s)
girl's(-)wear	37,2	tenue/ vêtements de fille/jeune fille/fifille
utility(-)wear	4,1	tenue/ vêtements utilitaire(s)/d'utilité/utilitariste(s)
spa(-)wear	3,91	vêtements de spa

As shown in the table, there are five words remaining: *everyday(-)wear, jean's(-)wear, girl's(-)wear, utility(-)wear, spa(-)wear*. None of the five words is included in OED. *Everyday(-)wear* refers to common, everyday clothing. Its most frequent counterpart on the internet is "vêtements de tous les jours" (616,000, July 16, 2017). *Jean's(-)wear* with its simplified written version *jeans(-)wear* refers to any clothes made of denim. The French counterparts show high frequency on the internet. The most frequent variant on *Google.fr* with over one million occurrences is "vêtements de jean(s)". *Girl's(-)wear*, often written as *girls(-)wear*, without an apostrophe, is defined as clothing for girls and there are numerous and frequently used counterparts on the internet (see Table 3): "vêtements de fille" (934,000), "tenue de fille" (688,000). Unlike the previous examples, the frequency of French counterpart "vêtements utilitaires" for *utility(-)wear*, defined in *Collins English Dictionary* as "casual clothing that was originally intended for a particular activity, such as snowboarding or skiing", is close to the frequency of the original English term (5,580). The last term analysed, *spa(-)wear*, refers to clothing worn for wellness, such as dressing gowns, slippers, kimono, or comfortable *home(-)wear*. The term also refers to clothing worn by people working wellness and massage centres. In French, we encounter frequently used counterpart "vêtements de spa" (422,000). Variant "tenue de spa" appears to be, according to the search engine (6 results), a hapax legomenon.

Conclusion

The goal of this article was to present *wear*-based compounds in contemporary French. Based on the chosen corpus and its analysis, we reached several conclusions. The original English compound words are not very lexicalized in French. Excluding the specialized dictionaries we consulted, only the following terms are part of the metalinguistic corpus of the common language: *sport(s)-wear*, *street(-)wear* and *ready-to-wear*, and expression *wash and wear* introduced in *Larousse*. Numerous expressions, however, were found in specialized dictionaries. For our research, we selected *Dictionnaire des anglicismes* and *le Grand dictionnaire terminologique*. These dictionaries included

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either individual French counterparts, definitions, or they suggested counterparts suitable for replacing original English expressions.

Compound words which we failed to find in the metalinguistic corpus were subjects to further analysis which helped us come to further conclusions, such as: 1/ The written form of *wear*-based compounds, including the lexicalized ones, is unstable. 2/ Even though the prevailing number of *wear*-based compounds are masculine, one entry in AFM, *la snow wear*, is feminine. As a matter of curiosity, we checked up on the frequency of both forms - *le snow wear* and *la snow wear* - on the internet. The masculine form prevails, with the frequency of 153 versus 5 results (July16, 2017). Similar results were obtained when we verified gender for other compound words in the corpus. Besides distinguishing between feminine and masculine forms, plural forms were found, e.g. *les snow wear*. We assume that this variability is caused by the connotation of the counterparts in French, as *wear* is most frequently translated as "tenue" (feminine, singular) or "vêtements" (masculine, plural). 3/ This observation is closely related to another finding we reached, i.e. even though plural form "tenues" exists and is used, and singular form of "vêtement", respectively, in compound words with *-wear* variant "tenue" in singular and "vêtements" in plural form (except compound word "sous-vêtement") is used. Therefore, we focused on these forms while quantitating the frequency of the expressions in French. 4/ French counterparts show higher frequency of usage on the internet, some of them even on news portal *20minutes*, such as "vêtements de surf" *vs surf(-)wear*. Yet we can also find examples of similar frequency of French and the original English word (*utility(-)wear vs* "vêtements utilitaires"), or even dominance of the English term, as we can see in *conscious(-)wear*. In one of the cases, *celebrity(-)wear vs* "vêtements de célébrités", the semantic meaning of the French counterpart is slightly different from the original English term.

Finally, we would like to emphasize that the corpus of words presented in this article is not a comprehensive list, yet only a demonstration based on data collected within a certain time interval. We will continue collecting data to address *wear*-based compounds in the future, to examine their situation in the particular period, and to compare their current position to the position demonstrated in this article, i.e. in a diachronic method.

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ÇOCUKLARDA RENK TONU FARKINDALIĞININ ARTTIRILMASINA YÖNELİK MOBİL BİR OYUN TASARIMI

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Özet: Bilgi teknolojilerindeki gelişmeler eğitim alanında da etkisini göstermiş ve eğitim amaçlı mobil oyunların tasarlanması günümüzde gittikçe önem kazanmaya başlamıştır. Bu oyunlar tasarlanırken disiplinler arası etkileşimden yararlanma ise bir ihtiyaç haline gelmiştir. Bu çalışmada görüntü işleme yöntemlerine dayalı eğitim amaçlı bir mobil oyun tasarlanmıştır. Kullanıcı tarafından sisteme yüklenen görüntü üzerinden Skaler Kuantalama veya Median Cut Kuantalama ile elde edilen ve zorluk seviyesine göre değişen en yoğun renk tonlarının sıralanması amaçlanmıştır. Yöntemler işlem süreleri göz önüne alınarak değerlendirildiğinde ise Skaler Kuantalamanın işlem süresi açısından daha kısa sürede sonuç verdiği ve yöntemlerin mobil uygulamalarda kullanımının uygun olduğu görülmüştür.

Anahtar Kelimeler: Skaler Kuantalama, Median Cut Kuantalama, Mobil Oyun.

A MOBILE GAME DESIGN TO INCREASE CHILDREN'S AWARENESS FOR COLOR TONES

Abstract: The developments in the information technologies have also been influential in the field of education and the design of mobile games for education has become increasingly important nowadays. While these games are being developed, benefiting from the interdisciplinary interaction has become a necessity. In this study, an educational mobile game based on image processing methods is designed. It is aimed to sort the most intense tones, which vary according to the level of difficulty, obtained by Scaler Quantization or Median Cut Quantization over the image uploaded to the system by the user, which vary according to the level of difficulty. When the methods are evaluated with respect to the processing time, it has been seen that Scalar Quantization results in a shorter time in terms of the processing time and the methods are suitable for use in mobile applications.

Keywords: Scalar Quantization, Median Cut Quantization, Mobile Game.

Giriş

Bilgi teknolojilerinde yaşanan gelişmeler eğitim alanında da etkisini göstermiş ve sundukları görsel, bilişsel, müzik vb. ayrıntılar ve sağladıkları karar verme, problem çözme, strateji geliştirme, yaratıcılık vb. becerileri ile bilgisayar destekli oyunlar günümüzde fiziksel oyunların yerini almaya başlamıştır. Bir kurallar bütünü olan oyun çocukların öğrenme sürecinde önemli bir etkiye sahiptir. Bilgisayar destekli oyunlar ile öğrenme arasındaki ilişki Lapper ve Malone (1987) tarafından detaylı olarak araştırılmıştır ve daha sonraki yıllarda Lepper ve Cordova (1992) tarafından bilgisayar temelli oyunların içsel motivasyonu arttırdığı ve öğrenme hedeflerinin oyunu kazanma ile bağlantılı olmasıyla öğrenmenin etkinliğini de arttırdığı gösterilmiştir.

Gelişen mobil teknolojiyle bilgisayar destekli oyunların, motivasyon avantajlarını kaybetmeden mobil ortamda da kullanılması mümkün olmuştur. Öğrenme dönemindeki çocukların öğrenme kabiliyetlerinin gelişimine yardımcı olan bu oyunların (Wang et al., 2017) hızla gelişen çağa uyum sağlama ve öğrenmeye teşvik etme adımında da başarılı oldukları yapılan araştırmalar ile gözlemlenmiştir (Cagiltay, 2007). Bu nedenle mobil oyunlar öğrenme sürecinde aktif olarak kullanılmaya başlamıştır.

İlk olarak 20. yüzyılın sonlarında yılan oyunu, tetris oyunu vb. gibi sadece eğlence amaçlı olan oyunlar ile belli sayıda kullanıcıya hitap eden mobil oyun sektörü şimdilerde İngilizce kelime pratiği, yabancı dil öğrenimi, Kiril harflerini öğrenme, dinleme ve konuşma becerilerinin gelişimi başta olmak üzere eğitim amaçlı çeşitli oyunlar ile

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yaklaşık 1.5 milyar kullanıcıya hitap etmektedir (Ekinci et al., 2017; Wu & Huang, 2017, Palomo-Duarteet al., 2016; Duh et al., 2017; Hwang et al., 2016). Sürekli gelişen bu sektör için araştırmacıların ve geliştiricilerin yeni fikirler üretmesi ve disiplinler arası bir yaklaşımın mobil oyun tasarımına dahil edilmesi bir ihtiyaç haline gelmiştir.

Bu çalışmada ise çocuklara yönelik renk farkındalığını arttırma amaçlı eğitici bir mobil oyun tasarımı gerçekleştirilmiştir. Oyunda kullanıcının sisteme yüklediği resim üzerinden görüntü işleme tekniklerinden olan Skaler kuantalama veya Median cut kuantalama yöntemleri kullanılarak elde edilen en yoğun renk tonlarının yine kullanıcı tarafından sıralanmasını hedeflenmiştir. Oyun her biri kendi içinde 4 alt seviyeye ayrılan 3 ayrı zorluk seviyesi içermektedir. Her zorluk seviyesi farklı sayıda renk tonunun sıralanmasını gerektirmektedir.
Çalışmanın geri kalan kısmı şu şekilde organize edilmiştir: ikinci kısımda resimlerden tonların elde edilmesi amacıyla kullanılan Skaler kuantalama ve Median cut kuantalama yöntemleri ayrıntılı bir şekilde verilmiştir. Oyun tasarımı ve prototip ile oyun çıktıları üçüncü bölümde anlatılmıştır. Çalışmanın sonucu ve ileriki çalışmalar ise son bölümde özetlenmiştir.

Yöntem

Çalışma kapsamında geliştirilen oyunda kullanıcılar tarafından sisteme yüklenecek olan görüntülerden elde edilen tonların sıralanması istenmektedir. Renk tonlarının tespit edilmesi için iki farklı renk kuantalama algoritmasından yararlanılmıştır. Bunlar skaler kuantalama ve median cut kuantalama yöntemleridir. Kuantalama yüksek çözünürlüklü bir görüntüyü en iyi temsil eden renklerin tespit edilmesi ve görüntünün bu renklerle temsil edilmesi işlemidir (Erdan et al., 2001). Kuantalama işlemi temel olarak dört adımdan oluşmaktadır (Heckbert, 1982);

- Renk istatistikleri için orijinal görüntünün örneklenmesi,
- Elde dilen istatistiklere dayalı bir renk haritasının seçilmesi,
- Renk haritasındaki renk temsilcilerinin renklerle eşleştirilmesi ve
- Yeni görüntünün elde edilmesi.

Renk kuantalama için kullanılan algoritmalar uniform ve non-uniform olarak ikiye ayrılmaktadır. Uniform kuantalamda renk alanı eşit sayıda parçaya bölünürken, non-uniform kuantalamada renk alanının bölünme şekli görüntüdeki renk dağılımına bağlıdır. Çalışma kapsamında kullanılan skaler kuantalama yöntemi uniform bir yöntemdir ve median-cut kuantalama yöntemi de non-uniform bir yöntemdir. Alt bölümlerde yöntemlerin detaylı açıklaması verilmiştir.

Skaler kuantalama yöntemi

Skaler kuantalama işleminde görüntünün her bir pixelinin renk değeri skaler bir değere bölünür. Daha sonra elde edilen değere yuvarlama işlemi uygulanır. Böylece renk değerleri skaler değerin katlarından hangisine yakınsa o değere atanır böylece görüntünün renk sayısı azaltılmış olur (Yildiz et al., 2012). Bir görüntüdeki renk sayısının m olduğu kabul edilir ve bu renk kodları *C* sembolü ile gösterilirse, görüntünün renk vektörü (1) ile ifade edilecektir.

$$C = \{C_1, C_2, C_3, \dots C_m\} \quad (1)$$

Bu durumda skaler kuantalama sonucu oluşan renk kodu değerleri (2) nolu eşitlikteki gibi *C'*olarak gösterilecektir. *C* vektöründen *C'* vektörünün elde edilmesiyle görüntü kalitesindeki değişim minimum tutularak görüntüdeki renk sayısı *m* farklı renkten *n* farklı renge dönüştürülmüştür.

$$C' = \{C'_1, C'_2, C'_3, \dots C'_n\} \quad (2)$$

Dönüşüm işlemi için (3) numaralı eşitlikten yararlanılmaktadır.

$$C_i' = C_i \frac{n}{m} \quad (3)$$

Şekil 1'de skaler kuantalama işleminin uygulandığı örnek bir ekran görüntüsü verilmiştir. Görüntüde bulunan toplam renk sayısı (*m*) 41108' dir. Dönüşüm için kullanılacak skaler değerin 17 seçilmesi durumunda elde edilecek renk tonları Şekil 2'de gösterilmiştir (Yildiz, 2012).

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Şekil 1. Skaler kuantalama uygulanmış örnek bir ekran görüntüsü (Yildiz et al., 2012).

Skaler değerin 17 seçilmesi durumunda 0 ile 255 arasında değişen RGB renk kodlarının değerleri 0,17, 34, 51, 68,…, 255 olacaktır. Örnek olarak gösterilen sonuçların elde edilmesi aşamasında tanesellik değeri olarak 4 seçilmiştir. Tanesellik değeri orjinal görüntüdeki pikseller örneklenirken kullanılan piksel atlama değerini göstermektedir (Yildiz, 2012).



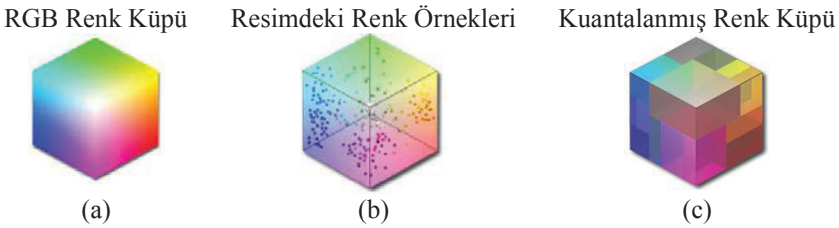
Şekil 2. Şekil 1'deki görüntüye 17 skaler değeri ile kuantalama uygulandığındaki renk tonları (Yildiz et al., 2012).

Median cut kuantalama yöntemi

Median cut kuantalama yöntemi pek çok görüntü üzerinde hızlı ve iyi sonuçlar üreten bir kuantalama algoritmasıdır. Yöntem uniform bölümlemenin aksine renk uzayını görüntüdeki original renk dağılımına göre bölümler. Yöntem dört temel adımdan oluşmaktadır (Gervautz & Purgathofer, 1988). Bunlar;

- Görüntü içerisindeki tüm renkleri içeren en küçük kutu bulunur,
- Kutunun en uzun ekseni boyunca renkler sıralanır,
- Sıralanan renkler ortadan ikiye bölünür,
- Orijinal renk alanı istenilen sayıda bölgeye bölünene kadar işlemler tekrarlanır.

Kuantalama işlemi sonrası elde edilen renkler her kutucuktaki renklerin ortalaması alınarak elde edilir. Algoritma yüksek bellek ihtiyacı sebebiyle yavaş işlem yapmaktadır.



Şekil 3. Median Cut kuantalama ile görüntüden kuantalanmış renk küpünün elde edilmesi süreci.

Şekil 3'te median cut kuantalama işleminde elde dilen küpler gösterilmiştir. Şekil 3(a)'da RGB renk küpünün en genel hali gösterilmiştir. Şekil 3(b)'de örnek bir görüntüden alınan piksellerin RGB renk küpü üzerinde konumlandığı noktalar ifade edilmiştir ve son olarak Şekil 3(c)'de kuantalanmış olan resimdeki renk kutucukları RGB renk küpü üzerinde gösterilmiştir.

Oyun Tasarımı ve Prototip

Literatürde renk tonlarını sıralamaya yönelik olarak geliştirilmiş pek çok farklı uygulama (Lonely, 2015; Benjamin Moore & Co., 2014) bulunmaktadır. Geliştirilen uygulama literatürdeki benzer uygulamalardan farklı olarak sıralanacak renk tonlarını kullanıcıların yükleyeceği görüntüler üzerinden uygulanan görüntü işleme algoritmaları aracılığıyla tespit etmektedir. Oyunda kolay, orta ve zor olarak belirlenmiş üç farklı seviye bulunmaktadır. Oyunda yer alan zorluk seviyeleri sıralanacak renk sayısı ve sıralama için oluşturulan şekil kullanılarak düzenlenmiştir.

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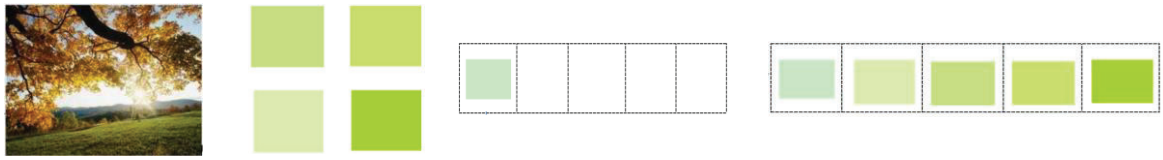
Tablo 1: Oyunda bulunan zorluk seviyeleri ve renk sayıları

Seviye	Renk Sayısı
Kolay	4- 6
Orta	7-10
Zor	11-15

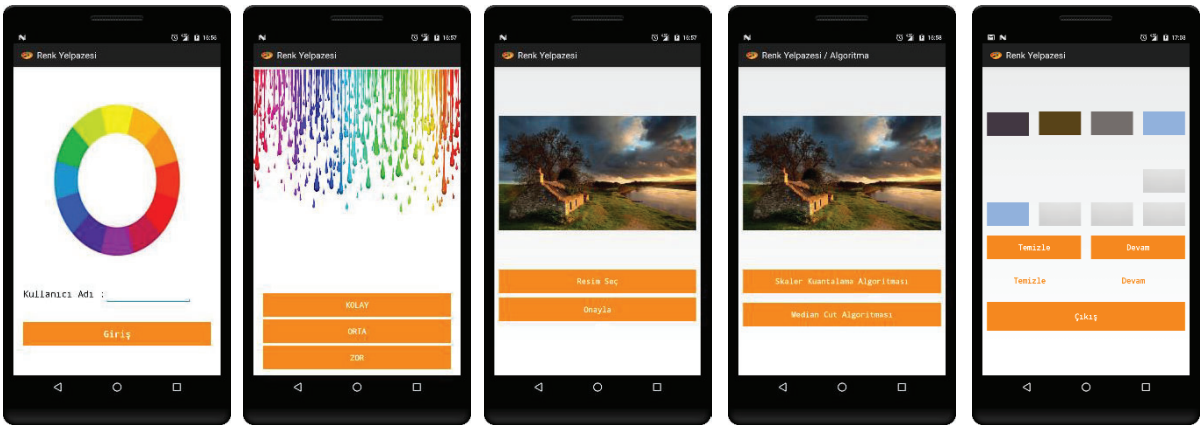
Zorluk seviyelerinde kullanılabilecek ren sayıları Tablo 1'de gösterilmiştir. Tabloya ek olarak seviyenin kendi içerisinde de zorluk seviyesi bulunmaktadır. Örnek olarak kolay seviyesi içerisinde de 5 farklı seviye vardır. Bu seviyeleri de renk sayısı (4-6 aralığından seçilecek) ve renklerin yerleştirileceği şekiller belirlemektedir. Yani kolay seviyesinde 4 renk ve düz kutucuklardan oluşan bir şeklin kullanılması kolay seviyesi içerisindeki en basit oyunu oluştururken, 6 renk ve karmaşık bir yerleştirme kutucuğunun seçilmesi kolay seviyedeki en zor alt seviye oyunu oluşturacaktır. Sonuç olarak oyunda kolay, orta ve zor olarak 3 temel seviye bulunurken bu seviyelerin her birinin için de en az 4 alt seviye bulunmaktadır.



(a) (b) (c) (d)

Şekil 4. Geliştirilen uygulamanın kolay seviyesi için örnek işlem adımları.

Şekil 4'te örnek bir senaryo üzerinden kolay seviyesi için gerçekleştirilecek işlemler sırasıyla gösterilmiştir. Şekil 4(a)'da kullanıcı tarafından uygulamaya yüklenen görüntü gösterilmektedir. Daha sonra yine kullanıcı tarafından seçilen skaler kuantalama algoritmasına göre görüntü içerisinde yer alan en yoğun beş renk tonu tespit edilmiştir. Bir sonraki adımda Şekil 4(c)'de gösterildiği gibi kullanıcıya verilen bir ipucu tonu üzerinde geri kalan renklerin sıralanması istenmektedir. Uygulama da renklerin koyudan açığa doğru mu yoksa açıktan koyuya doğru mu sıralanacağına verilen ipucuna göre kullanıcının karar vermesi gerekmektedir. Renklerin sıralanmış halinin nasıl olması gerektiği Şekil 4(d)'de gösterilmiştir. Burada sıralama açıktan koyuya doğru yapılmıştır. Uygulamada aynı zamanda işlem süresi ve adım sayısı dikkate alınarak puan hesabı da yapılmaktadır.



(a) (b) (c) (d) (e)

Şekil 5. Uygulamaya ait örnek ekran görüntüleri.

Şekil 5'te uygulama prototipine ait ekran görüntüleri verilmiştir. Görüntülerde uygulamanın açılış ekranını, seviye seçimi, görüntü yükleme ekranı, uygulanacak yöntem seçimi ve oyun ekranları sırasıyla gösterilmiştir. Aynı zamanda uygulamada kullanılan görüntü işleme algoritmaları işlem süreleri bakımından da incelenmiştir ve yöntemlerin mobil uygulamalara uygunluğu da gösterilmiştir. Tablo 2'de yöntemlerin işlem sürelerini test etmek amacıyla kullanılan iki farklı görüntüye ait en, boy ve boyut bilgileri gösterilmiştir. Seçilen görüntülerden ilkinin çözünürlüğü düşük, diğerinin ise yüksektir.

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Tablo 2: Test için kullanılan görüntülerin özellikleri

Görüntü	En	Boy	Boyut
Resim1	1024	768	245 KB
Resim2	1024	768	1,22 MB

Tablo 3'te her iki görüntü üzerinde skaler kuantalama ve median cut kuantalama yöntemleri için elde edilen işlem süreleri gösterilmiştir. Sonuçlar incelendiğinde oyun seviyesinin zorluğunun işlem süresini çok ciddi bir oranda etkilemediği görülmüştür. Görüntünün boyutu ve seçilen yöntem ise işlem süresini değiştirmektedir. Median cut kuantalama yöntemi, skaler kuantalama yöntemine yaklaşık iki kat daha fazla işlem süresine ihtiyaç duymaktadır. Benzer şekilde görüntünün beş kat daha büyük boyutlu olması işlem süresini yaklaşık olarak iki katına çıkarmıştır. Ancak her iki durumda da işlem süreleri mili saniye seviyesindedir ve mobil uygulamalar için uygundur.

Tablo 3: Algoritmalar için işlem süreleri

	Görüntü	Kolay İşlem Süresi (ms.)	Orta İşlem Süresi (ms.)	Zor İşlem Süresi (ms.)
Median Cut	Resim1	20	20	21
	Resim2	50	56	60
Skaler Kuantalama	Resim1	10	12	10
	Resim2	20	20	22

Sonuç ve İleriki Çalışmalar

Bu çalışmada çocuklarda renk tonu farkındalığının arttırılmasına yönelik eğitim amaçlı bir mobil oyun tasarımı gerçeklenmiştir. Mobil oyunlar, mobil ortam üzerinden sundukları bilişsel, müzik vb. ayrıntılar ve sağladıkları karar verme, problem çözme, strateji geliştirme, yaratıcılık vb. becerileri ile eğitim alanına önemli bir katkı vermektedir. Özellikle farklı disiplinlerden bu tür oyunları geliştirirken yararlanılabilir olması da artı bir özellik olarak araştırmacı ve geliştiricilerin bu alanda yoğunlaşmasını sağlamıştır.

Bu çalışmada ise eğitim amaçlı oyun tasarımına görüntü işleme yöntemlerinden kuantalama dahil edilmiştir. Kullanıcı tarafından sisteme yüklenen görüntü üzerinden her zorluk seviyesine göre değişken sayıdaki en yoğun renk tonları Skaler Kuantalama veya Median Cut Kuantalama yöntemlerinden birisi seçilerek elde edilmiş ve elde edilen bu tonların kullanıcı tarafından açıktan koyuya ya da koyudan açığa doğru sıralanması oyunun çıktısı olarak hedeflenmiştir. Yöntemler işlem süreleri göz önünde bulunarak değerlendirildiğinde ise Skaler Kuantalamanın Median Cut Kuantalamaya göre daha hızlı cevap verdiği görülmüştür.

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DEPOLLUTION OF OLIVE MILL WASTEWATER THROUGH ELECTROCOAGULATION AND ADVANCED OXIDATION

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Abstract: The goal of the Research described in this paper is to treat Olive Mill Wastewater (OMWW) to cause its decolorization, thus enabling its safe and legal release in main water streams. To this end, two different methods were tested on samples of OMWW collected from Ain Taoujdate, a small town that is located 25 km to the south of Fez, Morocco. These samples were freshly diluted by a factor of 20 prior to a treatment by either electrocoagulation or the photo-Fenton process, a type of advanced oxidation. It was found that an electrocoagulation treatment of two hours, at 22V DC with aluminum plates, was satisfactory to get nearly clear and colorless water (93% decolorization). A phenolic content reduction by 92.4% was obtained using this same technique. Photo-Fenton was tested with the use of H_2O_2/Fe(II), O_2/Fe(II), and H_2O_2/O_2/Fe(II) at a wavelength of 254 nm. With this technique, the best operating conditions afforded 78% decolorization. A discussion on the viability of each technique concludes this study.

Keywords: Wastewater, Pollution, Electrocoagulation, Oxidation, Fenton

Introduction

With an annual production of 140 000 tons of olive oil in 2014-2015, Morocco is ranked the 5th biggest producer of olive oil in the world. Unfortunately, like in nearly all industries, the production of this good is accompanied by the production of wastes that represent a major environmental issue and that must be dealt with. During the olive oil production process, two kinds of residues are generated: a wet solid waste called “crude olive cake” and an aqueous waste called “olive mill wastewater, OMWW”. OMWW is a dark liquid effluent characterized by high concentrations of organic compounds, including organic acids, sugars, tannins, pectins and phenolic substances that makes it phytotoxic and inhibit bacterial activity. In 2014, the amount of OMWW generated in Morocco alone was estimated to be 250-400 000 m^3 per year;[1-2] a sizeable amount given that 1 m^3 of OMWW is equivalent to 100-200 m^3 of domestic sewage.[3] OMWW treatment and disposal is a problem with great complexity due to the strong nature of the waste and several economical, technical, and organizational constraints involved in the olive oil sector. Over the last 60 years, practically all treatment processes developed for domestic and industrial wastewaters have been tested on OMWW but none of them appeared suitable to be generally adopted.[3] These processes include aerobic processes,[4-5] anaerobic processes,[6-11] anaerobic digestion,[12] pH neutralization,[13] coagulation,[12] electro-coagulation,[14] advanced oxidation processes,[15-19] distillation/ evaporation,[11-12] and membrane processes (ultrafiltration, microfiltration, reverse osmosis).[20-22] When not dumped illegally directly into nearby aquatic bodies, i.e. rivers, lakes, or even the sea,[23] nearly all olive mills in Morocco, and around the globe at large, dispose of OMWW in evaporation ponds or storage lakes (lagoons), such as the one shown in **Figure 1**. This technique consists in storing the waste outdoor and let its water evaporate naturally in ambient air by exposure to sunlight.



Figure 1: OMWW evapation pond beside an olive mill in Ain Taoujdate, Morocco (Feb. 2016).

In spite of having low energy costs and being simple to operate, this method has important drawbacks; it requires

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a long waste residence time (7-8 months) and a large land surface area (~1 m^2 for each 2.5m^3 of OMWW). Furthermore, it raises several ecological concerns including the possibility of groundwater contamination if the bottom of the pond is not properly lined against infiltration and leakage – as it is often the case – and the emissions of methane in the atmosphere due to the anaerobic fermentation of the waste that occurs in the pond.[3,10,11] Finally, these ponds and lagoons cause serious nuisance to their neighborhood because they attract insects and cause foul smells.

Materials and Methods

Chemicals and Equipment

Sodium hydroxide was supplied by Fluka, Switzerland. Aluminum sulfate was supplied by AppliChem Panreac, Spain. Ferrous sulfate heptahydrate was supplied by Fluka, Switzerland. Oxalic acid monohydrate, 99% pure, was supplied by PanReac Applichem, Germany. Hydrogen peroxide, 110 vol., was supplied by Société Nouvelle Pharmac, Morocco. Ethanol, 96% pure, was supplied by Carlo Erbo, Spain. Anhydrous sodium carbonate was supplied by Sigma-Aldrich. The Folin-Ciocalteu reagent was supplied by Educomptoir, Morocco. Medical grade oxygen gas was supplied by Maghreb Oxygen, Morocco.

For centrifugation, a 5500 rpm centrifuge, *Hettich Zentrifugen* model EBA 30, was used. Vacuum filtrations were performed by means of piston-powered vacuum pump with a pressure of 0.85 atm and an air flow of 38 L/min. Weights were measured by an *AND* balance with a readability of 0.01g model EK610i, an *OHAUS* balance with a readability of 0.0001g model AS120, or a *KERN* balance with a readability of 0.05g model KB10K0.05N. pH and temperature were measured by using a *Hanna* instruments pH meter model HI 9318.

Preparation of solutions for phenolic content determination was done by means of 25 µL and 100µL syringes, supplied by *HAMILTON*, Switzerland. For heating and stirring, digital stirring hotplates were used. Either *DLab* MS-H280-pro or *VWR* VMS-C7 advanced series. For electrocoagulation, a *Tektronix* voltage meter model PS280 was used. For measuring the absorbance, a *Jenway* spectrophotometer model 6320D was used. Wavelength scan was done with a *JASCO* spectrophotometer model V-530. Conductivity was measured with a *YSI* conductivity meter model 33. Ultraviolet light was generated by a *CAMAG* UV transilluminator model CM3 with wavelengths of 254 nm and 366 nm, and a *FOTODYNE* UV transilluminator model C3-3501. A Q.10 *CHANDOS* quartz cuvette was used to perform photo-Fenton reactions.

Phenolic content determination

The determination of total phenolics in treated OMWW samples was based on a micro method reported in the literature.[24] It was performed by spectrophotometry with gallic acid as standard. A calibration curve was plotted by preparing six standards. The latter were made in 4-mL glass vials by mixing 20 µL of gallic acid solution being in the concentration range 0-50-100-150-250-500 mg/L, 1.58 mL of distilled water and 100 µL of Folin-Ciocalteu reagent. After vigorous shaking for 1 min at room temperature, 300 µL of aqueous saturated sodium carbonate solution was added. Next, the solution was shaken again and heated at 40°C for 30 min by means of a bain-marie. The resulting blue solution was transferred entirely into the cuvette of a spectrophotometer and absorbance was measured at a wavelength of 765 nm. A 5000 mg/L aqueous gallic acid stock solution was used to prepare these solutions accurately.

Electrocoagulation experiments

All OMWW samples that were treated by electrocoagulation were first diluted with distilled water by a factor of 20. Next, they were filtered, centrifuged for five minutes at 5500 rpm, and re-filtered in order to measure their absorbance at a wavelength of 395 nm. The applied voltage for all electrocoagulation experiments was 22 V DC unless stated otherwise. Filtrations were done under vacuum over cotton wool.

Four different aluminum cells with various sizes and geometries were constructed and tested in the laboratory (**Figure 1**).

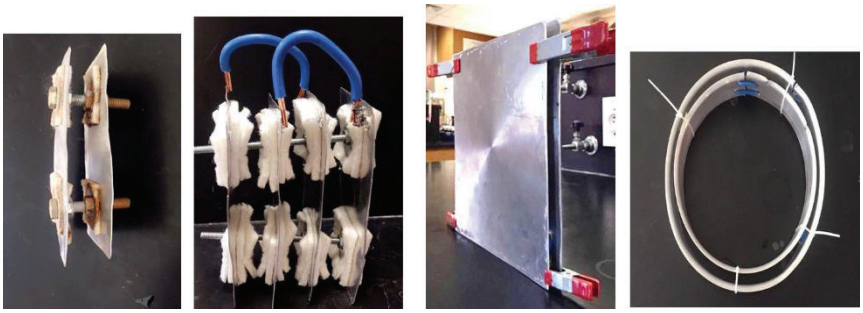

Figure 1: Aluminium cells tested in the electrocoagulation experiments**.**

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Characteristics of these cells are given in **Table 1**.

Table 1: Aluminium cells tested in the electrocoagulation experiments.

Cell name	*Shape*	*Number of plates*	*Effective surface area (cm^2)*
Cell #1	rectangular	2	139
Cell #2	rectangular	4	256
Cell #3	square	2	783
Cell #4	round	2	2791

Photo-Fenton experiments

Since photo-Fenton experiments require an exposure to UV light (λ= 254 nm), they were conducted directly in the quartz cuvette of a spectrophotometer having a thickness of 1.0 cm. When performed on a larger scale, experiments were conducted in a 50mL glass beaker placed below a UV lamp. The source of Fe (II) chosen for our experiments is iron (II) oxalate, FeC_2O_4. This compound was made by mixing equal volumes of aqueous solutions of 30 mM iron (II) sulfate, $FeSO_4$ and 5 mM oxalic acid, $C_2H_2O_4$. The photo-Fenton experiment consisted in reacting within a cuvette, 0.5 mL of iron (II) oxalate solution, FeC_2O_4, 1 mL of 8mM hydrogen peroxide solution, H_2O_2, and 1.5mL of OMWW sample. When need be, a gas tubing was inserted in the reacting mixture to allowing bubbling of oxygen gas with a controlled flow rate.

Results and Discussion

Conventional coagulation

Our first attempts to treat OMWW were done by performing conventional coagulation experiments by using two coagulants known to be effective in the field of wastewater treatment: iron (II) sulfate, $FeSO_4$, and aluminum sulfate, $Al_2(SO_4)_3$. In spite of a treatment time as long as 24 h and the testing of different pH conditions, none of our attempts with conventional coagulation was successful. Therefore, in our hands this technique, and these two simple coagulants, did not seem suitable for an effluent as complex as OMWW.

Electrocoagulation

Electrocoagulation differs from conventional coagulation mainly with the fact the coagulant – in our case aluminum hydroxide – is generated in situ. This technique turned out to be very successful when applied on OMWW. **Figure 2** shows the evolution of a sample of OMWW being treated for 19 h with cell#2.

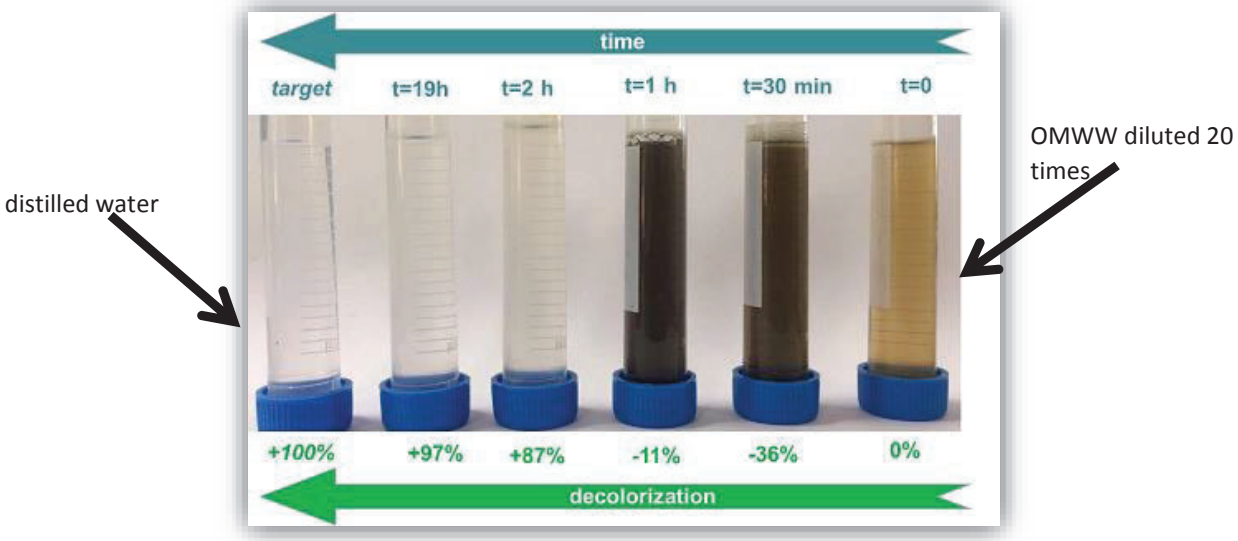

Figure 2: OMWW s being treated by electrocoagulation with cell #2. Decolorization as a function of treatment time.

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As shown in **Figure 2**, the OMWW gets initially darker and darker in the initial stage of the treatment. This phenomenon is presumably caused by the absence of a critical mass of coagulant at the outset. However, once the treatment has been carried out long enough, a high decolorization of the sample is attained (+87% in 2 h). Decolorization starts taking place when flocs are formed and precipitated; however, their particle surface charge are affected by various parameters, one of which is the pH of the solution. Evidence for this explanation was obtained by monitoring the pH and the absorbance simultaneously (**Figure 3**). Indeed, **Figure 3** shows that after 60 min of treatment, the increase of pH causes an immediate drop of the absorbance and therefore a decolorization. This increase in pH, which is typical in electrocoagulation, is caused by the formation of hydroxide ions at the cathode.

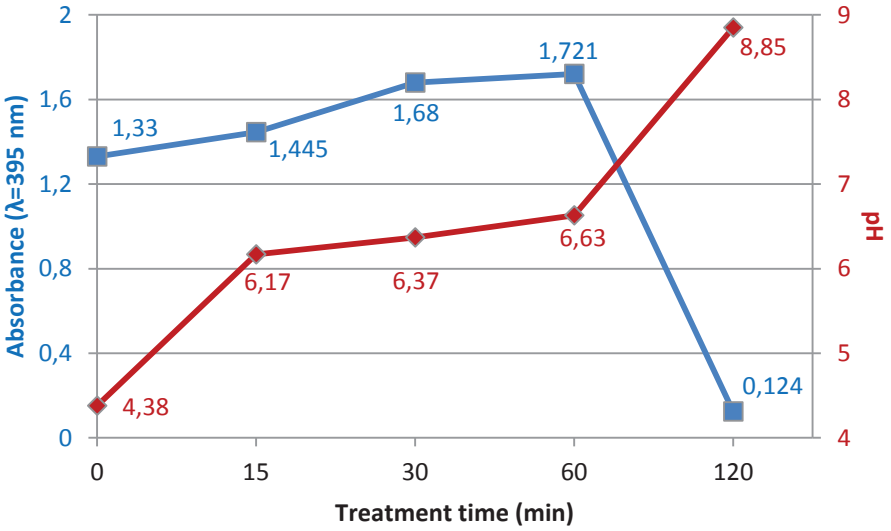

Figure 3: Monitoringof absorbance and pH in the electrocoagulation of OMWW with cell #2.

The effect of pH on decolorization is due to the solubility of the different aluminum hydroxide species in different pH ranges.[25] Indeed, depending on the pH, aluminum hydroxide will exist either as a monomeric species (e.g $Al(OH)^{2+}$, $Al(OH)_2^+$, $Al(OH)_4^-$), a polymeric species (e.g. $Al_2(OH)_2^{4+}$, $Al_2(OH)_2^{5+}$) or an amorphous and less stable species (e.g. $Al(OH)_3$).[26] Table 2 compares the results obtained with each of the cells employed in our electrocoagulation experiments.

Table 2: Results obtained with cells 1-4 in the electrocoagulation experiments.

Entry	Cell name	Conditions				Results		
		Volume of OMWW treated (L)	Voltage applied (V)	EC[(a)] treatment time (h)	Settling time (days)	Decolorization[(b)]	pH	Conductivity (µS/cm)
1	Cell #1	0.475	22	2.5	0	+84.0%	6.22	690
2	Cell #2	0.790	22	2	2	+ 92.3%	6.13	510
3				19	2	+ 97.4%	-[(c)]	300
4	Cell #3	9	14	15.5	10	+ 93.5%	7.41	550
5	Cell #4	5	11-13	8	10	+ 93.2%	7.65	550

(a) EC: electrocoagulation.
(b) Based on the change of absorbance at λ=395 nm. Sample centrifuged for 5 min beforehand.
(c) Not determined.

Determination of the phenolic content reduction was done for OMWW treated with cell #3. The concentration of polyphenols, expressed as mg of gallic acid equivalent, was found to drop by 92.4%; an excellent result given the detrimental effect of these polyphenols to the environment.

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Photo-Fenton

Results obtained in the treatment of OMWW with the Fenton and photo-Fenton process are shown in **Table 3**.

Table 3: Results obtained in the Fenton and photo-Fenton experiments. $[Fe^{2+}]$initial = 3 mM.

Entry	UV light[(a)]	O_2 (g)[(b)]	$[H_2O_2]$	Treatment time	Type of OMWW treated[(c)]	Decolorization[(d)]
1	no	no	5 mM	20h	Untreated	+8.0%
2					Pre-treated by EC	+2.1%
3	no	no	8 mM	20h	Untreated	-3.9%
4					Pre-treated by EC	**+15.6%**
5	yes	no	8 mM	2h	Untreated	-21.3%
6					Pre-treated by EC	-29.1%
7	yes	no	5 mM	5h	Untreated	+4.1%
8					Pre-treated by EC	-13.5%
9	yes	no	5 mM	5h	Untreated	+9.6%
10				+ 15h settling	Pre-treated by EC	-6.8%
11	yes	yes	0 mM	2h + 15h settling	Pre-treated by EC	-10.9%
12	yes	yes	8 mM	2h	Pre-treated by EC	-17.5%
13				2h + 3 days settling	Pre-treated by EC	**+78.2%**

(a) λ=254 nm.
(b) Flow rate: 40 mL/min.
(c) Untreated = only diluted with distilled water by a factor of 20. EC = electrocoagulation.
(d) Based on the change of absorbance at λ=395 nm. Sample centrifuged for 5 min beforehand.

First, **entries 1-4** show the level of decolorization attained in the Fenton process (i.e. absence of UV light). Under the conditions tested, the best result was obtained in the treatment of OMWW pre-treated by electrocoagulation for 20h with 8mM H_2O_2 and 3mM Fe (II), to afford a color reduction by 15.6%. In the case of untreated OMWW, it was found that a lower concentration of H_2O_2 is favorable to a rapid degradation of organic pollutants (**entry 1** vs **entry 3**); however, the opposite trend is observed when dealing with OMWW pre-treated by electrocoagulation (**entry 2** vs **entry 4**). Therefore, our data seems to indicate that the efficiency of the Fenton process can be fairly variable since it can be affected by both the oxidant concentration and the quality of the effluent to be treated. **Entries 5-13** deal with the photo-Fenton process (i.e. UV-induced degradation). Comparison of **entries 5,7,9** vs **entries 6,8,10** shows that better results are obtained by processing untreated OMWW rather than the pre-treated one. It was found that an increase of the treatment time from 2h to 5h, in spite of a reduction of the oxidant concentration from 8mM to 5mM, leads to a higher level of decolorization (**entry 5** vs **entry 7**). Also, our data shows that settling of the solution over a prolonged period of time is also beneficial to the purification process when used post-treatment (**entry 7** vs **entry 9**). When oxygen gas, O_2, was used either as a replacement of H_2O_2 or as a co-oxidant (**entries 11-12**), poor results were obtained. However, with proper reaction conditions of time and oxidant concentration, the combination of O_2 and H_2O_2 as oxidants afforded an exceptionally high level of decolorization (+78.2%, **entry 13**).

Conclusion

A total of four techniques were tested in our investigation, namely coagulation, electrocoagulation, Fenton, and photo-Fenton. One the one hand, coagulation and Fenton performed poorly in terms of decolorization of OMWW. On the other hand, electrocoagulation and photo-Fenton in presence of oxygen gas both proved to be potent and efficient solutions when performed under the right experimental conditions of time and oxidant concentration. Though electrocoagulation affords the best results in terms of decolorization (>93%) and phenolic content reduction (>92%) at the scale of the laboratory, its utilization at the olive mill scale may be challenging because of the inherent high energy cost of the technique. Consequently, the future of this technique will be largely dependent on its optimization by for example powering it with inexpensive energy sources. Regarding the photo-Fenton process, the identification of unique experimental conditions enabled to reach a decolorization of pre-treated OMWW by more than 78%. This technique is attractive because of its practicality; however, its use at a large scale may be hampered by the cost of usage and maintenance of UV light. This study has clearly shown that the issue of OMWW treatment can be hardly solved by a single method, but that it rather relies on the clever combination of a sequence of finely tuned processes to be operated individually. Electrocoagulation and photo-Fenton have been proved to be very good examples of such processes.

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DEVELOPMENT OF A GREEN ALTERNATIVE PROCEDURE FOR SIMULTANEOUS SEPARATION AND QUANTIFICATION OF PHYTOCHEMICALS

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Introduction:*Perilla frutescens* leaves is valuable as a medicinal plant as well as a natural medicine and functional food. Perilla leaves are an important source of essential oils and had antidepressive, anxiolytic, chemopreventive and strong antitumor-promoting activities.

Methods: Four different isolation techniques, specifically ultrasound-assisted supercritical carbon dioxide (USC-CO_2) extraction, heat-reflux extraction (HRE), conventional supercritical carbon dioxide (SC-CO_2) extraction and hydrodistillation (HD) were employed to obtain essential oils from purple-leafed of *Perilla frutescens*. The essential oils were further analyzed using gas chromatography (GC) with flame ionization detection and gas chromatography with mass spectrometry (GC-MS).

Results: The maximum yield of oil was extracted via USC-CO_2 extraction (1.92%, weight of the extracted oil/weight of feeding material) while utilizing less severe operating parameters, such as temperature (48 °C), pressure (25 MPa), organic solvent (0 mL) and the time consumed (85 min) by the process.The results revealed that the dominant component was perillaldehyde (>25%) in total average content.

Discussion: To evaluate the feasibility of supercritical separation processes and for establishing optimum operation conditions, the solubility of essential oil and fictitious solubility of perillaldehyde in SC−CO_2using the USC-CO_2 dynamic extraction method were first determined. Furthermore, three semi-empirical density-based models presented by Kumar and Johnston, Chrastil and Bartle were good agreement between the experimental solubility data and the modeled results. Additionally, the thermodynamic properties ofessential oil and perillaldehyde in the supercritical fluid systemwere estimated following the theory developed by the three density-based models.

Keywords: Perilla frutescens, essential oil, perillaldehyde, green extraction technique, ultrasound-assisted supercritical CO2 extraction.

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DEVELOPMENT OF A GREEN PROCEDURE WITH ULTRASOUND IMPROVED SUPERCRITICAL CO2 TO PRODUCE EXTRACTS ENRICHED IN ROSMARINIC ACID FROM PERILLA FRUTESCENS AND DETERMINATION OF ITS FICTITIOUS SOLUBILITY

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Introduction:*Perilla frutescens*is widely used as a fresh vegetable, popular garnishes, food colorants and traditional medicines. *Perilla* leaves have drawn the attention of researchers and consumers due to their nutritional and health benefits such as hepatoprotective, hypolipidemic, antiallergic, anticancer, anti-inflammatory, and antioxidant activities and to contain many bioactive compounds of flavonoids, phenolic acids, essential oils and triterpenoids, and is known to exert health beneficial effects. Rosmarinic acid (RA) in purple *perilla* leaves is the most abundant phenolic acid that exerts a variety of biological activities.

Methods: The present study reports on the ultrasonic enhancement of the supercritical carbon dioxide (SC-CO_2) extraction of RA from the purple-leafed of *Perilla frutescens*, to which ethanol is added as a cosolvent. Its performance was compared with that of conventional SC-CO_2 extraction and heat-reflux extraction (HRE) processes. The RA contentin the extractwas identified and quantified using HPLC/MS and HPLC.

Results: The results found that the highest yield of RA (98.46 milligram / gram of dry weight, mg/g of DW) was obtained with ultrasound-assisted supercritical CO_2 (USC-CO_2) extraction at 57 °C and 28.5 MPa with a CO_2 flow rate of 0.46 g/min and 12.3% of 70% ethanol in water (v/v) as a cosolvent for a 120-min extraction.

iscussion: Compared with conventional SC-CO_2 extraction and HRE and methods, the USC-CO_2 technique reduced the extraction time, extraction temperature, extraction pressure and solvent consumption and afforded a higher extraction yield of RA from the plant matrix. To determine whether a compound can be solubilized by SC–CO_2 in a given condition and for establishing the best operation conditions, the fictitious solubility of RA in SC−CO_2 using the USC-CO_2 dynamic extraction method were firstpredicted. Moreover, the experimental solubility data for RA correlated well with the density-based models, including the Bartle model, the Chrastil model and the Kumar and Johnston model.

Keywords: Perilla frutescens, essential oil, perillaldehyde, green extraction technique, ultrasound-assisted supercritical CO2 extraction.

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DIGITAL STORYTELLING AND TRAINING IN HEALTH CARE SETTINGS

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Abstract: This article presents a research carried out at a hospital in northern Italy where digital storytelling (DST) was used for health personnel training. A digital story is a short story narrated in the first person using multiple languages: images, music, sound and film sequences. This narrative methodology was chosen to achieve three main objectives: 1) encourage deep reflection and emotional mediation by the use of more expressive codes; 2) build a collection of digital stories produced in narrative workshops for training in health care; 3) reduce the distance between care settings and care users through the online publication of digital stories. The project phases and the results achieved are discussed.

Keywords: Digital storytelling, training health care settings, training.

Introduction

Since the mid-1990s, when we have come to the formalization of the concept and the practice of narrative medicine (Charon, 2006), there has been a proliferation of experiences that have seen narrative methodologies at the center of numerous healthcare interventions. Disease and patient histories have begun to represent a fundamental ingredient in medical practice, allowing to develop and interpret the bio-psycho-social approach in various contexts of care.

The introduction of these methodologies did not only cover clinical practice, but has led to many reflections on the use of these stories in health education. Hunter argues that the best clinical teaching is the one that comes from the patient (Hunter, 1991), highlighting how the disease stories do not deplete their function in the medical-patient dyad, but represent an important carrier for the transmission of knowledge and skills addressed both to healthcare personnel and to people in different forms of patient education.

From the Nineties onwards there are numerous projects, born in different contexts, aimed at gathering disease stories and promoting narrative processes in suffering contexts. Also thanks to this diffusion, narrative strategies and methods used in the socio-health field have known various processes of dissemination and evolution.

In this context, the use of Digital Storytelling (Lambert, 2002) has become more and more important: it is a narrative practice based on first-person narration through voice, images, and music. Digital storytelling (DST) has also been established in healthcare environments thanks to projects such as Patient Voices (Hardy & Sumner, 2014).

The research presented in this paper deals with the use of DST in the training of health care personnel according to a twofold approach: 1. Direct. Intended to promote reflective and narrative skills in professionals; 2. Indirect. It concerns the acquisition of the strategies needed to manage DST laboratories with patients.

We chose digital storytelling for a number of reasons, including:

1. Multimedality, which represents an added value especially when criticalities in the written composition may be present. The opportunity offered to the narrator to use different languages allows people to enhance their expressive ability. In addition, it offers valid strategies for the representation of complex concepts that sometimes do not find words to be the best vehicle for transmission. Multimedia opens up an aesthetic dimension that is well matched with the emotional component of the DST, especially when it has to do with nursing care.
2. Involvement. In continuity with the previous point, the use of multiple languages allows the creation of stories capable of wrapping the spectator and carrying it to an active and interpretive listening dimension.
3. The synthetic narrative that responds adequately to two needs: a) reducing the storyteller's investment of time; b) to reach the addressee in a very direct and immediate way.
4. Transmission potential. Among the characteristics of the DST there is the ability to enhance the emotional reach of the stories, creating the appropriate ground for the definition of forms of empathy that are particularly effective in socio-sanitary communication contexts.
5. Thoughtfulness. Narration has the ability to activate forms of reflection and meta-reflection both in the storyteller and in the beneficiary. This capacity is enhanced, in DST, because every single ingredient (images,

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music, text) requires, to be selected, an intense activity of analysis, reflection and meta-reflection that leads the narrator to cross many often interesting and enriching paths towards self-knowledge that sometimes can be an important factor in self-care.

The research-action project is based on the collaboration between the Department of Philosophy and Education Sciences of the University of Turin and the Training Department of the Hospital of Biella, a small town in Northern Italy. The Director of Education, Vincenzo Alastra, has based much of the training and education activities directed at healthcare professionals and patients on narrative methodologies (Alastra, 2015). In this direction, different strategies have been explored ranging from cinema, literature, poetry to photographic narratives.

Materials and Methods

Does multimedia narration promote professional reflection? Which processes are triggered during shared media narration paths within professional groups? Can DST support patient narrations?
These are some of the questions from which we started when we decided to introduce the DST methodology in educational actions with operators and patients.
Specifically, the experience was carried out with two distinct groups of "narrators":

1. a group of five healthcare workers (4 nurses and 1 health-care worker) who had previously been formed on the narrative front and had activated narrative workshops with patients. The objective, in this case, was twofold: a. To stimulate a professional meta-reflection on narrative practices; b. Foster the acquisition of a new narrative competence for any other laboratories to be offered to patients.
2. a group of educators and people with mental disease (5 patients and 3 educators). Subjects belong to the same health service.

Let's start examining the experience carried on with healthcare providers. As mentioned, they had a solid professional background and worked through different narration seminars in health and education. As a matter of fact, they have followed numerous training courses in this field and they have activated at least one narration workshop in their professional contexts. The aim was to reconstruct and to make a critical analysis of these experiences with the intent of "re-rendering" them by attributing meaning and value to those aspects that in practice were lost or at least unexplored.
Because they were experts, it was decided to start using the DST both to further expand their know-how and to enable the creation of expressive forms that would allow a higher level of content sharing and the surfacing of latent meanings.
Their involvement took place on a voluntary basis and activity was carried out over a couple of months with two collegial meetings each month and part of the work done autonomously.
The DST workshop was organized in 6 phases:

1. Introductive phase. During the first meeting participants presented their participation to the lab and motivated it. The facilitators explained the working modes, the timing of work and the tools that would be used. In addition, narrative themes (dramatic questions, DQ) were defined, on the basis of which participants would tell their stories. The DQs all had a common basis that recalled the experience of narrative practice in the contexts of care.
2. Sharing stories. In the second encounter the stories, thought and written in autonomy, were shared and discussed in a group. This has allowed each narrator to make changes, to access aspects that are not considered, and to proceed to the definite writing of the story.
3. Pictures and audio accompaniment selection. Each author chose images that would allow to express and effectively represent contents and meanings of history. Once the various media elements have been identified, narrators have made the storyboard in order to make the work more linear in the next step.
4. Sharing images and music. Just as the stories have been socialized, so has been done with multimedia elements. In particular, there was a deep discussion about iconographic choices, not so much about defining the aesthetic value of the elements, but to reflect and analyze the meanings attributed by the narrators.
5. Editing. Stories have been assembled using Movie Maker, a simple sw for video editing.
6. Sharing the final product. Although all the elements of the DST had been presented and discussed in the previous phases, it was considered appropriate to devote a space to the visualization and analysis of the finished products, both to close the lab and to grasp those aspects and dimensions that only emerge in overall vision.

The second group represented a challenge from an educational and narrative point of view, both because of its size and its heterogeneous form. The group was out together in two different moments: at first the facilitators met the educators to plan the intervention, define the narrative objectives, and establish the criteria to be used in identifying the patients. The activity was proposed to those patients (all attending the same mental health service) who had already taken a certain care pathway and had reached a good level of disorder management. At a later time,

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educators joined the group because they wanted to share this experience with their patients to create a co-location and equality situation that was considered important at that stage of the care path.
Again, the activity was organized in phases as in the previous group, setting a timeline appropriate to the various needs of the participants.
At this stage, we will only focus on some of the moments we consider particularly interesting.

1. Involvement and definition of the narrative theme (DQ). As mentioned earlier, the identification of the people to whom the laboratory was proposed had to take into account a number of factors related to the disorder of each person, and to the potential and criticality of each individual. We chose to work with those people who had achieved good pathology control and found themselves in an existential phase of balance and change. For this reason, the dramatic question "My Life With" was proposed, which was intended to allow participants to project themselves into a "future" and generative dimension. In fact, the purpose of the intervention was to bring people to reflect on aspects of their lives that could be good starting points for a new existential design.
2. Finding and Writing Stories. This was a very complex phase that took several weeks. Operators and patients worked together in a context of strong collaboration aimed at identifying what could be told and how to do so. The two facilitators also supported the group in the choices, especially in the critical moments in which some participants expressed difficulties in identifying, in their existence, something deserving to be told.
3. Media Writing. The activity was carried out by maintaining the principle of maximum copyright and soliciting the use of original iconographic resources. When these were unavailable, storytellers organized moments dedicated to photography, in which patients and operators took the pictures they needed.

Facilitators
As mentioned above, two facilitators worked to the design of activities and managed the narrative laboratories. At the design stage, they worked on defining criteria and ways of involving patients, helping educators to define selection criteria based on the opportunities offered by this type of intervention.
Subsequently, they played a crucial role in sharing moments by managing the critical issues and by stimulating the necessary analysis and reflection to achieve a DST. Above all they encouraged in the participants an evolutionary and transformative process, with an intervention that wanted to be primarily educational and partly rehabilitative for patients and educative for educators.

Results and Discussion

We will present the results obtained, resuming the questions with which this text started.
1. Does media narration promote professional reflection?
The DST has proven to be a functional method of activating key meta-reflective processes in professional contexts. The ability to tell through different languages allows individuals to access a more creative and expressive plan than the one written. This is functional to the acquisition of knowledge and awareness (Carper, 1978).
Here are some comments that nurses from the first group expressed when, at the end of the seminar, they were invited to report their formative experience:

"This experience has allowed me to combine new skills with old knowledges, creating a versatile, simple and powerful expressive tool that can give voice to the care work. (...) This experience has prompted me to reflect on how much a nursing relationship can lead to exploring the world of beneficiary and curator emotions" (Laura)

"Realizing a DST has been the occasion to look at my work through a kaleidoscope, reassembling, in a new light, many of its components" (Silvia).

"I rediscovered the pleasure of photography, my old passion, finding old photos that I had taken and that, used in a precise sequence, expressed with all my satisfaction what I meant" (Laura)

As can be seen from the first comment, the added value of this narrative practice is represented by the possibility of expressing itself through multimediality. In addition, the choice of the different narrative components (images, video sequences, music) enables the activation of professional memory retrieval processes and helps the professional to "put order" among the events.

2. Which processes are triggered during shared media narration paths within professional groups?
In general, there was a tendency to start very significant comparisons with regard to iconographic and editing choices. The discussions never mattered about the aesthetic dimension, but they focused on the coherence of pictures with respect to the meanings they had to represent. In addition, it should be pointed out how, tendentially, comparisons took place on a semantic plane to gradually shift to professional and emotional aspects. On more than

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one occasion, the empathic aspect has emerged, activated both by the personal story and by the research activity, especially of the iconic devices. Many of the operators involved claimed that the search for photographs led them to go back with their memory to experiences, facts, and people they had almost forgotten about. This has allowed them to find important pieces for the reconstruction of both personal and professional life. Although many of the nurses and educators involved in the project had already been involved in storytelling workshops and they were used to narrating their professional life, it was evident that DST has triggered reflection and analysis mechanisms which were different from what had happened with other strategies.
Another very interesting aspect is the importance of content represented by images and their impact on professionals. Although the participants of the two groups met each other, when they shared some images they had access to a deeper knowledge plan, which was precluded while reading stories. A change of perspective was noticed between the time when the narrative texts were shared and the time when the work with pictures started. It should be noted that participants were asked to only use original photographs and not to access online repertoires. This choice was motivated by both the respect of copyright and the need to minimize the risk of standardizing the performances, to allow, as much as possible, the creation of truly authentic tales.
The moments of sharing media choices have strengthened the group spirit and encouraged collaborative attitudes. This was even more intense when multimedia management has put narrators in the face of some technical critiques.
3. Can DST support patient narratives? The results of the group of people with mental discomfort lead us to assert that the narrative processes made possible within a DST path represent a scaffolding element for people with fragility. Specifically, it seems relevant in this regard to focus on some aspects that have emerged in a particular way:

1. The images facilitated the narration, especially for those people who manifested a greater discomfort in communicative and narrative processes. We take for example the experience of A., a very motivated patient suffering from severe schizophrenia, who at the beginning of the course, had manifested his difficulties in telling a story because he felt that he was absolutely incapacitated. The ability to use photographs and music has calmed down, allowing him to complete his work by achieving a high degree of satisfaction for his digital story.
2. Also in this case, as reported to professionals, sharing image selection has promoted a greater mutual knowledge among the participants. In addition, this activity has allowed forms of collaboration and, in particular, mutual support among patients. While in the "writing" phase of their story subjects kept a certain gap between them, whereas during shared media research activities it often happened that they mutually assisted and supported themselves in the face of the criticalities that sometimes the technological dimension presented to them. In particular, we mention the case of A. and S. that for several meetings ignored eachother, but when it was time to choose the images of S., A. began to participate and interact with S. activating forms of comparison to which we had never come to before. During the last meeting, when it was asked to participants what they thought about the experience they had participated to, one of them said that although they had known it for a long time, only at that time they could be considered a true group.
3. In closing, reference should be made to the effects of participation by operators and patients within the same group. A first reference should be made to the emotional climate that has been not only extremely positive and collaborative, but also serene and often fun, throughout the laboratory. Although people had exposed their weaknesses and shared very personal aspects of their existences, sometimes even particularly delicate emotionally, it was possible to maintain some joy in being "there" together to share that experience. This has been a highly motivating factor and has allowed everyone to overcome the criticalities that have emerged from time to time.
For the reasons given and for others that we do not mention here, we feel that the DST not only supported the narratives of the patients, but has allowed us to define relationships that were not built many years ago. This concerns not only the patients but also the relationships with the operators.

Conclusion

The experience with the two groups allows to highlight how DST can be a valid ally in the empowerment of people and in the self-valorization of their professional experience. With this process, the subjects involved are not just telling their professional history, but they are obliged to represent it. To do this people need to be able to reconstruct their own professional existence and to understand it so well that they can tell it through images or semantic devices that are effective but also extremely complex. Identifying the image that can properly represent a salient moment in your profession implies a strong awareness and the ability to arrange the elements that are a part of it. When reaching the goal storytellers will not just have the right photo for that specific sequence, but also a clear view of their position, their evolutionary process, and the acquired skills. This is a formidable result for people, especially for care professionals who are constantly running the risk of burnout, but at the same time it is a fundamental goal for healthcare organizations.

Other interesting aspects were observed during this experience. Here we focus on some of them:

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a. During the socializing moments of the stories it was noticed that people tended to be completely absorbed by tales and, above all, much more open to communication, listening, and empathy. This aspect is fundamental when there is some social marketing aim on particular issues (mental health, disability, independent life).
b. Some participants have interpreted the story as a sort of demonstration of their ability to cope with situations and difficulties.

Inside the Biella Hospital, where the experiences have been carried out, new DST laboratories are active, always addressed to care professionals both of the hospital and other healthcare companies. This will allow us to further study this methodology and to achieve mainly two objectives:
1. to assess the actual impact on organizations;
2. to identify good practices that can be exported in contexts not strictly sanitary.

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DIŞ MEKÂN SÜS BİTKİSİ İTHALİ VE OLASI SORUNLARI

Bilal ÇETİN ve Oktay YILDIZ

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Süs bitkileri sektörü dünyada hızla gelişen ve büyük bir ticaret potansiyeli olan bir sektördür. İç ve dış mekan süs bitkilerinin estetik ve işlevsel amaçlarla toplumumuz tarafından kullanılması da giderek yaygınlık kazanmaktadır. Türkiye'de giderek çeşitlenen ve artan ihtiyaçları karşılayacak üretim kapasitesine ulaşılamaması nedeniyle başta Hollanda, İtalya ve İngiltere olmak üzere pek çok ülkeden önemli miktarda tohum, fide, fidan, anaç, aşı gözü, çelik vb. süs bitkileri ve özellikle dış mekan bitki materyali ithalatı yapılmaktadır. Türkiye Dünya canlı bitkiler ithalatında 2012 yılı itibarıyla 59 milyon dolarlık harcamayla 22. sırada yer almıştır. Aynı yıl yapılan ihracat ise yaklaşık 34 milyon $ olup yaklaşık 25 milyon dolarlık bir dış ticaret açığımız bulunmaktadır.

Fakat asıl sorun bu sektördeki ticaret açığı değildir. Bitkilerinin ithalatı ile ilgili usul ve esasları belirlemek amacıyla Gıda, Tarım ve hayvancılık Bakanlığı tarafından çıkarılmış genelgeler olmasına rağmen uygulamadaki aksaklıklar nedeniyle Su sümbülü (*Eichhornia crassipes*), bataklık seven (*Elodea Canadensis)*, kaz-ayağı (*Carpobrotus edulis)*, yalancı akasya (*Robinia pseudoacacia)* vb. bazı istilacı türler ile egzotik bitkilerle birlikte mantar, bakteri, virus, nematod vb. hastalık ve zararlılarda ülkeye sokulmaktadır. Örneğin, Son yıllarda Akdeniz kıyılarında sık kullanılan hurma ve palmiyelerle birlikte bazı nematodların ve kırmızı palmiye böceğinin (*Rhynchophorus ferrugineus*) zararlarının önemli boyutlara ulaştığı rapor edilmiştir. Ayrıca dişbudak tepe ölümleri, kestane kanseri, karaağaç ve şimşir ölümlerinin dünya çapında yayılmasının en büyük nedeni bu türlerin sınır ötesi taşınımının yaygın olmasıdır.

İstilacı türler doğal ekosistemlere veya tarım alanlarına yakın yerlerde kullanılırsa önemli tehdit unsuru haline dönüşmektedirler. Özellikle endemik bitkilerin çok yaygın olduğu Türkiye'de getirilen bitkilerin istilacı olup olmadığına ve ithal edilen bitkinin kullanıldığı sahaların etrafında korunan alanlar veya endemik türleri barındıran ekosistemlerin bulunup bulunmadığına dikkat edilmelidir. Ayrıca yerli türlerin bağışıklık sistemi egzotik türlerle yeni giren hastalık ve zararlılara dirençli olmadığı için bu hastalık ve zararlılar hızlıca yayılıp epidemik hale dönüşebilmektedir. Dolayısıyla ithal edilen bitki materyallerinin her ne kadar hastalıklardan ari olduğuna dair belgeleri istense de getirilen bu materyallerin belirli bir süre kontrol altındaki sahalarda test edildikten sonra o türün yerli üretiminin teşvik edilmesi, olası riskleri azaltabilir.

Keywords: Süs bitkileri, egzotik türler, dış mekan, istilacı türler

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ECO BAKERY FOR FRIENDLY ENVIRONMENTS IN ECOLOGICAL - CASE STUDY FROM THAILAND

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Abstract : According to the United Nations of Sustainable Development Goal 2030 (SDG 2030) 17 topic concepts of which were announced and demonstrate the scale of the universal Agenda for seeking to build on the Millennium Development Goals to complete achievement in economic, social and especially in environmental.
The Goals and targets will encourage action in areas of critical importance for humanity and the planet; in social development sector in Bangkok, Thailand has setting up the developed project in the business training for bakery new entrepreneur based on the SDG2030 compositions which has combined within the concept by using the Eco techniques and practices. To issue healthy product for customer by the key success idea of production practices has realized for environment concerning, energy and reserving resource were saving, from the beginning to end of process; as raw material preparing such as; use the organic and non-hazardous which are the main materials and purified mixed such as; gluten-free, trans fat free, low sugar, low GI, low sodium and non-genetically engineered or non-injections products as the ingredients.
By selected the baking technique which has energy saving of less electricity power, gas, wind and water supplied and used the packaging which can be decomposed in naturally instated of foam packages types. To deliver the best qualities to customer and friendly environments till the last consumer in life-cycle chain as fish and other spicy in environment.
After the project has implementation, Eco bakery, the contribution of Eco bakery production has selected to evaluation by SDG2030 concept of No. 14 to ensure the products has friendly with the environment or not, , "Eco bakery" which has been created the problem pollutions for the river for long time ago by Thailand traditional yearly festival.
Eco bakery, which produces by SDG2030 concept as selected to be the treatment of the experimental research was launched into the rivers and the seas in Thailand. The research has operated to study the difference of water quality as BOD (Biological Oxygen Demand) Value and DO (Dissolved Oxygen) Value that have analyzed by Laboratory in Thailand . The research has operated found out the results has accepted the hypothesis at level with significance. Therefore, ECO Bakery for Friendly Environments in Ecological – cased studied of Eco bakery in Thailand, has been the optional of the integrated and indivisible of SDG 2030 for water pollution solution in action for environmental matters.

Keywords: ECO Bakery, SDG 2030, Eco bakery, Friendly Environments in Ecological – cased studied, Cased studied of SDG 2030 for water pollution solution, Action for environmental.

Introduction

This Agenda is a plan of action for people, planet and prosperity. It also seeks to strengthen universal peace in larger freedom. That eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. These are universal goals and targets which involve the entire world, developed and developing countries alike. They are integrated and indivisible and balance the three dimensions of sustainable development in a balanced and integrated manner (UN SDG 2030 Agenda, 2015). The solving also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work for all, taking into account different levels of national development and capacities. All countries have acting in collaborative partnership, will implement this plan and environmental. It is important to recognize the link between sustainable development and other relevant ongoing processes in the economic, social and especially in environmental fields.

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Figure1. UN SDG 2030Because the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth, and noting the importance for some of the concept, that we focused on that part to develop the project on the matters addressed in this Agreement. (Paris Agreement, 2015)



Figure2. Sustainabl Development Goal 2030 Articles

This is the concept of bakery business which has supported some topic base on UN SDG 2030 in several goals by applied. It's mention focus on friendly environments in Bakery business. Its segment functions by bakery technologies and bakery management by practices.

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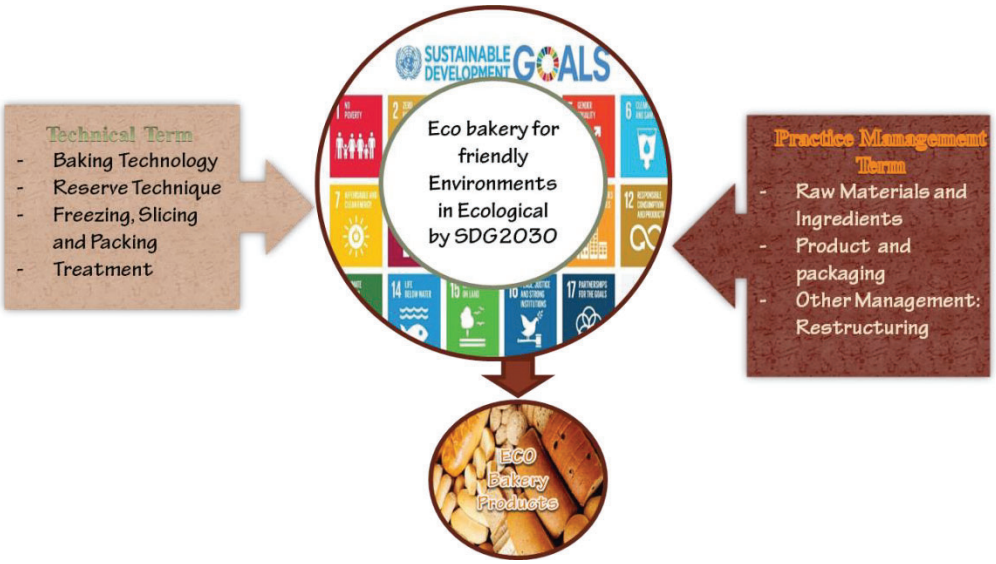

Figure3. Functional-oncept framework.

The functions convers from the beginning till end of process. The specific needs and special situations of the developed countries with regard to funding and transfer of technology (Paris Agreement, 2015) by separated between Technical Term and Practice Management term both functions have related with SDG 2030 concepts and the contribution was the ECO Bakery Products. Each technic module based on SDG concept as follows:

Technical Term

Goal 7: Affordable, reliable, sustainable and modern energy**.**

By use several baking technique by hi-tech of multiple machines, modern with updated but not too expensive and saves power of electricity, wind, gas. Included the freezing technique of freezing par-bake good, slicing and packing by uses the automatic machines of wrapping or bagging by saving energy machines and multifunction usages by the concept of Goal 7 (Paris Agreement,2015).

Practice Management Term

Goal 2: Nutrition Agriculture and Goal 12: consumption and production patterns, this will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

By raw materials and ingredients management: By selected the raw materials and ingredients by using the organic and non-hazardous, purified ingredients from non-genetically engineered animals and none injections.

Select the whole grain, cereal and seed for the mixing with zero-trans shortenings and Trans fat- free oil, which has made from high oleic soybean oil and keep clean for the all machines. It should be support Gluten free Flour, Non-Pho Shortening production.

Goal 15: Protect ecosystems, halt and reverse land degradation and halt biodiversity loss:

By select the safety packaging for the ecological system. That's can be decomposed naturally use non-foam type package, recycle paper instead of Plastic or foamed pattern.

Goal 8: Promote sustained economic growth, higher levels of productivity and technological innovation, full and productive employment and decent work for all.

By run bakery business for job creation, employs the disable person, gives a chance to unemployed, reduced inequalities and manage the other business parts as marketing, display, accounting and inventory by systematic and run business by fair price and fair job support the inclusive economic growth.

Materials and Methods

After implement, the bakery product were created as ECO product based on the concept of UN SDG # 14 (For ecological of river) to product the eco bakery product which friendly environment. Eco bakery, it's produced by gluten free four and healthy ingredients , were selected to evaluation by SDG2030 to ensure the products has friendly with the environment as the treatment of the experimental research was launched into the rivers and the river before the seas in Thailand.

Research Methods:

The study was conducted by using experimental research methodology by mixed method of qualitative and quantitative.

Population: Sampling by random

The sample of water 319 Samples from 3 rivers in northern and central and southern (before go out to the sea) each river 10 samples of water in 11 times with 100 treatments per each river.

The research has operated to study the difference of water quality as BOD (Biological Oxygen Demand) : Standard method for indirect measurement of the amount of organic pollution (that can be oxidized biologically) in a sample of water. BOD test procedure is based on the activities of bacteria and other aerobic microorganisms (microbes), which feed on organic matter in presence of oxygen. The result of a BOD test indicates the amount of water-dissolved oxygen (expressed as parts per million or milligrams per liter of water) consumed by microbes incubated in darkness for five days at an ambient temperature of 20°C. Higher the BOD, higher the amount of pollution in the test sample. For the contaminants that cannot be oxidized biologically, chemical oxygen demand (COD) method is used. And DO (Dissolved Oxygen) value: Oxygen is measured in its dissolved form as dissolved oxygen. If more oxygen is consumed than is produced, dissolved oxygen levels decline and some sensitive animals may move away, weaken, or die. To prove by Laboratory that fish and other aquatic animals under the river can also be eaten and can also be decomposed in nature. (Jan Sendzimir**,** 2014).









Result and Discussion

Data analyzed by SPSS statistical program when t-test is applied in determining the significant of the difference between pretest 3 times and posttest 3 times of each river by kept record or data for evaluation. The measurement used science parameters as BOD and DO (International Soil and Water Conservation Research, 2016)

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Biological Oxygen Demand (BOD)

Table1: Mean of Posttest BOD3 level has the maximum of average score = 1.94 with SD = 0.23 and Posttest

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Posttest BOD1	319	1.49	0.50	0.02
Posttest BOD2	319	1.71	0.45	0.02
Posttest BOD3	319	1.94	0.23	0.01

BOD1 level has the minimum average score = 1.49 with SD = 0.50

Table2 : The descriptive show the statistic of posttest BOD of Eco bakery has Significant (α) > 0.05 % or 95% in posttest BOD3 level = 1.94 and critical t<1.91 to t> 1.96

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2 tailed)	Mean Diff	Lower	Upper
Posttest BOD1	53.33	318	0.00	1.49	1.44	1.55
Posttest BOD2	68.07	318	0.00	1.71	1.66	1.76
Posttest BOD3	150.20	318	0.00	1.94	1.91	1.96

Dissolved Oxygen (DO)

Table 3: Mean of Posttest DO 1 has the maximum of average score = 1.92 with SD = 0.52 and Posttest DO 3 level has the minimum average score = 1.52 with SD = 0.23

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
PosttestDO1	319	1.52	0.50	0.02
PostestDO2	319	1.74	0.43	0.02
PostestDO3	319	1.92	0.23	0.01

Table 4: The descriptive show the statistic of Pretest DO of Eco bakery has significant (α) >0.05% or 95% in Pretest DO 3 level = 1.92 and critical t<1.89 to t>1.95

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
PosttestDO1	54.26	318	0.00	1.52	1.46	1.57
PostestDO2	71.53	318	0.00	1.74	1.69	1.79
PostestDO3	132.91	318	0.00	1.92	1.89	1.95

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Research Result

This contain of overall data analysis, presentation, interpretation and explanation of the data. Tables and figures are given in order to make the data analysis clear. Outcomes are clearly interpreted. Data collected included pretest and posttest scores as mean test and t-test were performed as follows:

1. The results of the research have accepted the hypothesis with significance level.

2. The result of research found out that the water quality after the experimental was not so good and getting better after 3 days later and after 7 days has getting into normal value.

3. It mean that the treatment has not create the river pollution and not harmful to the fish and other species under the river, that can be eaten the eco bakery products and it has decomposed in naturally.

Conclusion

Eco bakery for friendly Environments in Ecological can be the optional model which has supported the sustainable development goal 2030 in action and practices.

The result of research found out the difference of water quality as BOD value of pre-test and post-test of the experimental research by using, ECO bakery as the treatment to evaluate that the treatment has not create the pollution to the river and not harm to fish and aquatic species under the river and can be decomposed in naturally.

By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans. (Rights of Nature for Peace and Sustainable Development, United Nations, Geneva, 2017)

Acknowledgements:

Limitation

1. We cannot count the fish population in the river for testing, it cannot be confirmed the number of fish population which effected and related with Eco bakery. (Sustainable Management of Water and Fish Resources in Burkina Faso, 2014).
2. The balance of DO has lower value in the big River might be effected from the boat traffic and organic compounds in water. (Oceans and the Sustainable Development Goals, 2011).
3. Time has Limited.

Future work:

1. It should be test in other material as leaf wood for comparison the result.

2. It should be test again in every year to keep data and monitoring water qualities.

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ECZACILARIN YAŞADIĞI GÜNCEL SORUNLAR VE ECZACI ADAYLARININ BU SORUNLARA ILIŞKIN BILGI DÜZEYI

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Bu çalışma Türkiye'de eczanesi bulunan bir eczacının yaşadığı güncel sorunlardan yola çıkarak, eczacılık fakültelerinde öğrenim gören eczacı adaylarının yaşanan sorunlar hakkında kibilgi düzeylerini ortaya koymayı amaçlamaktadır. Çalışma aynı zamanda eczacılık fakültelerinde uygulanan programlarının güncel sorunlar hakkında eczacı adaylarını ne derece bilgilendirdiğini de ortaya koymayı amaçlamaktadır. Araştırma Sakarya ili Arifiye ilçesi'nde bulunan üç eczanede stajını yapmakta olan ve farklı üniversitelerde öğrenim gören 10 eczacı adayı ile gerçekleştirilmiştir. 2016 yılı Nisan ayının birinci gününden başlayarak altı ay süre ile (01.04.2016-30.09.2016) Arifiye ilçesinde bulunan eczanelerde ilaçlarını alan kişiler ile eczacılar ve eczacı kalfaları arasında geçen diyaloglar gözlemlenmiştir.Ayrıca eczacılar ve eczacı kalfaları ile görüşmeler yapılmıştır. Yapılan gözlem ve görüşmeler sonucunda eczane çalışanlarının bazı durumlarda hastalar ile karşı karşıya kaldıkları belirlenmiştir. Ayrıca mevzuatın ve ilaç fiyatlarının sürekli değişmesinden dolayı da çeşitli sorunların yaşandığı belirlenmiştir. Bu noktalar başta olmak üzere el yapımı ilaçların hazırlanmasından, doktor reçetelerinin okunamamasına kadar pek çok sorun ortaya konmuştur. Sorunların belirlenmesinin ardından eczacılık fakültelerinin üçüncü ve dördü sınıfında öğrenim gören eczacı adayları ile staja başladığı ilk gün yarı yapılandırılmış görüşme formu kullanılarak bir görüşme gerçekleştirilmiştir. Görüşme formunda eczacı adaylarının bu sorunlar hakkında bilgi düzeyini ve bu sorunlar ile karşılaştıklarında pratik çözüm yollarını kullanıp kullanamayacaklarını belirleyecek sorulara yer verilmiştir. Başlangıçta gerçekleştirilen görüşme eczacı adaylarının stajlarının son günü de gerçekleştirilmiştir. Elde edilen bulgulara göre eczacı adaylarının başlangıçta güncel sorunlar ve bu sorunlara ilişkin çözüm yolları hakkında bilgi sahibi olmadıkları, fakültedeki derslerde bu konulara ilişkin kendilerine açıklamalarda bulunulmadığı belirlenmiştir. Ancak staj sonunda ise sorunlar hakkında nispeten bilgi sahibi oldukları ve sorunlarını nasıl çözebilecekleri hakkında çeşitli fikirleri olduğu belirlenmiştir. Ancak eczacı adayları sorunlara ve çözüm yollarına okullarındaki programlarda çok fazla yer verilmediğimi belirtmişler, daha çok staj esnasında yaşadıklarına istinaden bilgi sahibi olduklarını dile getirmişlerdir. Buna göre eczacılık fakültelerinde uygulanan programlarda güncel sorunlar ve bu sorunlara ilişkin çözüm yollarını içeren içeriklere yer verilmesi gerektiği önerilmektedir. Ayrıca halen eczaneye sahip olarak serbest şekilde çalışan eczacılar fakültelere kaynak kişi olarak davet edilerek söyleşi ve konferanslar düzenlenebilir. Bu araştırma sadece eczanesi bulunan eczacıların yaşadığı sorunları ortaya koymaktadır. Bu alanda çalışmak isteyen diğer araştırmacılar eczane sahibi olmayan sektörün farklı alanlarında çalışan eczacılar ile de benzer çalışmaları gerçekleştirebilirler.

Keywords: Eczacılık, Eczacı, Eczacıların sorunları, Eczacılık Eğitimi

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EMG BASED HAND PATTERN RECOGNITION USING ARTIFICIAL NEURAL NETWORKS CONTROL

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Cognitive interaction between human and prosthetic devices is one of the high popular researching areas for researchers in recent years. Electromyography (EMG) is is a highly effective method to recognition of hand pattern for using control signal of prosthetic devices. Electromyography (EMG) is widely used to design prostheses for its benefit to get valuable information about the neuromuscular activity of a muscle. This paper suggests the real time classification algorithm for human hand motion by sEMG. Bioelectrical signals were recorded by Surface Electromyography method for four muscles with the help of the surface electrodes. The recorded bioelectrical signals were subjected to a series of preprocessing and feature extraction processes to calculate the maximum, effective, mean, variance and energy values of the EMG signals. Then featured value of EMG signals such as average, maximum, variance and energy value are extracted in order to use ANN control for recognizing desired hand pattern.

Keywords: EMG, Prosthesis Hand, Pattern Recognition, Bioelectrical Signal, Signal Processing

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ENDÜSTRIYEL MUTFAKLARDA İŞ GÜVENLIĞI

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Mutfak, yiyeceklerin hazırlandığı, pişirildiği ve bazen de tüketildiği yerdir. Sanayi mutfakları, restoranların ve toplubun beslenme şeklindeki mutfakların mutfakları genel tanımıdır. Işyerinde yaşayan personel, işyerinde yaşayan insanlar için uygun şartlar içermemesi, iş güvenliğini tehlikeye atan koşullar oluşturmaktadır. Bu da çalışanların performanslarının düşmesine ve buna bağlı olarak iş kazalarının sayısı artmaktadır. Tüm servise, turizm sektörü, dünyada büyüyen ve istihdam alan devamlı artan, ancak çalışma sürelerinin uzunluğu, ara dinlenme ya da hafta tatili ihlali, iş kazası ve meslek hastalıkları için gerekli etki oluşması bir sektör.

Keywords: Mutfak, Endüstriyel Mutfak, İ ş Güvenliği

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ENVIRONMENT OF CULTURE AND ART IN THE OTTOMAN EMPIRE IN 19th CENTURY

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Abstract: Westernisation and modernisation of the Ottoman Empire began to burgeon in the 17th century; it became evident in the 18th century and the 19th century witnessed the most intense interaction and the exact reconstruction process. New way of living which was originated in Europe and representatives thereof became influential as guides and determinants of reconstruction process in the Ottoman Empire. It is possible to point out that the Ottoman Empire which got closer to France for handling military problems, to England for industrialisation purposes and to Italy for architecture and arts had intense communication and the resulting interaction with European states in the course of reconstruction process.

This study aims to give information about the social, cultural and artistic environment in the Ottoman Empire during the reign of Sultan Abdul Hamid II (1876-1909).

Key Words: Culture, Art, Ottoman Empire, Sultan Abdul Hamid II.

General View of the Environment of Culture and Art in 19th Century in the Ottoman Empire

It is clear that sultans had a very important role in the ruling of the country as a part of state system of the Ottoman Empire thus, good or bad functioning of the state and events and actions which might affect the society from various aspects were closely connected to personality, behaviours and mentality of the sultan. This fact which is valid for all absolute monarchies rendered the personality of sultans very important for ruling of the state and events, practices and behaviours which might affect the society based on the ruling in a country like Ottoman Empire majority of whose population was illiterate. Therefore, westernisation movements in our history were primarily shaped in line with the personality, mentality, philosophy, behaviours and ruling capacity of the sultans. Artistic issues would inevitably undergo a transformation process depending on the same environment and circumstances (Cezar, 1971: 19).

Although the transfer of some cultural elements had a preliminary function in the adoption of Western art in the Ottoman Empire, the main motivation was the beginning of disintegration of Ottoman society upon the change of land order at the end of 16th century (Renda and Erol, 1980: 79). New diplomatic, commercial and cultural relations with European states in 18th century had a significant effect on artistic environment of the Ottoman Empire. One of the most important innovations was surely the introduction of the printing to the Ottoman Empire following the mission of Mehmed Çelebi and Said Efendi in Paris. Said Efendi had İbrahim Müteferrika establish the first printing house in 1726 and initiated the publishing of books in Turkish.

It is evident that westerners exerted efforts for familiarizing themselves with Turkey in that century. Envoys arriving in Istanbul started to bring scientists, intellectuals, painters with themselves even in the Tulip Period. These developments even enhanced and continued in the course of events. Westerners were studying history, state organisation, social structure of Turkey and they were publishing articles and books based on these studies. Painters who accompanied envoys or came on their own were depicting buildings, clothes and way of living in Turkey with their pencil or brushes (Cezar, 1971: 7).

Institutional Westernisation which was accomplished by successively innovative sultans during 18th and 19th century which were identified as reconstruction period in the Ottoman history resulted in a comprehensive cultural evolution in the empire. This period witnessed the formation of a new cultural and artistic environment in the country and trial of new forms and techniques of each branch of art and gradual institutionalisation of art education. A new phase was also introduced for Ottoman painting in this period (Bağcı et al., 2006: 261). Given that these changes were resulted from impacts of economic depression on social life and culture in the Ottoman Empire and

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art works of this environment were inseparably connected to historical process thereof, it is clear that westernisation in painting was an extension of social changes (Fischer, 1995: 163).

Commencement of painting education under the auspices of court in the 19th century enabled the training of painters who were creating art works in western style. Newly established technical schools offered a modern curriculum and lectures of math, geometry and technical drawing. Firstly Mühendishane-i Bahri-i Hümayun (Imperial School of Naval Engineering), Mühendishane-i Berri-i Hümayun (Imperial School of Military Engineering) then Mekteb-i Harbiye (School of War) and schools like Sanayi and Mülkiye Mektebi (Industrial and Civil Service Schools), civil high schools, teacher-training schools following Tanzimat reform era were the centres of painting education until the foundation of Sanayi-i Nefise Mektebi (Academy of Fine Arts) in 1883 (Bağcı et al., 2006: 300). However, design and painting lectures might have been held in studios of some painters apart from abovementioned official institutions. As noted previously, it is known that some European painters arriving in Istanbul in 18th century had studios in Galata district and Levantines, non-Muslim and Muslim painters came and worked in these studios. It should be considered that European painters who stayed in Istanbul for a longer period and worked at court's service in the 19th century played a greater role in the adoption of the western painting (Renda, 2002: 948).

Renewal concepts which were tried to be identified as Westernisation process in Turkey brought about the prejudice that the sole factor designating the changes of form was Europe. It is not possible to point out that a particular art environment is deprived of an internal dynamism where connection with its historical creative volition and its traditions is sustained in spite of very powerful exposure and that it is incorporated in modern developments (Tansuğ, 1986: 11).

Environment of Culture and Art under the Rule of Sultan Abdul Hamid II (1876-1909)

Sultan Abdul Hamid II who might be identified as innovative due to developments under his rule witnessed very important political events of the imperial history. He announced the first Ottoman constitution (Kanûn-i Esasî) on December 23, 1876. The first parliament consisting of the Sultan-selected Senate and generally elected Chamber of Deputies opened on March 19, 1877. Thus, the First Constitutional Era started. This period which was designated as era of innovations in the empire had impacts not only on political life but also on social and cultural life. The interest of Sultan Abdul Hamid II in fine arts flourished as a result of taste of Ottoman court in the 19th century and his presence in visit of Abdul Aziz to Europe before he took the throne (Germaner and İnankur, 2002: 104).

Artistic activities of particularly foreign architects were outstanding under the rule of Sultan Abdul Hamid II who attached importance to culture, art and architecture. Private academy of the French artist Guillemet[16] was active in Pera district prior to foundation of Sanayi-i Nefise Mektebi (Academy of Fine Arts) in 1883. Pera as a European cultural zone hosted the activities of foreigners, Levantines or artists of minority. Vividness of artistic life was sustained during First Constitutional Era (1876–1908) which spanned the rule of Sultan Abdul Hamid II (Tansuğ, 1993: 15).

16 Pierre Desire Guillemet (1828-1878): Is a French painter who came to Istanbul during the reign of Abdul Aziz, the second sultan of the Tanzimat period, during the process of westernization. After being sent to Turkey with an official mission in 1863, he made portraits of Sultan Abdul Aziz, one of them standing on the horse. In the 1870s, the artist produced works showing women from the harem of the Ottoman Palace as well as another copy of the standing portrait of Abdul Aziz. The last piece we know of the artist is II. Abdul Hamid is probably the portrait portraying the first years of his reign. All of these artistic activities, which Guillemet put forward in connection with the two different cultures of Europe and Ottoman, in the context of the relations between the traditional and the modern transformation, have made permanent contributions to the history of contemporary Turkish art (Kıbrıs, 2003). (http://tez.yok.gov.tr/UlusalTezMerkezi/SearchTez) (Date of Access: 11.12.2013)

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Figure 1: Sanayi-i Nefise Mektebi (Academy of Fine Arts)

It appears that understanding of western painting attracted the attention and support of statesmen and aristocrats resident in Istanbul beginning from the rule of Sultan Abdul Aziz even though this understanding could not be rendered available for a vast majority of public. Thus, "Sanayi-i Nefise Mekteb-i Âlisi" (Academy of Fine Arts) was founded in Istanbul in 1882 upon the initiative of government in order to institutionalise understanding of western art and activities thereof in Turkey and modern artistic activities primarily painting, sculpture and architecture were tried to be taught and made available to majority of public through this school. In fact, obstacles to descriptive painting which was forbidden by Islam and deemed as a taboo thus could not be developed could only be overcome through enduring and extensive efforts. It is a historical fact that European artists particularly Italians arriving in Turkey as well as stance and support of Ottoman administration particularly from the beginning of 19th century played an important role in overcoming these obstacles (Sönmez, 2006: 313).

The most important event for the history of painting was the foundation of Sanayi-i Nefise (Academy of Fine Arts), art education was demilitarised by means of the school. The school which was founded by Osman Hamdi Bey who received education of painting in Paris together with the support of court following a long preparatory period started to operate on March 3, 1883. Osman Hamdi Bey was always criticised due to academic staff which was mainly composed of foreign and non-Muslim academicians such as Alexandre Vallaury for teaching science of architecture and his assistant Pietro Bellò, Salvatore Valéri for oil painting, Warnia Zarzecki for sketching, Yervant Osgan Effendi for sculpture and Aristo Efendi for history. However, it might be thought that he established such a group of academicians since he wanted to concentrate on figure which he attached utmost importance (Arlı, 2000: 147). The attitude of Ottoman sultans was also evident from the fact that they ordered court painters who was invited from West such as Zonaro, Chlebowski to create large paintings depicting the victories of their ancestors (Çağman, 2002: 931).

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Figure 2: Ertuğrul Süvari Alayı'nın Galata Köprüsü'nden Geçişi (Passage of Ertugrul Cavalcade from Galata Bridge), 1901 Fausto Zonaro
Oil on canvas,
117x202 cm.



Figure 3: Kağıthane, Date Unknown Stanislas Chlebowski
Oil on canvas
62x102 cm.

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Factors resulting in the acceleration of cultural and artistic environment of Sultan Abdul Hamid II and dynamics reflecting in the art works of the period might be summarized as follows (Yasa-Yaman, 2011: 20);

> "Famous photographers of Pera took the photos of urban life, monuments, historical surrounding, bazaars, streets, peddlers, ceremonies, portraits of notables of that period, members of foreign royal families visiting the empire, travellers, admirals of Ottoman Navy, foreign navies, new hospitals and schools, official ceremonies, daily life and events, life of women particularly in public and private areas, portraits of important people and albums and postcards became popular under the rule of Sultan Abdul Hamid II. Picture, engraving and particularly photographs were important sources affecting the theme-related repertoire and vision of painters."

Reign of Sultan Abdul Hamid II was also important for portrait-painting of sultans since Sultan Abdul Hamid II ordered the Europeans such as H. Bertaux, F. Zonaro, W. Reuter to create the oil portraits of preceding sultans. Sultan also established a museum inside Yıldız Palace and exhibited the portraits of sultans and some paintings from court collections as well as artefacts such as coins, porcelains, manuscripts etc. (Renda, 2002: 947).



Figure 4: Antikacı Antique Dealer), Date unknown
Salvatore Valéri
Oil on canvas
60x44 cm.

Turkish Artists in the 19th Century Ottoman Art Environment

In the 19th century only foreign painters did not give work in the Ottoman Empire. During this period, the artists who went to Europe and trained in perspective, shadow, color toning and the use of these techniques developed themselves in painting Western style paintings. When we are going to touch Turkish painters of this period, we should not mention "Military Painters". The Ottoman state is clearly based on the military plan, and this is also the area where it is most sensitive. The reorganization of the military order in the direction of westernization led to the establishment of military schools with the name of Mühendishane-i Bahr-i Hümayun (1773), followed by Mühendishane-i Berri-i Hümayun (1793). These schools and military officers, such as the Harbiye (1831), were

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later turned into artistic studies in the hands of their talents and created a military painter who is unprecedented in the world (Tansuğ, 1993: 11).

Some artists, military or civilian school graduates who make their paintings using the photographs taken by Abdullah Brothers[17], the first famous photographer of Istanbul, are much unknown to life stories, and they come as a unique group in 19th century painting activities. These artists, such as Hüseyin Giritli, Hilmi Kasımpaşalı, Fahri Kaptan, Necip, Selahaddin, Salih Molla Aşkî, Ahmet Bedri, Münip, Ahmet Şekûr, Ahmet Ziya Şam, İbrahim, Mustafa, Şefik, Şevki, Osman Nuri are known as one, two or three paintings (Tansuğ, 1986: 85).

In the 19th century, the strong representatives of the new understanding of painting towards the West became artists who were sent to painting education in Europe. After the Tanzimat the innovative sultans Sultan Abdul Mecid and Abdul Aziz sent these artists to Paris for education as well as established a school under the name of Mekteb-i Osmanî in Paris in order to educate them and the school which served between 1860-1874, it was obtained. There are records of the paintings of the painters, such as Ferik İbrahim Pasha (died in 1891), Hüsnü Yusuf Bey (died in 1861) and Ahmed Emin Bey (died in 1891) who were sent abroad during Abdul Mecid period, as well as canvas paintings (Bağcı et al., 2006: 301). In addition to all these artists who made up the Ottoman art scene, we can also consider Şeker Ahmed Pasha (Ahmed Ali died in 1907), who was first educated at the Academy of Fine Arts at Mekteb-i Osmani and later at the Paris Fine Arts Academy, as the pioneer of these painters. Şeker Ahmed Pasha, attracted the attention of Sultan Abdul Aziz at the 1867 Paris World Fair, was appointed as a minister in his turn and was also commissioned to create a collection of paintings at the same time. Şeker Ahmed Pasha also organized the first collective art exhibition in Istanbul in 1873 (Bağcı et al., 1996: 301-302).



Figure 5: Otoportre (Self-portrait), Date unknown
Şeker Ahmed Paşa (Şeker Ahmed Pasha)
Oil on canvas
116x84 cm.

17 It is the commercial name of Vicen (1820-1902), Hovsep Abdullahyan (1830-1908) and Kevork (1839-1918) brothers, all of whom are Armenian-renowned as the founders of the art of photography in Turkey. In 1858 a photographer shop was opened in Istanbul near Tunel. They were rewarded by Abdul Aziz and Abdul Hamid II with the title of artist painter (painter of the sultan).

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Another painter who went to Paris and studied was Süleyman Seyyid (died in 1913). Süleyman Seyyid's soft brush technique and strong light use, which are mostly known for their still life but also have scenes, figurative paintings and portraits, draw attention. Both Şeker Ahmed Pasha and Süleyman Seyyid depart from the 19th century viewers who took photographs or engravings as examples (Bağcı et al., 1996: 302). From Turkish painters who went to Paris for the first time, Şeker Ahmed Pasha and Süleyman Seyyid's naturalism and Barbizon School's[18] orientation to the landscape are linked to the world of art from 1860-70, as well as their own worldviews. They have become spectators of Courbet's image (Germaner, 1999: 119). Another representative of the painters who studied in Paris is Halil Pasha (died in 1939). His distinction from his other is that he is closer to the impressionist painting with his vibrant colors, thick brush strokes, flickering light stains (Bağcı et al., 1996: 303).

Osman Hamdi Bey (died in 1917) is another artist who had not attended military school in the second half of the 19th century but had studied in Paris. Osman Hamdi, who is also an archaeologist and founder of both the Archaeological Museum and Sanayi-i Nefise Mektebi, has a privileged place in Ottoman art. The greatest contribution of Osman Hamdi Bey, who is the forerunner of figurative illustration and portraiture, is that he has placed human beings, especially women, in monumental dimensions. In Paris he was influenced by orientalist movement and used Ottoman decorations and clothes in his paintings. But like European Orientalists, he has not tried to create a mysterious Eastern world of imagination. Realistic decorations and people are part of the Ottoman culture. Osman Hamdi established the School of Industry in 1883 and established the institution of painting education. Painters studying here will bring more innovative trends to painting in the early 20th century. Most of these painters will continue their activities during the Republican period and will accelerate the republican era (Bağcı vd., 1996: 303).



Figure 6: Osman Hami Bey

The Ottoman artist who went to Paris met a metropolis that attracted the pain of industrialism unlike orientalists who were fascinated by the mystical life of the eastern cities. For the first time, they discovered the existence of

18 The Barbizon School is used to describe the landscape picture style of the 19th century, which was applied by a French painter group between 1830 and 1870. It is from the Barbizon village near Fontainebleau (France) where the painters of the school come together. Among the leading names of the Barbizon school are Jean-Baptiste Camille Corot, Théodore Rousseau, Jean-François Millet and Charles-François Daubigny. Barbizon painters were part of the road to reality when romanticism prevailed in visual arts.

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great museums, galleries and intense art scene. While European artists working in the east gradually moved away from academic education and valid rules, the Ottoman artist found himself in a new style of workshop education (Germaner, 1999: 119).

Some Ottoman painters who did not go to Europe also took an important place in the history of painting. They seem to be influenced by Orientalist painters who came to Istanbul. For example, Hüseyin Zekai Pasha (died in 1917) was known for his landscaped buildings. Ahmed Ziya Akbulut (died in 1938), who made the same kind of paintings, wrote two books on the perspective of Amel-i Menâzır and Ameliye-i Fenn-i Menâzir (Bağcı et al., 1996: 303). Hoca Ali Rıza (1857-1930) was the painter who attracted attention with the innovative style of 19th century Turkish painters who had not been educated in Europe. As a matter of fact, Hoca Ali Rıza and Halil Pasha, Şeker Ahmed Pasha and Süleyman Seyyid form the bridge between the painters who brought impression of Turkish painting to the beginning of the 20th century (Renda, 2002: 952-953).

Conclusion

It is pointed out that Western figurative painting was first introduced by Italian Gentile Bellini under the rule of Mehmed the Conqueror in the researches on Turkish art history and development of Turkish painting. Accordingly, it is known that portraits of Selim III, Mahmud II and their successors were created as a part of portrait painting of sultans. However, the depiction of public, scenes from daily life, ceremonies, feasts, cafes etc. in the imperial territories started in the 19th century and it gained. This process is included in Turkish painting history as "arrival of Western painting to Ottoman Empire or Turkey".

It is consequently known that numerous European artists arrived in Ottoman territories in the 19th century and some of them came upon the court invitation and some of them were residing in Istanbul for work. In all these developments, it is possible to say that the contribution of Turkish artists as well as European or foreign artists in the development of the Ottoman art scene and in the establishment of art in the Western sense is possible. It is the "art" that is able to effect and spread quickly and easily among the societies. Collecting the source of art, together with being connected to the culture structure of the powerful society, has freedom and individuality depending on it (Cezar, 1971: 2). In the 18th century and the first half of the nineteenth century, which constituted the first period of Westernization in the Ottoman Empire, art traces a culture change that new conditions pose. In this environment, it can be seen that both in architecture, in the field of painting, Western forms are adopted to a great extent, and in some places they are copied and copied in some places. The miniature, the sole dominant species of Turkish painting, has also gradually left its place in the Western sense (Renda, 1977: 193).

As a result, the 19th century Ottoman culture-art scene emerged as a result of the co-productions of foreign and Turkish artists and the influence of these artists in the 20th century. In the formation of contemporary Turkish art lies the tradition of Turkish painting which comes from the miniature tradition and completes the evolution with Western artifacts.

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ENVIRONMENTAL-MAFIA. THE ROLE OF LITERATURE IN EDUCATION IN ENVIRONMENTAL EDUCATION PROJECTS.

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Abstract: The judicial systems of many countries contemplate the notion of "environmental crime". A crime always involves suffering; then, through the notion of environmental crime, the law recognizes the existence of a pain inflicted to the entire Earth. A narrative focused on "Environmental Crimes" allows readers to experience (virtually) this "pain of the planet." The purpose of this intervention is to illustrate how the thriller, thanks to the identification mechanisms, may contribute to the formation of an "environmental consciousness" able to feel empathically the planet's pain and prevent it. In other words, it is assumed that fiction can play an important role in environmental education projects.

Keywords: environmental education, fiction, .

Introduction

My aim is to analyze the role of literary fiction in the definition of massive environmental sensitivity. To explain the problem I'll start from a text by one of the most famous contemporary Italian writers: Roberto Saviano. In his non-fiction novel, *Gomorrah*, Saviano illustrated the tremendous power of the economic empire of the Neapolitan Mafia, the Camorra, and for this reason he was sentenced to death by the mafia itself. In the last chapter of the book, he speaks of the "Land of Fires", of the territory where, through criminal organizations, thousands of tonnes of toxic or polluting waste are illegally disposed of. The following passage clarifies many aspects of this business, but also tells us something about social attitudes that make it possible:

> The image of a landfill, pit, or quarry is increasingly a concrete and visible synonym for deadly danger for nearby residents. The Giugliano-Villaricca- Qualiano triangle near Naples has come to be known as the Land of Fires. Thirtynine landfills, twenty-seven of which contain hazardous waste. An area with a 30 percent annual increase in landfills. When a site approaches capacity, the trash is set on fire. A tried and true method. Gypsy boys are the best at it. The clans give them 50 euros for each mound burned. The technique is simple. They circumscribe each hill with videocassette tapes, pour alcohol and gas all over it, twist the tape ends to form an enormous fuse, then move away, putting a cigarette lighter to the fuse. In a few seconds there's a forest of flames, as if they'd launched napalm bombs. They throw foundry remnants, glue, and naphtha dregs into the fire. Dense black smoke and flames contaminate every inch of land with dioxins. The local agriculture, which used to export fruit and vegetables as far as Scandinavia, is collapsing. Plants sprout diseased, and the land grows infertile. But this disaster and the farmers' rage are only the umpteenth advantage for the Camorra: desperate landowners sell off their fields, and the clans acquire new landfill sites at low— very low—costs. Meanwhile people are constantly dying of tumors.(Saviano 2008: 223)

What Saviano tells is not an absolute novelty, it is not a discovery. The " Land of Fires " is inhabited by two million people, and the mountains of garbage is plain to all: the strength of Saviano's book is not in the choice of the facts, but in the power of the word that denounces. To denounce is to make known who ought to have a fact that otherwise would be hidden, but in Italian literary practice, denouncing means, more often than not, to turn into a story not

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what is concealed but what has been circulating for a long time in the vox populi, as if the reality, to be really such, needs a sort of literary consecration.

«The world was so recent – writes Garcia Marquez in *One hundred years of solitude* - that many things lacked names, and in order to indicate them it was necessary to point». So, the literature of denunciation has this function, that of providing a vocabulary to reality. Literature does not disclose the world of environmental disasters, but it does make this world within us not only in a rational but emotional way: literature, through the mechanism of imitation, forces us to suffer together with the planet who suffers and this suffering is the starting point for any environmental education project. To make this statement clearer, we read again a passage from Saviano:

> The bosses have had no qualms about saturating their towns with toxins and letting the lands that surround their estates go bad. The life of a boss is short; the power of a clan, between vendettas, arrests, killings, and life sentences, cannot last for long. To flood an area with toxic waste and circle one's city with poisonous mountain ranges is a problem only for someone with a sense of social responsibility and a long-term concept of power. (Saviano 2008: 214)

> I once decided to cross the Land of Fires on foot. I tied a handkerchief over my mouth and nose, the way the Gypsy boys do when they set fires. We looked like a gang of cowboys in a desert of burned garbage. I walked through lands devoured by dioxins, dumped on by trucks, and so gutted by fire that the holes would never completely be erased. The smoke around me wasn't dense, but more like a sticky patina on the skin, making me feel damp. Not far from the fires was a series of houses, each one sitting on an enormous X of reinforced concrete. Homes resting on closed landfills and unauthorized dumps, their potential exhausted now that they'd been filled to the point of exploding and everything combustible had been burned. Yet the clans managed to reconvert them to building zones. After all, officially they were pasture and farmlands. And so they built charming clusters of small villas. The terrain was unstable, however; landslides could occur and chasms suddenly open, so a fretwork of reinforced concrete propped up the dwellings, securing them. The houses were affordable. Everyone knew they were standing on tons of trash, but given the chance to own their own home, office clerks, factory workers, and retirees don't look a gift horse in the mouth. (Saviano 2008: 224)

These words make us realize that the first obstacle to the path of environmental education is the failure to acknowledge the danger. So are the bosses of the mafia who scatter poisons in their own land, as ordinary citizens who build their homes on that land, place the times of ecological apocalypse, but also the shorter ones of the inexorable decline of a circumscribed territory, outside of the temporal horizon of their lives; they are convinced that the consequences of their acts will not concern them, nor their children, and even think that so far distant consequences are not even related to their gestures and that maybe in the meantime someone will find the way to clean where they are got dirty.

The first idea to be fought in a process of environmental empowerment is the idea that the environment is not a part of our life, which is something strange to it. Literary imitation works in the opposite direction, bringing within our lives and our experience something that does not belong to us. If we read the Odyssey, The sufferings of a Greek warrior thousands of years ago become our sufferings: we are anxious for him, we wonder if he will ever return to Ithaca, We wonder if he will ever return to Ithaca, if he will ever embrace Penelope again, and if, after returning home, he will be able to defeat the Proces that occupy the palace and make an attempt on the bride's virtue. We do not have the same emotional attitude when we read a book of Greek history; rational thought allows us to understand the lives of men who lived in such a great distance in time and space, but it is the emotional intelligence that makes us grasp Ulysses' modernity, which makes us understand that Ulysses are us. Likewise, we can read dozens of essays on the dramatic situation of pollution, but only when the environment becomes a character of a story we feel its closeness to our existence: the empathic power of fiction is even stronger than reality and physical proximity.
Siri Hustvedt says:

> Fictions are born of the same faculty that transmutes experience into the narratives we remember explicitly but which are formed unconsciously. Like episodic memories

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> and dreams, fiction reinvents deeply emotional material into meaningful stories, even though in the novel, characters and plots are not necessarily anchored in actual events. And we do not have to be Cartesian dualists to think of imagination as a bridge between a timeless core sensorimotor affective self and the fully self-conscious, reasoning, and/or narrating linguistic cultural self, rooted in the subjective–intersubjective realities of time and space. Writing fiction, creating an imaginary world, is, it seems, rather like remembering what never happened. (Hustved 2011: 195)

Fiction as "Futur studies"

As we have seen, the first element necessary for environmental education is the projection to a future that is not our individual future, but the future of a society, if not the future of all humanity. In other words, to be truly aware of environmental damage, we must look beyond the horizon of the next two generations and to do so we must use the tools of imagination, fiction or, to say, science fiction. From its origins, science fiction has divided literary criticism into two distinct factions: those who believed it a literary genre of pure entertainment and, ultimately, corruption of reality; and those who argued that the "literature of anticipation" had the ability to warn against dangers to appear in the future but generated by attitudes of the present. The latter preferred, within science fiction, a very important sub-genre that today we generally call "dystopia".

> Dystopia is an imagined place or state in which everything is unpleasant or bad, typically a totalitarian or environmentally degraded one.

The opposite of utopia
This is the definition of Dystopia offered by the Oxford dictionary.

A good example of political dystopia has been offered by Orwell's *1984*, while the end-millennium environmental dystopian imagery is surely marked by the movie *The Matrix.* The function of dystopian fiction is, for our society, very similar to that of some texts of teleological content and, in particular, is very similar to the function that has, in Christian context, the Apocalypse of St. John: the dystopia, like the Book of Revelation, are threats and warnings at the same time, they are the image of a future far away from the present time, but whose construction begins in the present or, perhaps it has already begun in the past, a building based on sin, sin against God, for believers, sin against nature, in a materialistic conception. In two thousand years, that is, in the time spent between the editing of the last book of the New Testament and the release of The Matrix, humanity has always needed to adjust its behavior basing on the narrative prefiguration of a world destroyed by evil . This is an anthropological necessity that we can not ignore in the design of environmental education interventions.

Distopian fiction says with great clarity how tomorrow's world will be if we do not modify our environmental behaviors today.And here's how, in 1973, a great Italian writer, Italo Calvino, who had never been to China, imagined the Chinese cities of the future:

> The city of Leonia refashions itself every day: every morning the people wake between fresh sheets, wash with just-unwrapped cakes of soap, wear brand-new clothing, take from the latest model refrigerator still unopened tins, listening to the last-minute jingles from the most up-to-date radio.
>
> On the sidewalks, encased in spotless plastic bags, the remains of yesterday's Leonia await the garbage truck. Not only squeezed rubes of toothpaste, blown-out light bulbs, newspapers, containers, wrappings, but also boilers, encyclopedias, pianos, porcelain dinner services. It is not so much by the things that each day are manufactured, sold, bought that you can measure Leonia's opulence, but rather by the things that each day are thrown out to make room for the new. So you begin to wonder if Leonia's true passion is really, as they say, the enjoyment of new and different things, and not, instead, the joy of expelling, discarding, cleansing itself of a recurrent impurity. The fact is that street cleaners are welcomed like angels, and their task of removing the residue of yesterday's existence is surrounded by a respectful silence, like a ritual that inspires devotion, perhaps only because once things have been cast off nobody wants to have to think about them further.
>
> Nobody wonders where, each day, they carry their load of refuse. Outside the city,

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> surely; but each year the city expands, and the street cleaners have to fall farther back. The bulk of the outflow increases and the piles rise higher, become stratified, extend over a wider perimeter. Besides, the more Leonia's talent for making new materials excels, the more the rubbish improves in quality, resists time, the elements, fermentations, combustions. A fortress of indestructible leftovers surrounds Leonia, dominating it on every side, like a chain of mountains.
>
> This is the result: the more Leonia expels goods, the more it accumulates them; the scales of its past are soldered into a cuirass that cannot be removed. As the city is renewed each day, it preserves all of itself in its only definitive form: yesterday's sweepings piled up on the sweepings of the day before yesterday and of all its days and years and decades.
>
> Leonia's rubbish little by little would invade the world, if, from beyond the final crest of its boundless rubbish heap, the street cleaners of other cities were not pressing, also pushing mountains of refuse in front of themselves. Perhaps the whole world, beyond Leonia's boundaries, is covered by craters of rubbish, each surrounding a metropolis in constant eruption. The boundaries between the alien, hostile cities are infected ramparts where the detritus of both support each other, overlap, mingle.
>
> The greater its height grows, the more the danger of a landslide looms: a tin can, an old tire, an unraveled wine flask, if it rolls toward Leonia, is enough to bring with it an avalanche of unmated shoes, calendars of bygone years, withered flowers, submerging the city in its own past, which it had tried in vain to reject, mingling with the past of the neighboring cities, finally clean. A cataclysm will flatten the sordid mountain range, canceling every trace of the metropolis always dressed in new clothes. In the nearby cities they are all ready, waiting with bulldozers to flatten the terrain, to push into the new territory, expand, and drive the new street cleaners still farther out. (Calvino 2006: 114-166)

Political dystopia and enviromental dystopia: are they differents things?

Speaking about dystopian fiction we have said that it is generally of two types: political and environmental. But are these really two different categories?? What Calvino proposes to us in his *Invisible Cities* is surely an apocalyptic scenario from an environmental point of view, but this scenario is made possible by political choices. Political choices make possible the city-dump of Agbogbloshie, Ghana, or Guiyu in China. At the Agbogbloshie dump there are about 40,000 people, most of whom are young people: they spend their lives in waste, drink polluted water and breathe the smoke of combustion of electrical insulators; the incidence of cancer incidence is infinitely higher than that of any other part of the world. Much like this is the situation in Guiyu, where, as in Agbogbloshie, e-waste accumulates from all over the world: millions of old cathode-ray monitors, millions of motherboards, hard disks, and televisions. The technologically advanced world is the city of Leonia and the forgotten regions are its boundaries. But the risk of environmental education is that these places, these *waste lands*, are perceived as a natural consequence of development, as a simple container waste a bit smelly: it is not pleasant to have it close to home, but by moving it a little farther, it is more than tolerable. To avoid this risk, it is necessary for those who live in advanced areas to realize that much of the polluting waste disposal passes through the power of criminal organizations, through the Mafia. This is the true political dystopia: an international totalitarian governed by the mafias. And unfortunately this is not a dystopia, it is not political fiction, but a simple reality, albeit a little hidden. Roberto Saviano writes:

> There are two types of waste producers: those whose only objective is to save on price and who have no concern for the trustworthiness of the removal companies, considering their responsibility complete as soon as the poison leale their premises; and those directly implicated in the operations, who illegally dispose of the waste themselves. (Saviano 2008: 218)

Saviano refers to industrial waste producers, but all of us, as members of a consumer society, are waste producers, doing environmental education means creating citizens who do not belong to any of the two categories, means creating citizens interested in understanding where they end up the computers, the smartphones, the paint or the tires that we no longer use, the citizens who are not content to place the waste container away from their nose. We need to make citizens aware of the fact that waste constitutes for criminal organizations a much larger business than the drug. And this is where criminal fiction can help educational processes, showing, with all the strength that

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narrative has, what mechanisms are governing the illegal trade of hazardous waste and what are the consequences of this trade for the planet and for other human beings.

The judicial systems of many countries contemplate the notion of "environmental crime". A crime always involves suffering; then, through the notion of environmental crime, the law recognizes the existence of a pain inflicted to the entire Earth. A narrative focused on "Environmental Crimes" allows readers to experience (virtually) this "pain of the planet." It is therefore necessary to give space to a thriller sub-genre who expressly speaks of environmental crimes. In various parts of the world are emerging editorial series completely dedicated to crime story stories and these topics were dealt with important writers such as Italian Carlo Lucarelli,(2008) US Carl Hiaasen (1986) or German Frank Schätzing (2011), but there is still no serious commitment from of television producers. Television series are perhaps the most powerful "narrative education" tool we have today; as demonstrated by studies on Miguel Sabido's educational soap opera (Lozano & Singhal 1993; Nariman 1993) and those on the use of a crime series such as CSI in health prevention; it is therefore necessary for the cultural industry to promote fiction productions focusing on the fight against the environmental mafia: of course it will not be fiction to solve the waste problem, but its role will be to create a new environmental consciousness on viewers, and this is already very much.

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EVALUATION OF FIRE RESISTANCE OF GLASS FIBRE REINFORCED CONCRETE IN TERMS OF VARIOUS PARAMETERS

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In this paper, in order to improve the mechanical properties of concrete, various materials are added to the concrete mixture and researches are done in the literature. Glass fiber is one of the materials added to the fresh concrete mixture. Glass Fiber Reinforced Concrete (GFR) with glass fiber added is also used in practice. By adding glass fiber into the concrete, there are considerable increases in the bending and tensile strength of the concrete, Concretes produced in this way are preferred in practice because they are thinner. In this study; By experimentally measuring the mechanical properties of GFR elements for various fire durations, The GFR elements of the temperature and the effect of the glass fiber in the interior depends on their mechanical properties and external factors. Moving from this motivation; Effect of glass fiber admixture at different ratios on concrete strength, The mechanical properties of the GFR elements will be investigated experimentally by exposure to fire for different durations.

Keywords: Concrete, Glass Fiber Reinforced Concrete, Mechanical Property, Fire.

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EVALUATION OF POLYETHYLENE BASED INSULATION MATERIAL IN TEXTILE DYEING MACHINES

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Abstract: Energy efficiency efforts are getting more importance in accordance with the better understood of the sustainable development in all over the world. Accordingly improvements of the energy efficiency, reducing energy intensity both sectoral and macro-level are primary components of Turkish national energy policy. Textile sector has a significant share in the production and export industry of Turkey. A significant percentage of heat energy is being lost in the dyeing processes through wastewater, equipment surfaces, and exhaust gasses. These energy losses can be reduced via an efficient isolation of the machinery. The subject of this study is to evaluate the energy-saving efficiency of a highly cross-linked polyethylene foam insulation material in textile dyeing machines. Dyeing machines are heated to 130°C and cooled again during the process. 27% heat saving was achieved after 48 tons of dyed fabric in 20 days of trial period.

Keywords: textile finishing sector, energy saving, heat loss, isolation

Introduction

Energy is one of the main factors of economic and social development and indispensable input of the production. Accordingly, energy demand is continuing to increase in all over the world due to the factors such as population growth, improving technology and trends for rising life qualities. Projection studies indicate that in case of the continuation of current energy policies, global energy demand will reach about 1.5 times of 2014 value in 2040 by 1.4% annual increase ratio (from 13.68 Mtoe to 19.64 Mtoe) (EUAŞ, 2014, IEA, 2016). On the other hand, the largest contribution of fossil fuels to the energy supply, corresponding climate change problem, the increase in the energy costs and the depletion risks of the fossil fuels make necessary the efficient use and saving of energy.

Energy efficiency is defined as the reduction in the energy consumption per unit or product amount without leading to the decrease of the living standard and service quality in buildings and the production quality and the amount in industrial enterprises (Url-1). It is a growing policy priority for the most of the countries around the world and widely recognized as the most cost-effective and readily available. That means to address energy security, the social and economic impacts of high energy prices, and concerns about climate change (Url-2). The policies on the energy efficiency are required to be sensitively discussed because of its direct relation to the economic growth and social development objectives' sustainability and its key role played in reducing the total greenhouse gas emissions.

Reducing energy intensity both sectoral and macro-level is significant and primary components of Turkish national energy policy. Turkey's 2023 national strategic objectives and energy policies include providing energy demand safety, reducing the external dependence risks, the sustainability of the energy costs, protecting the environment and increasing the efficiency of the struggle against the climate change, those all fulfill the national strategic targets of Turkish energy policy (Url-3). Consequently, energy efficiency should be improved in all stages from energy production to the consumption at the end users. Through the energy efficiency studies, it is aimed to be reduced energy intensity of Turkey (energy consumed per national income) as 20% until 2023 compared to 2011 (Official Gazette, 2012).

Textile sector has a significant share in the production and export industry of Turkey. The number of the enterprises and the employees correspond to about a quarter of the manufacturing sector whereas value added has 16% share as given in Table 1 (MoDev, 2014). Besides it has been mentioned as the 3rd most energy-intensive sector after iron-steel and cement industries in Turkey (Alkaya and Demirer 2014, Ozturk, 2005).

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Table 1: The shares of textile and ready to wear sectors in Turkish production industry, % (MoDev, 2014)

Number of enterprises	23,3
Number of employees	26,3
Production values	14,9
Value-added	15,5

Energy cost corresponds to 8-12% of the total production cost in the sector (Gümüşderelioğlu, 2009, Koç University, 2012, Palamutçu, 2010). On the other hand, the most demanded energy type that is more than 80% of the total demand is the heat energy in the textile industry. Approximately 50% of this energy is lost through wastewater, the surface of the machines and exhaust gases those indicate the most energy saving potential (Moser and Schnitzer, 1985, Yamankaradeniz. et. al, 2007, Url 4). Besides, in a globalizing world, the increasingly difficult competitive conditions necessitate a reduction of the production costs.

The aim of this study is to evaluate the energy-saving efficiency of a highly cross-linked polyethylene (PE) foam insulation material used on the dyeing machines in a textile finishing sector. This is one of the initial studies on prevention of heat losses for dyeing machines including also cooling processes. In this study, the cost and the energy saving potential of glass wool and polyethylene based insulation materials are compared for reducing heat losses in dyeing machines.

Materials and Methods

The finishing processes in the factory include dyeing with machines those are heated to 130°C and cooled again. The most of the energy cost comes from heating processes in textile finishing sector. Stainless steel made machines are used and during the whole process, significant heat is lost mainly at the surfaces. A typical dyeing machine is given with Figure 1.

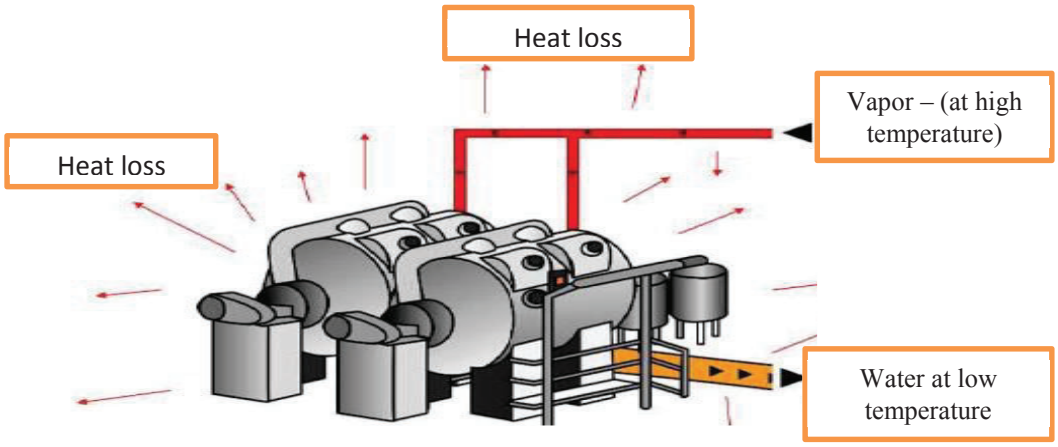

Figure 1. Typical dyeing machine

Corrosive chemicals are used with water in the processes. Therefore, the use of chemical resistant isolation materials is essential. Currently, 26% of heat saving is achievable with some of the machines those are isolated with silicone coated glass fiber and glass wool blended material in the factory. Due to no adhesive property, this material can only be applied via roping or snap fasteners to the machinery. Therefore, it can not be applied to the small joints of the machines, on the surfaces where the shapes are changing, and recess ledges of the machines, where all cause the most energy losses. Furthermore, the insulation material is susceptible to water and especially to the chemicals used in the process consequently, deformations began to occur at the end of the first year and it needed to be totally changed at the end of the second year. Therefore, more corrosive resistant isolation materials are needed to be used.

In this study highly cross-linked polyethylene foam material is used as an alternative to the silicone coated glass fiber and glass wool blended material for the isolation of dyeing machines. The material has adhesive property thus whole machine surfaces even recess ledges and small joints of the machines can be isolated. Applying is quite simple it can be applied on the machines by steam or hot water and efficiently block the heat transmission. Due to the high thermal insulating property, heat and a great chemical resistance much energy saving and long lasting isolation are expected. Moreover, it can be cleaned easily.

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Three types of dying machines having same technical properties with 900 kg capacities were used in the trials. These are:

1. without isolation; as the reference case
2. isolated with silicone coated glass fiber and glass wool blended material
3. isolated with highly cross-linked PE foam material. (Fig.2-4).

The same process conditions were set for all the machines and the saved energy was compared to both insulation materials in order to determine the material that is more long lasting and can provide energy saving more. Energy saving was evaluated basing on the steam and cooling water consumption of the machines. Measurements were made 20 working days for all the shifts (3 shifts in a day). Cotton-polyester dyeing and cotton dyeing processes were tested. The outer surfaces of the dyeing machines and machinery temperatures were measured with thermal cameras to see the heat losses and the results are given in Fig. 5. Hot surfaces indicate the places of the energy losses. The values have also been verified with the actual temperatures on the machines.



Figure 2. Dyeing machines without isolation

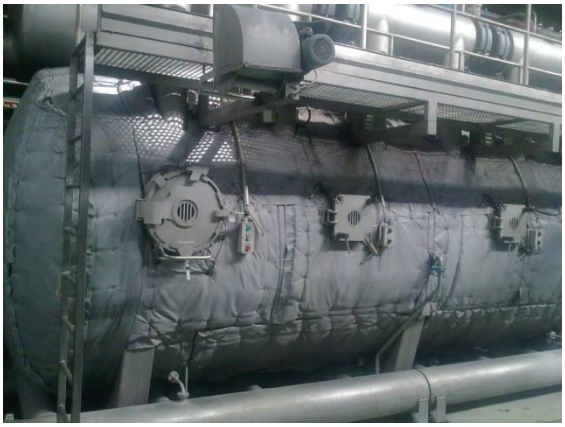

Figure 3. Dyeing machines isolated with silicone coated glass fiber and glass wool blended material



Figure 4. Dyeing machines isolated with highly crosslinked polyethylene foam manufactured insulation material

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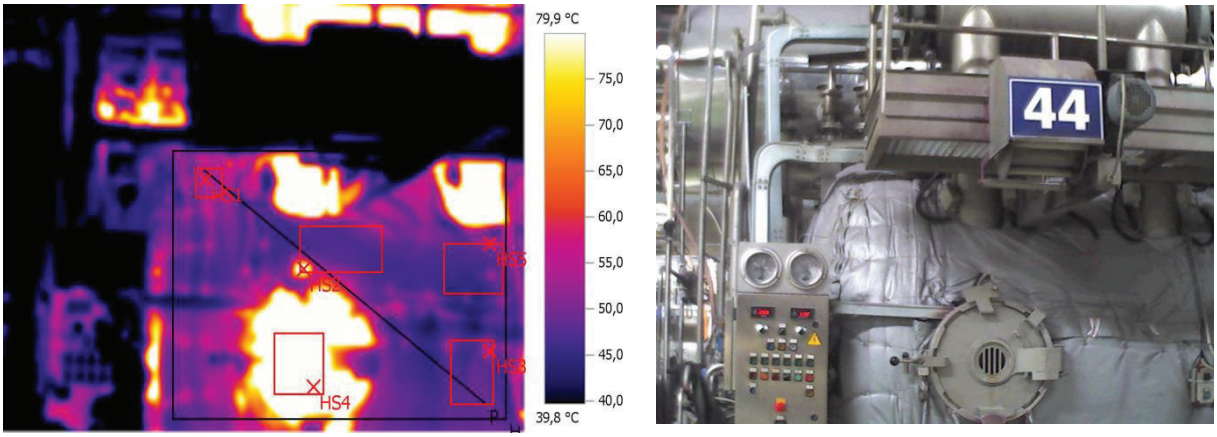

Figure 5. Thermal camera views of the machines

Due to the cooling times of the machines change, recipes are also checked if any changes are needed for the evaluation of the isolation material.

Results and Discussion

At the end of the 20 days, approximately 48 tons of fabric was dyed during all the trials (60 trials). The unit steam consumptions (kg steam/kg fabric) were compared for the same garment dyeing processes in the tested machine types and results are with Figures 6-7.

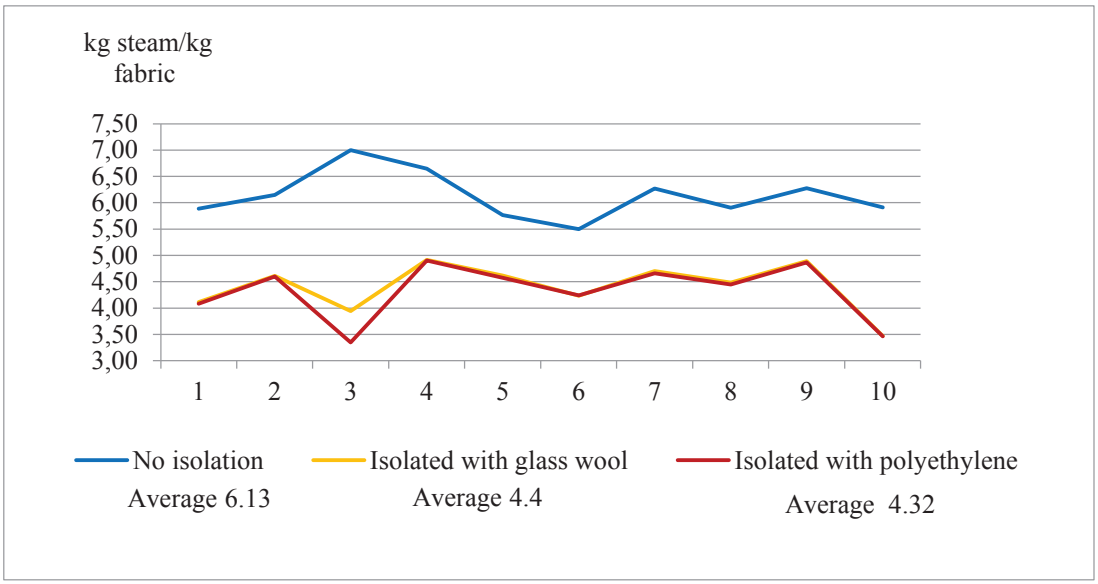

Fig.6: Unit steam consumption in the cotton-polyester dyeing process

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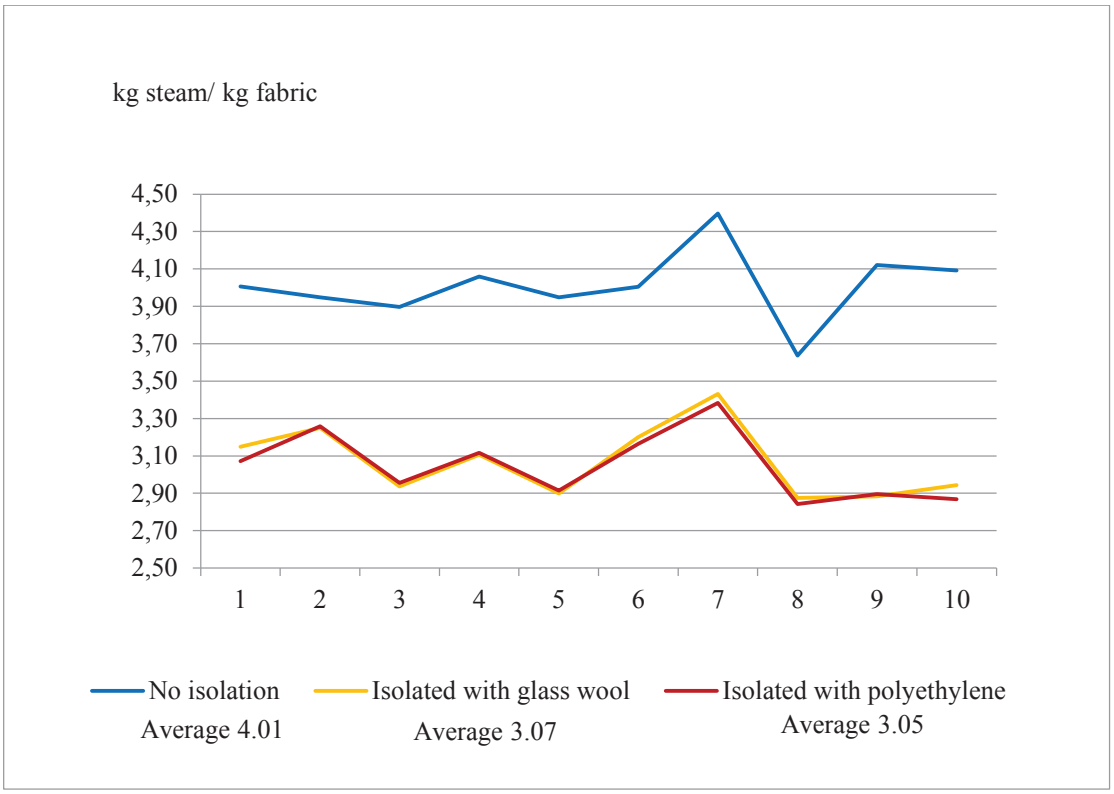

Fig.7: Unit steam consumption in the cotton dyeing process

The results indicate the energy saving with:

- the silicone coated glass fiber and glass wool blended material is: 25.76%.
- highly cross-linked polyethylene (PE) foam insulation material is: 26.6%.

in the tested machines. The energy saving potential seems similar for both materials. 62,416 tons of steam is consumed in 2015 in the machine isolated with glass wool material, whereas 16,072 tons of steam was saved which corresponds to the approximately steam consumption of 3 months in the factory. PE material was used 18 months in the factory, and no deformation was observed. This also indicates the long-lasting property of PE based insulation material. On the other hand, the unit steam generation costs are 11,4 USD/ton steam generation via domestic coal and 22,73 USD/ton steam generation via natural gas. The annual cost savings for the steam generations are approximately 183 thousand USD if domestic coal with 4000 kCal/kg calorific value is used for the steam generation, whereas it is approximately 365 thousand USD if natural gas is used. The results also indicate that there was no change for cooling time and the amount of cooling water in the tested machines; there were all about 302 thousand liters.

Conclusion

In this study, silicone coated glass fiber and glass wool blended and highly crosslinked polyethylene foam manufactured insulation materials are compared for reducing heat losses in textile dyeing machines in the context of the cost and energy saving potentials. The factory has used the silicone coated glass fiber and glass wool blended material on some of the dyeing machines and 26% of heat saving can be achieved. Totally 48 tons of fabric was dyed during 60 trials in the same process conditions of two types of isolation systems and a reference case of no isolated machine. The results indicate the energy saving potential seems similar for both isolation materials; however, for reducing the energy losses polyethylene foam material was determined as more long-lasting isolation material since after 18 months no deformation was observed, whereas glass fiber and glass wool blended material deformed after 12 months. Furthermore, PE material can be cleaned easily and the application is quite simple due to its adhesive property. Since the cooling time of the processes did not change, recipe changes are not needed. Energy costs can be reduced at least 15% annually after isolation which corresponds to 183 thousand and 365 thousand USD compared to coal and natural gas use, respectively.

The results of this study may contribute to mitigate the energy losses at dyeing machines used in the textile sector which has been mentioned as the 3rd most energy-intensive sector with 16% of value added in Turkish production industry. Accordingly, the energy that is the main cost of the manufacture can be reduced.

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Since this is one of the initial studies on saving heat energy at dyeing also including cooling processes an important know-how is gained for the sector. These applications are intended to be representative to the similar factories. The results may also spread to the dye-houses in Turkey ensuring serious energy savings and may guide to the dyeing machine producers for the new design of the machines.

Acknowledgements

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FACIAL COMPONENT SEGMENTATION USING CONVOLUTIONAL NEURAL NETWORK

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Abstract: Facial components are important for many face image analysis applications. Facial component segmentation is a challenging task due to variations in illumination conditions, pose, scale, skin color etc. Deep learning is a novel branch of machine learning, very efficient in solving complex problems. In this study, we developed a deep Convolutional Neural Network (CNN) to automatically segment facial components in face images. The network has been trained with face images in Radboud face database. Training labels have been created using Face++ SDK. The developed CNN produces a segmentation mask where mouth, eyes, and eyebrows components of the face are marked as foreground. We have focused on these components because they can include very important information for facial image analysis studies such as facial expression recognition. The segmentation success rate of the study is 97.96 % according to jaccard index, 99.47 according to true-positive rate and 98.01 according to average accuracy.

Keywords: Convolutional Neural Network, Deep Learning, Facial Feature Extraction, Facial Image Segmentation

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Introduction

Face image analysis tasks such as facial expression recognition, face recognition, face verification etc. have many practical uses in security (Moniruzzaman & Hossain, 2015), traffic (Maralappanavar et al., 2016), and healthcare (Bevilacqua et al., 2011) fields. Facial feature extraction is a fundamental but challenging step in face image analysis because of variations in illumination conditions, head pose and scale, skin color, and other factors such as occlusions, complex backgrounds, etc.

Two main categories of facial feature study and description are holistic description and local feature-based description (Li et al., 2017). Holistic approaches treat and investigate faces as a whole. Principle component analysis (PCA) (Chengjun Liu, 2004) linear discriminant analysis (LDA) (Linsen Wang et al., 2015) and independent component analysis (ICA) (Kwak & Pedrycz, 2007), are common methods for holistic face description. Local feature-based approaches analyze and describe a face in terms of its parts/components rather than as a whole. That can be beneficial for some situation, such as occlusion (Li et al., 2017).

Detection and interpretation of facial components are difficult tasks because of variations in shape, size, appearance, and relative positions of the facial components. Recently, numerous facial feature extraction methods have been proposed. Fang et al.(Fang et al., 2017) proposed a novel partial differential equation based method for facial feature learning. Perakis et al. (Perakis et al., 2014) provided a novel generalized framework of fusion methods for landmark detection. Gong et al. (Gong et al., 2017) presented a new feature descriptor for heterogeneous face recognition. Das et al. Ding et al (Ding et al., 2014) introduced a new color balloon snake model for face segmentation in color images.

Deep learning catches the attention in machine learning and computer vision area because of its outstanding performance. In deep learning approaches, features are learned automatically and complex connections of the data can be resolved (Krizhevsky et al., 2012). Recently deep learning methods have been very popular in face analysis studies such as facial age estimation (Liu et al., 2017), facial beauty prediction (Xu et al., 2017), face detection (Triantafyllidou & Tefas, 2016), face recognition (Zeng et al., 2015), and facial expression recognition studies (Zhang et al., 2017). For instance, Liu et al. (Liu et al., 2017) presented a group-aware deep feature learning approach that learns discriminative face representation for facial age estimation, Ding et al.(Ding & Tao, 2015) proposed a deep learning framework to jointly learn face representation using multimodal information, Mukherjee et al.(Mukherjee & Robertson, 2015) presented a CNN based model for human head pose estimation in low-resolution multi-modal RGB-D data, Fan et al. (Fan & Zhou, 2016) presented a CNN structure for facial landmark localization.

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This paper presents a deep learning approach to automatically segment facial components in face images. Viola & Jones face detection algorithm (Viola & Jones, 2001), has been used for face detection and cropping in the database images. We have developed a deep convolutional neural network (CNN) for segmentation of facial components in cropped face images. The network has been trained with face images and corresponding binary facial component masksmarking mouth, eyes, and eyebrows regions of the face. Training masks have been created using Face++ toolbox (Face++, 2017), postprocessing, and visual inspection. These specific components were selected because our ultimate goal is facial expression recognition and mouth, eyes, and eyebrows play and important role in facial expression formation (Lin Zhong et al., 2012).

The rest of the article is structured as follows. Section 2 gives details of the system. Section 3 presents the experimental results. Finally, Section 4 compiles the results of the study and makes suggestions for future studies.

Proposed System

The proposed processing pipeline consists of three steps: (1) face cropping, (2) training data generation, and (3) development, training, and testing of a convolutional neural network (CNN) architecture. Block diagram of the proposed pipeline is shown in Figure 1. Training and testing images are first cropped by Viola&Jones face detection algorithm (Viola & Jones, 2001). Cropped images are then used for training data generation and facial component segmentation as follows.

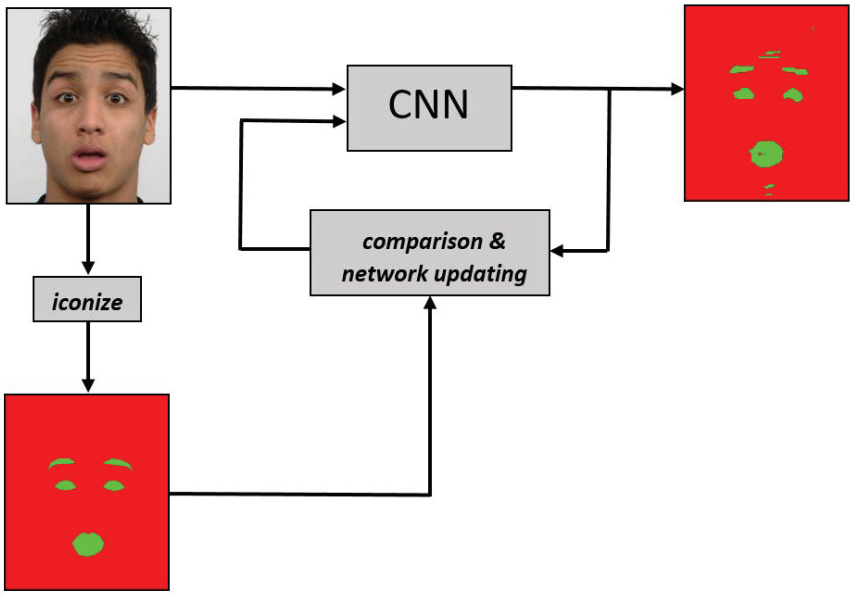

Figure 1. Proposed System

a) Training Data Generation

We have created training masks for facial component segmentation using Face++ SDK (Face++, 2017). The Face++ SDK detects 83 keypoints on human face. With the help of these keypoints, we have created close shapes on human eyes, eyebrows and mouths by polygon fitting to the detected landmark points. Finally, the input images have been iconized. These steps can be seen in Figure 2.

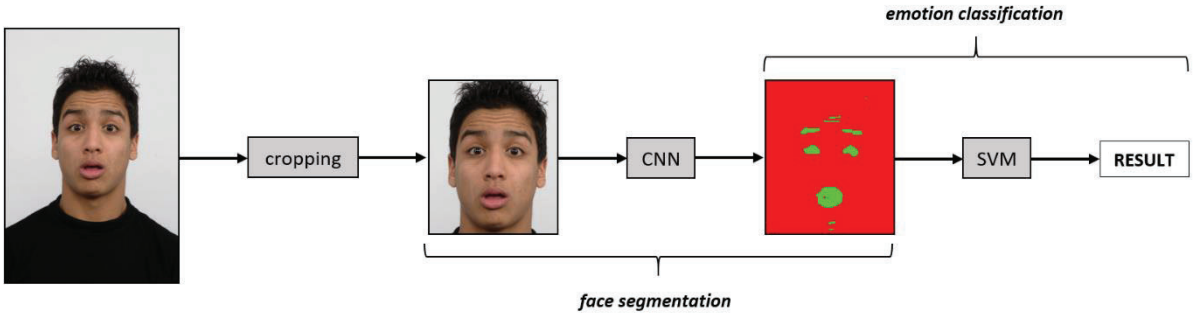

Figure 2. Training data generation steps

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b) The Proposed CNN Architecture

We have developed a CNN structure to segment mouth, eyes and eyebrows component in face images. Segmentation is done by classifying 16x16 blocks on the image as background versus facial component. The proposed CNN architecture consists of one batch normalization layer, four convolutional layers (two layers with 16 5x5 filters, one layer with 32 5x5 filters and one layer with 32 4x4 filters), two pooling layers, and one fully connected layer. Training is done with 16x16 non-overlapping blocks extracted from the training image. It has been obtained 345600 blocks totally. Blocks are assigned a training data label based on the percentage of pixels from facial components and background classes. Blocks having 80% or more of their pixels from facial components or background classes, are kept for training, remaining 3018 mixed class blocks are removed from training. 7132 facial components blocks and 335450 background class are obtained.

Testing is done by feeding the whole image to efficiently simulate sliding window processing using the sliding window processing method described in (Shelhamer et al., 2016). Figure 3 illustrates the proposed CNN architecture. Table 1 shows kernel size, number of filters, and input and output size for each convolution layer.

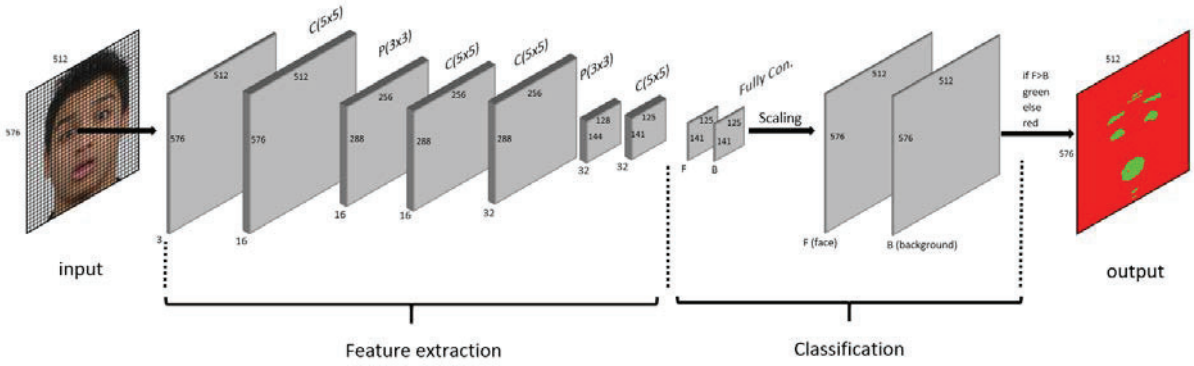

Figure 3.Proposed CNN architecture

Table 1: Detailed layer information for the proposed CNN

Layer	Kernel	Filter	Input	Output
Conv1	5x5	16	576x512x3	576x512x16
Conv2	5x5	16	288x256x16	288x256x16
Conv3	5x5	32	288x256x16	288x256x32
Conv4	4x4	32	144x128x32	141x125x32

Experiments

Radboud Face Database (Langner et al., 2010) has been used for training and testing of the proposed network. The images have been resized to 512x576 pixels in order to avoid partial blocks. 335 images have been used for the study (300 for training and 35 for testing).

We evaluated our segmentation results in terms of accuracy, true-positive rate, and Jaccard index as shown in Table 2, where TP, TN, FP, and FN refer to true positives, true negatives, false positives, and false negatives, respectively. As can be seen in the Table 2; our average accuracy is 98.01%, true-positive rate is 99.47% and jaccard index is 97.96. Sample test results can be seen in Table 3.

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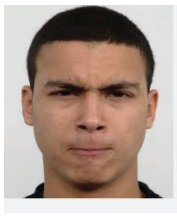
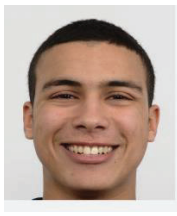
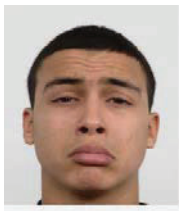
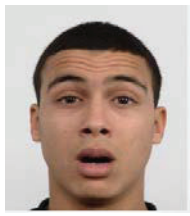
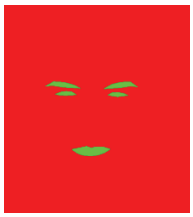
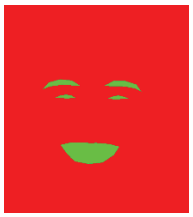
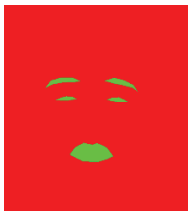
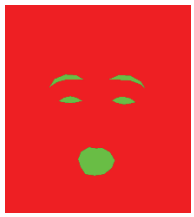
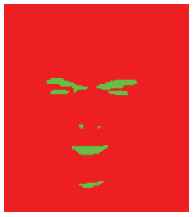
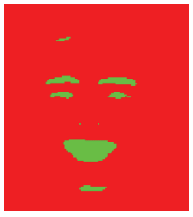
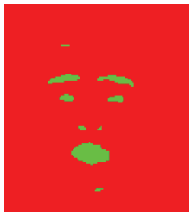
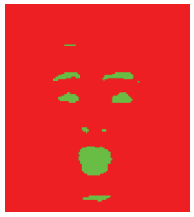
Table 2: Success rates of our study

Index	Equation	Success Rate (%)
Accuracy (Acc)	$\frac{TP+TN}{TP+TN+FP+FN}$	98.0133
True-Positive Rate (TPR)	$\frac{TP}{TP+FN}$	99.4716
Jaccard Index (JAC)	$\frac{TP}{TP+FP+FN}$	97.9676

Table 3: Sample facial component segmentation results.

Expressions	Angry	Happy	Neutral	Sad	Surprised
Original face images					
Training Data					
Segmentation results produced by the proposed system					

Conclusion

In this study, we presented a deep convolutional neural network approach for facial component segmentation. We focused on eyes, eyebrows and mouth components because these components play an important role in facial analysis studies, such as facial expression recognition and head pose estimation. Our next plan is to extend this work to facial expression recognition.

We anticipate that the iconized images obtained using the proposed pipeline will be useful to reduce data size requirements and privacy concerns.

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FACIAL EXPRESSION RECOGNITION WITH ROBUST FEATURE SELECTION

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Abstract: Facial expressions are an important part of human-machine interaction as well as playing a substantial role in human communication. Since facial expressions are significant parameters in decision making on such important issues as criminal detection, monitoring the attention of the driver and patient follow-up, automatic detection of facial expressions via systems has become a popular subject. In this study, the detection of facial expressions is aimed by selecting the robust features affecting the detection of emotions in facial images. Face++ SDK is used for locating the facial keypoints. All probable distance data between the points and ratio data between the lines have been calculated, then the robust distance, ratio and distance + ratio features affecting the expression detection has been selected by Sequential Forward Selection (SFS) method. Following this step, each robust feature vectors has been classified and their success rates have been compared. For classification, Support Vector Machines (SVM) and k-Nearest Neighbors (KNN) are used. As a result, 91% success rate has been achieved with 4 robust ratio features on SVM. In our study, in which neutral, surprised, sadness, angry, happy facial expressions have been analysed, surprised has been predicted right by 100%, happy and angry by 95%.

Keywords: facial expression recognition, robust feature selection, image analysis, machine learning

Introduction

Human behavior is the basic principle behind communication among people and is also used in human-machine interaction (Shin, 2009). As one of the keystones of inter-human communication, facial expressions reveal different combinations of facial muscles and constitute one of the variations of nonverbal communication (De et al., 2015). Mehrabian underlined that facial expression is more effective in communicating a message than words in face-to-face communication (Mehrabian, 1968). In his study, he revealed that words are 7% effective, voice tone is 38% effective, and body language is 55% effective in communicating a message.

As a noted scientist in psychology, Paul Ekman determined six innate facial expressions as universal. In their study, Ekman and Friesen sought answers to the question of which facial expressions are universal. The results of the study revealed that the emotions of anger, disgust, fear, happiness, sadness, and surprise are observed in the same way among all people (Ekman & Friesen, 1971).

Automatic detection of facial expressions via systems is among the most popular subjects studied today. Facial expression can be used in areas such as the detection of criminals via computers (Stanković et al., 2015), monitoring driver attention (Zhang & Hua, 2015), human-machine interaction (Luo et al., 2015)(Mistry et al., 2014) image understanding (Sonmez & Albayrak, 2016), artificial face animation (Thalmann et al., 1998)(Tu et al., 2004), health (Lo Presti & La Cascia, 2015), computer games (Osone et al., 2010)(Liang et al., 2004)(Zhan et al., 2008), and media (An & Chung, 2009). However, while noise occurring in facial images transferred to digital media (e.g., full or partial concealment of the face by various objects, shade formation, or low resolution) increase the difficulty of this process, ensuring real-time performance further restricts the general process.

Facial expression recognition is generally carried out under three categories (Hsu et al., 2013)(Lin Zhong et al., 2012), namely geometric-based, appearance-based, and action unit- (AU) based analysis. In the geometric-based method, shape information about the face is used. The active shape model (ASM) is an example of the geometric-based approach (Oktay, 2011). For the appearance-based approach, features of the facial tissue come into prominence. Local binary pattern (LBP) (Hung et al., 2006) is an example of this approach. The active appearance model (AAM) (Cootes et al., 1998) method uses both the geometric- and appearance-based approaches. For the

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AU-based approach, the movements of facial muscles are identified by a system called the Facial Action Coding System (FACS) (Ekman & Friesen, 1978).

The detection of facial expressions comprises four stages, namely detection of the facial area, preprocessing step, extraction of facial features, and classification of facial expressions. For facial feature extraction, principal component analysis (PCA) (De et al., 2015), (Sonmez & Albayrak, 2016), steerable pyramid decomposition (Mahersia & Hamrouni, 2015), histogram of gradients (HOG) (Ouyang et al., 2015), linear discriminant analysis (LDA) (Sonmez & Albayrak, 2016), LBP (Sonmez & Albayrak, 2016), Gabor filters (Bashyal & Venayagamoorthy, 2008)(Lajevardi & Hussain, 2009), and learning vector quantization (LVQ) (Bashyal & Venayagamoorthy, 2008) have provided successful results. For facial expression classifications, a support vector machine (SVM) is frequently used because of its successful results (Liao et al., 2013)(Sümer, 2014)(Zavaschi et al., 2011)(Valstar et al., 2011)(Bartlett et al., 2005)(Martin et al., 2008)(Littlewort et al., 2011)(Yurtkan & Demirel, 2014)(Zhang et al., 2012)(Zhang et al., 2016)(Ji & Idrissi, 2012).

In this study, the Radboud Facial Expression Database (RaFD) was used. Facial keypoints were detected on the images of the database with Face++ SDK (Face++, 2017). Of the 26 keypoints obtained, the distance to other keypoints and the ratios of these distances were calculated. The obtained distance, ratio, and distance + ratio feature clusters were analyzed by the sequential forward selection (SFS) feature selection algorithm, and strong features affecting the facial expression response were determined. Features were entered in various classifiers, and comparative results are presented in a table. This study contributes to the literature through its analysis of the features obtained from (Zhang et al., 2016)the distances and ratios of facial keypoints and high success rates in the detection of facial expressions with only four features.

The rest of the article is structured as follows. Part 2 explains the proposed method in detail. Part 3 presents the comparative experimental results in tables. Part 4 compiles the results of the study and makes suggestions for future studies.

Proposed Method

In this study, facial keypoints were detected on human face images. The distance between these keypoints and the ratios of these distances were calculated. Based on this distance and ratio data, strong features were obtained using the SFS algorithm. The obtained data were classified by means of the KNN and SVM methods, and facial expressions were detected. A block diagram of the application is shown in Figure 1.

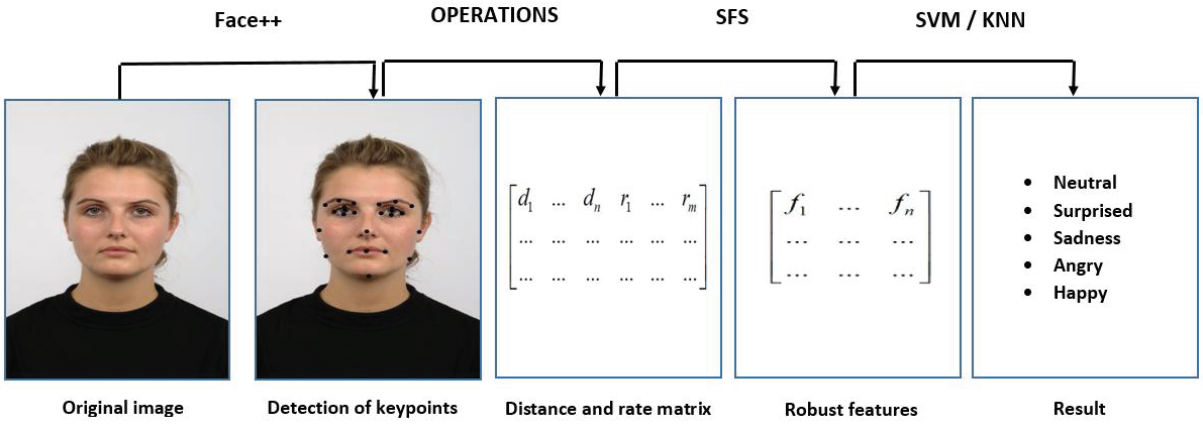

Figure 1. Proposed Method

A. Feature extraction using facial keypoints

According to psychology studies, facial expressions are formed by changes around the mouth, eyes, and nose (Lin Zhong et al., 2012). In this study, 26 points were determined and these are shown in Table 1.

The Euclidean distance of each point was calculated. The number of distance between each set of two points is calculated according to Equation 1:

$$C(n,r)=\binom{n}{r}=\frac{n!}{r!(n-r)!} \quad (1)$$

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n in Equation 1 is the total number of points (*n*=26), and the *r* value is 2 since the distance between each set of two points was calculated. Based on 325 distance data records, ratios of each distance to other distances were calculated. The number of ratio data was calculated as 52650 according to Equation 1. Information on two distances is required for ratio data. For this calculation, *n*=325 and *r*=2. Thus, 325 distance records, 52650 ratio data records, and, as the unified form, 52975 distance + ratio data records were created for each face image in the database. Since this huge number of features would create a processing load in the classification stage, features should be chosen for better detection.

To sort out the data negatively affecting the result, the obtained distance, ratio, and distance + ratio data were subjected to the feature selection process. Instead of working with all the data, the possibility of achieving the same level of success is increased by using less and more meaningful data. With the feature selection process, the load on memory and the processor is reduced. Thus, the SFS algorithm was used in this study.

A ratio and distance matrix and its unified version were analyzed separately by the SFS algorithm. As a result of the analysis, six robust features were selected from the 325 distance data records of each image. The four robust feature data were selected from 52650 ratio data. The 52975 ratio + distance data records were reduced to five features.

Table 1: Facial Keypoints and their Explanation

Facial Keypoints	Point	Explanation
	1	Chin
	2	Left ear level
	3	Left cheek level
	4	Right ear level
	5	Right cheek level
	6	Left under eye
	7	Left eye outer corner
	8	Left pupil
	9	Left eye inner corner
	10	Left over eye
	11	Left eyebrow outer end
	12	Left eyebrow center
	13	Left eyebrow inner end
	14	Mouth left corner
	15	Mouth center bottom lip
	16	Mouth right corner
	17	Mouth center top lip
	18	Nose
	19	Right under eye
	20	Right eye inner corner
	21	Right pupil
	22	Right eye outer corner
	23	Right over eye
	24	Right eyebrow inner end
	25	Right eyebrow center
	26	Right eyebrow outer center

B. Selection of the robust feature for facial expression recognition

In this study, SFS was used for the robust feature selection. The SFS algorithm was proposed by Whitney (Whitney, 1971). Classification is used in the algorithm. Although its working speed is low, its performance is high because of its capacity to analyze different feature clusters together and evaluate the relationships between features (Kaya, 2014).

The SFS algorithm begins by working with one feature vector from the feature cluster. With the help of a classifier, it scans the features, selects the best feature affecting the result with the first feature, and creates a feature cluster with two elements. Afterwards, the algorithm continues working with the same logic for the selection of a new feature from the feature cluster. This cycle continues until there is no further improvement in the classification process and ends when it reaches the present success limit. Pseudo code of SFS is as follows:

I. Create an empty set, $F_0 = \{\}$

II. Select a feature for the best result: $Z^t = \text{argmax}[J(F + Z)] \& Z^t \notin F \; k \; k$

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III. Add Z^l to the set: $F_{k+1} = F_k + Z^l$ & $k = k+1$

IV. Go to II

C. Classification of the Facial Expression

After the determination of robust features affecting facial expression recognition, these features have to be classified. In this study, SVM (Sümer, 2014),(Beszedes & Culverhouse, 2007) and KNN (Lee et al., 2016)(Cheon & Kim, 2008)classifiers, which produced successful results in the literature, were used for the classification of facial expressions, and the success rates were compared. Since the resulting data will be used in another study on the analysis of attention, the present study was conducted for five emotions. These expressions are neutral, surprised, sad, angry, and happy.

SVM is a classification algorithm developed by Vapnik et al. based on statistical learning theory that calculates the longest distance between the classes to sort out different classes (Cortes & Vapnik, 1995)(Vapnik, 1999). SVM draws a hyperplane in the training set that maximizes the distance of the data from different classes and covers the possible largest part of the data from the same class.

SVM uses various core functions (Lee et al., 2008). These functions are linear, polynomial, sigmoid, and radial based functions (RBF). The RBF core function is mostly preferred in classification studies using SVM. According to the performance assessments, the most successful results are achieved with the RBF core (Ayhan & Erdoğmuş, 2014), so the RBF core function is used in this study.

KNN algorithm (Cover & Hart, 1967) developed by Cover et al. is a statistical and supervised algorithm. It is based on the principle of determining the class of the data by considering its distance to k number of neighbors. In the calculation of the distance between data, various methods, such as Chebychev distance, Manhattan distance, and Euclidean distance, can be used (Mulak & Talhar, 2015). In this study, the Euclidean distance method is used.

Experimental Results

Various databases have been used for training and testing purposes in studies on the detection of facial expressions. In this study, the RaFD (Langner et al., 2010) face database was used. RaFD provides successful results in facial expression studies (Ahmady et al., 2013)(Shokrani et al., 2014)(Kanan & Ahmady, 2012).

RaFD is a free face database that contains facial images of Caucasians. These facial images were obtained with five cameras with different angles (i.e., 0, 45, 90, 135, and 180 degrees). Using the content of this database, researchers can conduct studies on facial expression analysis and detect the viewing angle and head orientation. According to the studies of Ekman mentioned in the introduction, the fact that the database consists of Caucasians does not constitute an impediment for the analysis of universal emotional expressions. Moreover, the database has eight different facial expressions (i.e., neutral, angry, sad, afraid, dis-gusted, surprised, happy, and contempt) and three different viewing angles (i.e., straight, right, and left). All images were prepared based on FACS examples. The database has images of 49 people, 39 adults and 10 children; 6 of the children are girls, and 19 of the adults are women. In this study; for training process 235, for testing process 100, totally 335 images were used.

Table 2 presents the total number of data records for each feature cluster, the number of reduced features, and the locations of the selected features on the face after applying SFS. For example, lines 13-16 in Table 2 refer to the length between the 13th and 16th points.

These features were classified with the SVM and KNN algorithms. The success rates are presented in Table 3 and Table 4.

Table 2: Reduced features as a result of SFS Algorithm

Data Type	Total Data Number	Data Number after SFS	Selected Features
Distance	325	6	13-16, 6-12, 12-17, 21-26, 6-15, 9-13
Ratio	52650	4	1-8 / 2-22, 1-11 / 3-11, 6-19 / 15-25, 7-21 / 15-19
Distance + Ratio	52975	5	1-8 / 2-22, 20-24, 1-6 / 11-22, 1-2 / 2-11, 1-23 / 7-20

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Table 3: Complexity matrix of the features obtained after SFS by classification with SVM

Expression	Distance Data (%)	Ratio Data (%)	Distance + Ratio (%)
Neutral	60	80	60
Happy	95	95	100
Angry	100	95	100
Sad	85	85	70
Surprised	90	100	95
Average	86	91	85

Table 4: Complexity matrix of the features obtained after SFS by classification with KNN (k=1)

Expression	Distance Data (%)	Ratio Data (%)	Distance + Ratio (%)
Neutral	50	65	40
Happy	100	100	100
Angry	95	90	100
Sad	65	80	80
Surprised	95	100	95
Average	81	87	83

In both classification algorithms, it has been observed that the most successful results are obtained as a result of entering only the ratio feature data. One of the most important results of the study is that a high level of success has been achieved with only four facial ratio feature data records. Comparative results of the proposed algorithm with other studies extracting features are shown in Table 5.

Table 5: The Comparison of the proposed method with the other methods Detecting Facial Expressions

Researchers	Database	Methods	Neutral (%)	Happy (%)	Angry (%)	Sad (%)	Surprised (%)	Average (%)
Lee et al. (Lee et al., 2016)	Mobile platforms	AAM+KNN	80	86	85	77	95	85
Ren et al. (Ren & Huang, 2015)	BU-3DFE	AAM+SIFTW+SVM	-	84.1	82.5	77.3	84.5	81.4
Mistry et al. (Mistry et al., 2014)	Cohn Kanade (CK+)	AAM+LBP+ANN	-	86.7	83.3	96.4	93.3	88.8
Cheon et al. (Cheon & Kim, 2008)	Facial Expression Database (FED06)	Dif-AAM+KNN (k=5)	92.5	93.69	82.11	-	96.29	91.52
Beszedes et al. (Beszedes & Culverhouse, 2007)	Private database	AAM+SVM	78	95	84	-	95	-
Senechal et al. (Senechal et al., 2012)	GEMEP-FERA	LGBP+AAM	-	96.8	96.3	76	-	83.5
Proposed	Radboud	KNN(k=1)	65	100	90	80	100	87
		SVM	80	95	95	85	100	91

Conclusion

This study presents an algorithm with high success where features are minimized for the detection of facial expressions. In experimental studies using the Radboud database, 26 important keypoints have been determined for face images. The Euclidean distance of these 26 keypoints to each other was calculated, and 325 distance feature data records were obtained for each image. Ratios of the 325 distance data records were calculated, and 52650 ratio data records were obtained.

In the next step, distance, ratio, and distance + ratio data were analyzed with the SFS feature selection algorithm, and six distance, four ratio, and five distance + ratio feature data records were obtained. These features were classified with SVM and KNN classifiers, and the comparative results are presented in the tables. It was observed that the highest success rate was achieved by using only ratio feature data. Thus, facial expressions were predicted correctly 92% of the time using the SVM algorithm with four ratio feature data records. With the KNN algorithm, an 87% success rate was achieved with the stated four ratio features.

For future research, the proposed system could be strengthened with different features and different classification algorithms. Angles between the lines formed by the 325 distance data records can be determined as a new feature cluster. Since the changes in the muscles that occur when facial expressions are formed also change the important facial points, angles between the lines are formed by distances. A study could be conducted on the unified effect

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of angle information and distance and ratio and distance + ratio data on the results. Moreover, the analysis results for the five conditions obtained in this study could be used in the various fields studying facial expressions, as stated in the introduction.

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FARKLI KAYNAK YÖNTEMİ İLE STELLITE 6 KAPLANAN YAPISAL ÇELİK MALZEMELERDE KOROZYON DİRENCİNİN İNCELENMESİ

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Bu çalışmada yapısal çelik malzeme üzerine; lazer kaynak, plazma transfer ark kaynak (PTA) ve Tungsten Inert Gas (TİG) kaynak yöntemleri ile kobalt bazlı Stellite 6 kaplaması yapılmıştır. Yapılan kaplamalar sonrasında numuneler kaplama bölgesine dik olacak şekilde kesilerek korozyon direncini incelemek üzere bakalite alınmıştır. Bakalite alınan numuneler TS EN ISO 9227 standardına göre tuz püskürtme deneylerine tabi tutulmuştur. Numunelerden 100x büyütmeli optik mikroskop ile 17, 41 ve 48 saat sonunda yüzey mikroyapı görüntüleri alınmıştır. Deney sonucunda yapısal çeliğin korozyona uğradığı, kaplama malzemesinin yapısal çelik ile birleştiği noktalarda ve kaplamada oluşan çatlak bölgelerinde korozyona uğradığı diğer bölgelerde ise değişme olmadığı tespit edilmiştir.

Keywords: Lazer Kaynak, Plazma Transfer Ark Kaynak, TİG Kaynak, Stellite 6, Korozyon Testi

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GAMIFICATION: SOFTWARE USAGE ECOLOGY

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Abstract: Gamification is applied in academia and industry and is being studied in the last years. Gamification is nowadays applied to several areas, such as learning, computer science, business, marketing, tourism, among others. Research performed till now suggests that its usage may improve students' and workers' motivation and increase study, productivity and sales. Nevertheless, there are many forms of implementing, according to each industry. Supported in the literature, we identified the game components, game mechanics, and game dynamics, used as part of any gamification implementation. Then, we selected some specific cases in e-learning, computer program learning, open source software development, and crowdsourcing. Finally, we list some of the main software employed in this fields, identifying also implemented features. This allowed us to find the great complexity and variety of implementations. It also enabled us to find ether practitioners or researcher use the word gamification for a broad range of approaches.

Keywords: Gamification, Game Design, Gamification Tools, Software

Introduction

Gamification has increased awareness since its definition, (Google, 2017). Google Scholar indexes 8,660 scientific publications in 2016, and in 2011, the year when the concept was coined, 481 publications. Gamification reached the peak of popularity in 2014 (Google, 2017). Gamification corresponds to the "*use of game elements, in non-game context"*(Deterding, Dixon, Khaled, & Nacke, 2011, p. 9), with the objective of achieving individuals' engagement towards defined goals. In several studies, gamification concept is used with other concepts, for example, simulation, game, and serious games (Deterding et al., 2011). The gamification concept has been used in several contexts, mainly related with education, management, simulations of real situations, serious games, gaming, e-banking, and marketing (Costa & Aparício, 2006; Costa, Aparicio, Aparicio, & Aparicio, 2017; Costa & Costa, 2010; Costa & Costa, 2010; Manuela Aparicio, 1999; Miller, 2013; Rodrigues, Costa, & Oliveira, 2014, 2016). Authors have applied game-design elements, game principles, and game mechanics in non-game contexts (Bunchball, 2010; Deterding et al., 2011; Slegers, Ruelens, Vissers, & Duysburgh, 2015).

The main goal of this paper is to identify the game components, game mechanics, and game dynamics, used as part of gamification implementation. The methodological approach of this paper follows a documental study method. First, it is made a review on the theoretical background on the topic, then applying a theoretical framework, we analyze a set of cases.

The paper is structured in two main parts. The first part is related to the literature review on gamification and associated concepts. The second part relates to the presentation of each study case and analysis of the elements and software used to instantiate gamification on the several contexts. Finally, we present the conclusions of our analysis.

Gamification Vs Other Concepts

The gamification concept was coined in 2011 by Deterding et al. (2011), the definition has been used since then and states for "*Gamification is the use of game design elements in non-game contexts*." (Deterding et al., 2011, p. 9). Although gamification concept derives from the word game, it does not inevitably suggest gaming, or playfulness, or even serious game contexts. Gamification has to do with the use and application of design

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dimensions to induce motivational behaviour on users in a certain context, usually inducing individuals into intention, and attitudes to achieve a pre-defined goal. For example, on a gaming environment, certain dynamics attains a set of rules and guidelines, and those dynamics induces a willing to play. Schell proposed a game definition "*A game is a problem-solving activity, approached with a playful attitude*" (Schell, 2008, p. 37). Transporting those dynamics and elements into different contexts, also induces users, learners, workers, to the willing of fulfilling a set of challenges, and interactive guidelines, in a way that is voluntary to the users. This willingness is a result of a perceived intrinsic value, which engages users in the various activities. In this context, it is important to address a disambiguation of the term gamification and the related term of a serious game. A Serious Game corresponds to a developed system within the usage of a game technology, which is specially designed using game principles, to achieve a purpose different than just entertainment (Pañella, 2012), the serious purpose can be as serious as a medical training environment. Marczewski (Marczewski, 2013) defines this particular concept "serious game", which is conceptualized, as a fully developed game to be used in contexts, other than pure entertainment. Systems like teaching games, simulators, meaningful games, and purposeful games. Figure 1 shows the overlaps between experience, entertainment, and multimedia, which corresponds to serious games.



Figure 1. Serious games based on (Costa et al., 2017; Laamarti, Eid, & Saddik, 2014)

Students can learn using real gameplay environment, the game is not designed for playful purposes, but it serves as a simulator of a real scenario in a virtual version set. These virtual learning scenarios are extracted from the real world, and allow a safe learning environment for practising and testing knowledge. A "meaningful game" uses gameplay to endorse a specific message to the player. A "purposeful Game" creates certain outcomes directly into the real world. These terms lead conceptually to the term "gameful design", corresponding to a process, where "game thinking" has been used (Marczewski, 2013). Figure 2 illustrates the main differences between these concepts. From the figure, one can conclude that the unique characteristic which is present in a game and is no present on other contexts is the playfulness just for fun purpose. Game thinking is present in the game inspired design, in gamification, in serious games, and in games. Gamification does not comprehend playing a game just for fun or playing a game for that matter. Gamification uses "game thinking" and "game mechanics" in non-playful contexts to engage users in solving problems.

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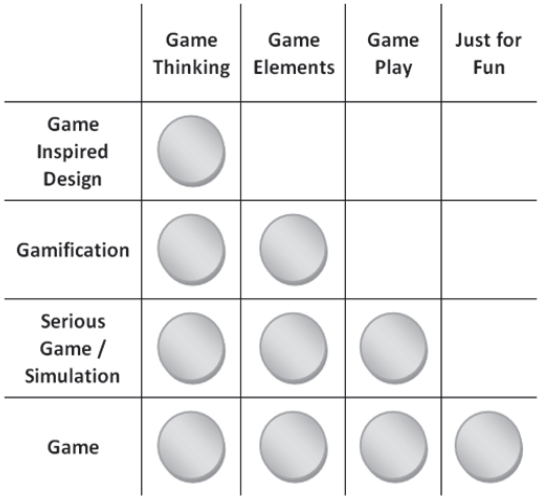

Figure 2. Gamethinking, broken down by design goals (Marczewski, 2013)

Gamification is implemented in applications and processes to improve user engagement, return on investment, data quality, timeliness, and learning. From a bibliometric study results showed the evolution of these concepts two main digital libraries, verifying that gamification studies registered a considerable increase throughout the years, whereas the related concepts registered a decreased in both digital libraries (Costa et al., 2017). From that same study, the authors found that "Gamification" term or "Gamified" is mainly related to other keywords, such as motivation, serious games, crowdsourcing, engagement, user experience, learning, and design. The terms evolution registered a crescent tendency of the relationship between "gamification", "engagement" and "user experience". These results may also indicate that new areas of research are arising. It was observed that researchers are transposing gamification into other areas, rather than pure technology engineering, education, learning, e-learning, design, motivation, games, crowdsourcing, collaboration, behavior, software, games, design, interaction, engagement, motivation, technology, experience, enterprise, and serious, are among the most studied topics. From the previous analysis, we verified the progress of gamification related terms and concepts. From the Web of Science directed searches (WoS, 2017), we found the scientific fields related to gamification Table 1.

Table 1. Gamification relation with other scientific fields (Costa et al., 2017)

Research Areas	% Gamification publications
Computer Science	35%
Education Educational Research	21%
Engineering	17%
Business Economics	4%
Psychology	3%
Telecommunications	3%
Social Sciences Other Topics	3%
Health Care Sciences Services	2%
Medical Informatics	2%
Information Science Library Science	2%
Public Environmental Occupational Health	1%
Science Technology Other Topics	1%
Communication	1%
Rehabilitation	1%
Robotics	1%
Operations Research Management Science	1%
Nursing	1%
Environmental Sciences Ecology	1%
Automation Control Systems	1%
Total of publications	**100%**

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Education/educational research and computer science represent 56% of the scientific publications. Engineering, business and economics, and psychology weights 24% of all of the publications related to gamification. The most cited scientific publications, 2846 in total, on gamification are of Deterding, Sicart, Nacke, O'Hara & Dixon (2011). The usage of game dimensions has been studied by several authors (Aparicio, Costa, & Braga, 2012; Bunchball, 2010; Costa, 2011; Costa & Costa, 2010; Deterding et al., 2011; Gatautis, Vitkauskaite, Gadeikiene, & Piligrimiene, 2016; Kuutti, 2013; Laamarti et al., 2014; Marczewski, 2013; Pereira, Costa, & Aparicio, 2017; Piteira & Costa, 2017; Rodrigues et al., 2014, 2016, Werbach & Hunter, 2012, 2015). Game elements define the "characteristics" which are present in games, as a set of "building blocks", that may or may not be all present in a game (Deterding et al., 2011). Game elements can be categorized into five levels: first game interface design patterns, second game design patterns and mechanics, third game design principles and heuristics, fourth game models, and in fifth game design methods (Deterding et al., 2011). Some authors refer to "game elements", however elements may also refer to components in some studies, therefore instead of elements, we refer in this study as game dimensions. The way these dimensions are aggregated differ from framework to framework, and from model to model. Table 2 presents various definitions according to different levels of dimensions. To operationalize these concepts, researchers and practitioners developed several approaches, among the most used we can find: Octalysis, (2015), Werbach and Hunter model (2015), and a recent model named Gamification Model Canvas (Jiménez, 2015).

Table 2. Gamification dimensions' definitions (Costa et al., 2017)

Dimensions	Definitions	Authors
Game mechanics	"*Commonly reoccurring parts of the design of a game that concern gameplay" (Deterding et al., 2011, p. 12)* *"Mechanics are already more specific elements in the way that they imply towards more specific actions" (Kuutti, 2013, p19)* *"Mechanics are the basic processes that drive actin forward and generate players engagement (Werbach and Dan, 2012, p. 79)."*	(Deterding et al., 2011; Kuutti, 2013; Werbach & Hunter, 2012)
Game components	"*Components are specific instantiations of mechanics and dynamics" (Werbach and Dan, 2012, p. 82)* *"Components are specific applications that can be seen and used in the interface of the game" (Kuutti, 2013, p. 19)* *"Game components act as stimuli and are often directly perceivable from the consumer perspective." (Gatautis et al., 2016, p.92)*	(Gatautis et al., 2016; Kuutti, 2013; Werbach & Hunter, 2012)
Game dynamics	*"Dynamics describes the run-time behavior of the mechanics acting on player inputs and each others outputs over time." (Hunicke et al., 2004)* *"Dynamics are the big-picture aspect of the gamified system that you have to consider and manage but which can never directly enter into the game" (Werbach and Dan, 2012, p. 82)* *"Dynamics are the highest level of abstraction of game elements. They are themes around which the game revolves." (Kuutti, 2013, p. 18)*	(Hunicke, LeBlanc, & Zubek, 2004; Kuutti, 2013; Werbach & Hunter, 2012)

Figure 3 pictures a combination of the gamification pyramid containing the elements based on the hierarchy proposed by Werbach and Hunter (Werbach & Hunter, 2015), and the literature review which instanciates those dimensions (Costa et al., 2017). Those three elements, dynamics, components, and mechanics characterize different interconnected levels, for example, defining the design principles (Dynamics) is crucial to choose the adequate actions structures (Mechanics) to select the suitable interface level displays (Components).

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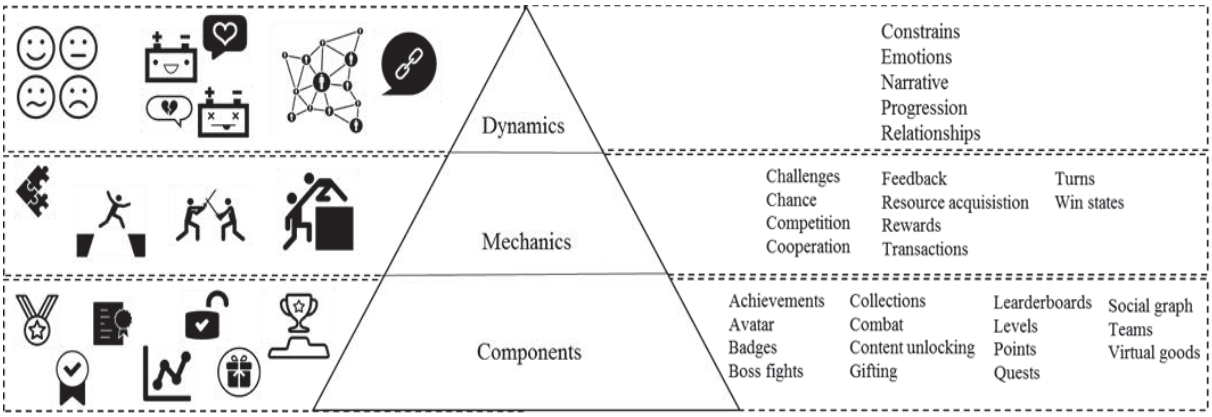

Figure 3. Pyramid of Gamification Elements (Costa et al., 2017; Werbach & Hunter, 2012)

Figure 3 depicts on the left side iconography associated with the different levels of gamification dimensions. Game dynamics usually are instantiated in emotions, constraints, progression perception, narratives, and relationships. Game mechanics correspond mainly to a set of actions or processes which implement the challenges, feedback, cooperation or competition, rewards systems, among others. Mechanics define the guidelines, for example suggesting that if the user watches a video, or do a quiz, gets extra points to unlock the next level. Components are more "tangible" elements, as for example, we usually find badges, avatars, achievements' boards, gifts, points, just to exemplify.

The next section presents four different cases where gamification elements were introduced, describing the main objectives and contexts of application.

Cases

Case 1: SmartMOOC

This case corresponds to a solution presented to the problem of improving computer programming, especially in the first year of college (Piteira & Costa, 2017). This solution has as the main purpose helping the student learning programming. The emphasis is on the core concepts of programming (Figure 4), like variables, control structures. The language uses JAVA. The solution was implemented using Moodle (http://iscte.acm.org/elearning/). The purpose of using Gamification was to improve motivation of the students. The narrative used is very related to a traditional lecture with some exercises. This study is still undergoing, and the final was not reported yet.

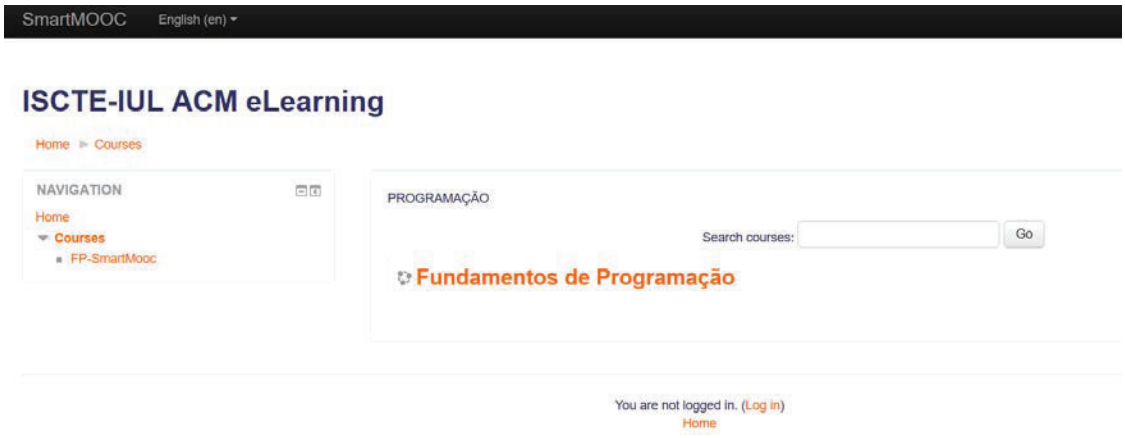

Figure 4. Print screen of the SmartMooc frontend

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Case 2: Kaboom Academy

This case corresponds to a solution presented to the problem of improving computer programming (Pereira et al., 2017). This solution has as the main purpose helping the student learning programming. The emphasis is on the basic concepts of programming, like variables, control structures. The language used is JavaScript. The solution was implemented using firebase platform (Figure 5). Gamification is one of the approaches used to improve motivation of the students. Kaboom Akademy (https://kaboomacademy-1443a.firebaseapp.com/login) is a project very similar to the SmartMOOC. However, its narrative is much more informal.

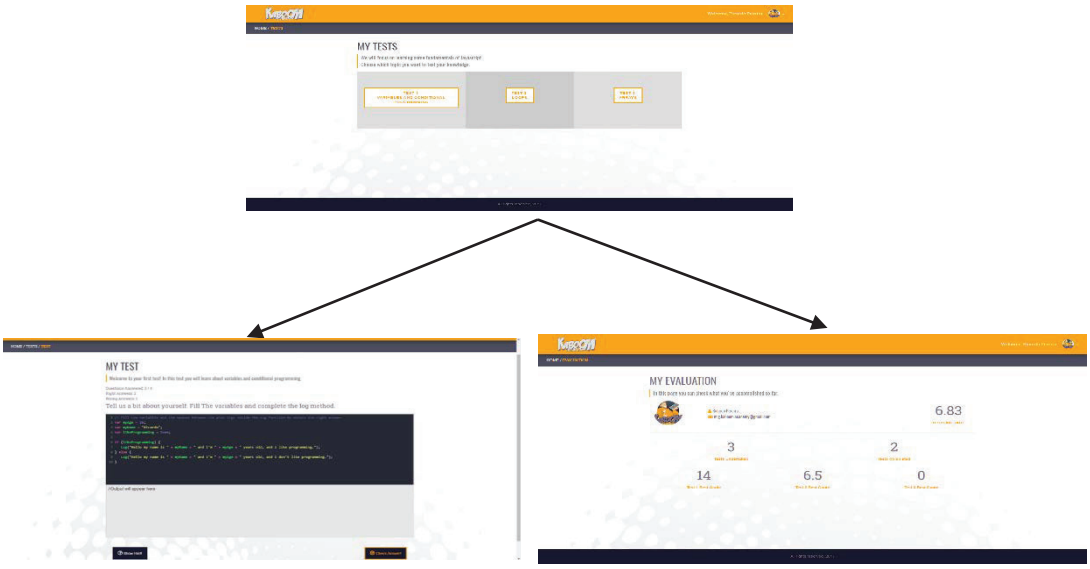

Figure 5. Prototype of Kaboom Akademy

Case 3: Guild Software Development

This solution started as a need to support an open source community around an open source application (Costa, 2011). The solution initially proposed was supported in Drupal. Then, it evolved to Wordpress. Other software and services were also used, like Github. Gamification was proposed as a way of motivating the community and improve engagement in the project. The narrative is related to a metaphor of a middle age craft guild (figure 6), where the user starts as an apprentice, and then became a journeyman and ended as master. There is also several types of the user using the same hierarchy: end user (brothers), the developer (craftsman), testers (worriers).

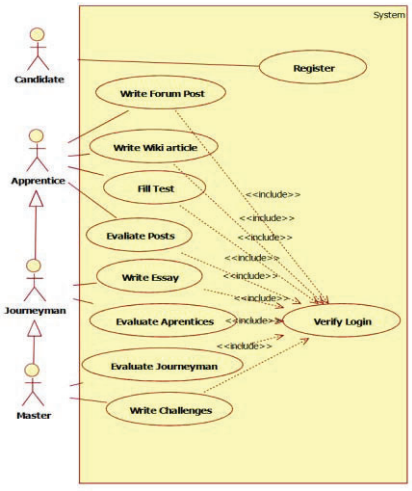

Figure 6. Guild functionalities

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Case 4: Crowdsourcing

This solution started generic solution to support crowdsourcing projects (Aparicio et al., 2012). The solution was developed using WordPress as the main platform. Then, several plugins were used to support the implementation of gamification. The purpose of using Gamification was to improve motivation of the potential participants.

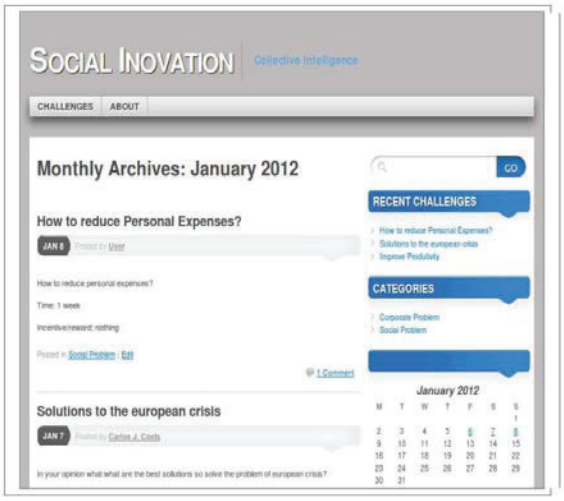

Figure 7. System to support crowdsourcing

Summarizing Cases

Table 3. Gamification dimensions' definitions

	SmartMOOC	Kaboom Akademy	GuildSW	CrowdSourcing
Authors	Piteira & Costa. (2017).	Pereira, Costa, & Aparicio (2017)	Carlos (2011)	Aparicio, Costa, & Braga (2012)
Dynamics	+ -	+	-	+ -
Mechanics	+ -	+ -	-	+ -
Components	+	-	-	-
Software	Moodle	Auto developed software using firebase	CMS (Drupal then Wordpress) and Git-Hub	Wordpress
Gamification	Plugins	Features Incorporated in the software	Components and Plugins	Plugins
Notes: + Fully implemented +- Satisfactory implemented - Poorly implemented				

Conclusions

Gamification is widely employed and disseminated in the corporate context. In order to analyse how software is used to support gamification, we study four cases. Two cases were related to e-learning (SmartMOOC and Kaboom Akademy), one case was related to software engineering, and open source (GuildSW) and another case was related to crowdsourcing (CrowdSourcing). The technology used was different according to the case. Moodle was used in SmartMOOC. In the Case CrowdSourcing, it developed a solution supported in Wordpress. In both projects, plugins were used to implement gamification. Kaboom Akademy is a more informal project, but main purposes are very similar to the purposes of SmartMOOC. GuildSW had a more troubled process. In what concerns, conceptual solution, it was very stable. However, the implementation changed significantly. Originally the implementation was supported in the Drupal. However, then, it changed to WordPress using plugins. However, there was also a need of connecting other tools and services, like Github. In what concerns level of dynamics, mechanics and components implementation change significantly.

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GETTING INFORMATION, SOCIALIZING OR WHAT? EVIDENCE FROM INTERNET AND SMARTPHONE USE

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Almost three decades ago, The International Telecommunications Union (ITU) Maitland Commission pointed out the importance of telecommunications to development and documented the gaps in access to telecommunications in the developing world in its 1984 report "*The Missing Link.*" It is in that context that the role of telecommunications in the development process received considerable attention during the latter part of the last century. In today's world, telecommunications can be conceptualized as information and communication technologies (ICTs) such as telephones, mobile phones, Internet, and IP telephony (VOIP). ICTs are vehicles for the conveyance of information, facilitate information sharing, and therefore *sine qua non* for the process of development—a link in the process of development and thus enhance the well-being of society. This paper seeks to examine internet and smartphone users in three thematic areas: getting information; career and commerce; and socializing. In that veiShengelaian, how do the characteristics of consumers who use internet and smartphone for getting information differ from those using it for career, commerce, and socializing? To what extent are socio-demographic and attitudinal profiles of those who use internet and smartphone for career and commerce different from those using it for getting information and socializing? Answers to these questions have implications for social marketing. Logistic regression analysis is utilized based on nationally representative data from 31 emerging and developing nations. The data was collected by Pew Research Center, USA.

Keywords: Internet, smartphone, getting information, career and commerce, socializing, social marketing.

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GLOBAL EKONOMİK KRİZ SONRASI PARA POLİTİKALARINDA GELİŞMELER VE TÜRKİYE

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Özet: 1980'ler boyunca dünya ekonomisi ölçeğinde uygulanmakta olan liberalizasyon politikaları, beraberinde özellikle son otuz yılda pek çok ciddi ekonomik krize maruz kalmamızla sonuçlanmıştır. Diğer yandan 2007 de ortaya çıkan ve 2008 den itibaren derinliğini daha da arttıran özelliğe sahip bu süreç "Büyük Durgunluk" olarak ifade edilmiştir. Bu büyük durgunluk pek çok ülkeyi özellikle gelişmekte olan ekonomileri de büyük ölçüde etkisi altına almıştır. Gelişmiş ülkelerde uygulanan miktarsal genişleme politikaları gelişmekte olan ülkelerdeki sermaye akımı dalgalanmalarının da gerekçesi haline gelmiştir. Gelişmekte olan ülkelere yönelik sermaye akımlarının kesintiye uğraması ve bu durumda ekonomideki muhtemel olumsuz etkiler karşısında bu ülkelerde, makro ihtiyati tedbirler gündeme alınmış ve para politikalarının yeniden gözden geçirilmesi gerekmiştir. Bu çalışmada, Türkiye ekonomisi deneyimi, geleneksel ve yeni geliştirilen para politikası araçları bağlamında değerlendirilecektir.

Anahtar Sözcükler: Finansal Kriz, Para Politikaları, Türkiye Ekonomisi

Giriş

Devlet müdahaleleri ve ekonomi politikalarının etkisinin nasıl sonuçlanacağı iktisatçılar arasında en hararetli tartışma konuları arasında yer almaktadır. Bu tartışmalar devam ederken iktisat politikalarının etkili olduğunu savunan iktisatçılar arasında yapılan teorik ve ampirik araştırmalarda, para ve maliye politikalarından hangisinin ekonomik performans üzerindeki nispi gücün baskın olduğu konusu da aynı hararette tartışma konuları arasında kendine yer bulmuştur. Diğer yandan, hem para hem maliye politikalarının nispi etkinliği konusunda da birbirine zıt görüşler ileri sürülmüş, ampirik bulgular çerçevesinde birinin diğerine göre daha etkin olduğunu savunan pek çok çalışma iktisat literatüründe kendine yer bulmuştur. Monetarist-Keynesyen görüş penceresinden para ve maliye politikalarının etkinliğini pek çok iktisatçı, çeşitli ülkeler özelinde araştırmış ancak, hangi politikanın daha etkin olduğuna dair bir konsensüs sağlanabilmiş değildir

Türkiye ekonomisi özelinde de aynı durum geçerlidir. Örneğin bazı çalışmalarda para politikasının milli gelir üzerindeki etkisinin daha belirgin olduğuna (DÖNEK, 1995), genişletici bir para politikasının ekonomiyi canlandırıcı, genişletici bir maliye politikası ekonomiyi daraltıcı etkisine vurgu yapılmıştır (DÜZGÜN, 2010, s. 236). Bir başka çalışmada yüksek düzeyde bütçe açıkları parasal otoriteye borçları para basarak finanse etme baskısı yaratabileceğinden hareketle hızlı bir para arzı artışı ve akabinde enflasyonun ortay çıkacağına vurgu yapılmıştır. Maliye otoritesi aşırı bütçe açığı finansmanıyla meşgul olmasıyla para ve maliye politikasının amaç yakınlaşması para otoritesinin enflasyonu kontrol altına almasına yardımcı olur. Özetle para ve maliye politikalarının uyumu da ekonomik istikrar için vurgulanan hususlar arasındadır (MISHKIN, 2014, s. 40).

Öte yandan 2008 Global Krizi tüm dünyada para politikası yaklaşımlarında değişikliğe milat olmuştur. Gelişmiş ülke merkez bankaları niteliksel genişlemenin faizlerin yüzde sıfıra inmesi ardından niceliksel genişlemeye, bir başka ifade ile bilanço artışına geçerken, Türkiye'de de benzer şekilde ortodoks /geleneksel para politikaları terk edilerek geleneksel olmayan para politikasına geçilmiştir. Birçok ülkede finansal reformların uygulanması, enflasyon oranlarının istikrara kavuşturulması amacıyla uygulanan para miktarı ayarlama enstrümanlarının kullanılmasına ilişkin tartışmaları alevlendirmiştir. 1980'lerden bu yana uygulanagelen liberalizasyon politikalarının ardından birçok gelişmiş ekonomideki merkez bankaları, para arzını etkileyen politikalara, banka oranını etkileyen politikalara yönelterek para politikaları araçlarını değiştirmişlerdir. Çok sayıda gelişmiş ülke vaka incelemesi, finansal reformlar nedeniyle para talebinin istikrarsız hale geldiğini ve dolayısıyla merkez

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bankalarının faiz oranını hedeflemeyi desteklediğini göstermektedir (KUMAR, WEBBER, & FARGHER, 2013 (35), s. 979).

Bu çalışmada; global ekonomik kriz sonrası uygulanan para politikalarındaki yeni dönüşüm ve gelişmeler ile Türkiye'nin bu kriz sonrası uyguladığı yeni politik enstrümanlar, TCMB kaynaklarına dayanılarak, betimsel metotla ele alınacaktır. Bu amaçla öncelikle, geleneksel para politikasının içerik ve stratejilerinin ele alındığı teorik çerçeve; döviz kuru, parasal hedefleme ve enflasyon hedeflemesi yaklaşımları ile açıklanacaktır. Bunu takiben kriz dönemlerinde uygulanan, ağırlıklı olarak global kriz sonrasında öne çıkan uygulamalar konu edilecektir. Bu çerçevede miktar genişlemesi, kredi genişlemesi, faiz taahhüdü politikası, zorunlu karşılık oranı uygulaması, faiz koridoru politikalarına yer verilecektir. Son bölümde Türkiye'de uygulanan para politikalarındaki paradigma değişimleri ve bu politikalardaki uygulamalar incelenerek çalışma tamamlanacaktır.

Para Politikalarının İçeriği ve Stratejileri

Para politikası, ülkelerin ekonomik büyüme, istihdam artışı, ödemeler dengesi ve fiyat istikrarı amaçlarını gerçekleştirebilmek için paranın tedarikini, hacmini, elde tutma maliyetini ve diğer finansal koşulları etkilemeye dayalı kararları içeren ve merkez bankalarınca uygulanan politikalar olarak tanımlanabilir. (ARICAN & OKAY, 2014 , s. 1). Tanımda vurgulandığı üzere para politikası ile ilgili uygulamalardan sorumlu kuruluş öncelikli olarak merkez bankalarıdır. Burada Debelle ve Fisher tarafından yapılan araç ve amaç bağımsızlığı ayrımına temas etmek gerekir. Amaç bağımsızlığı; merkez bankasının para politikası için kendi amaçlarını oluşturabilme yeteneği iken araç bağımsızlığı; merkez bankalarının bağımsız bir biçimde amaçlarına ulaşmak için para politikası araçlarını seçebilme yeteneğidir (MISHKIN, 2014, s. 46). Bu çerçevede örneğin Türkiye'de temel politik amacının fiyat istikrarını sağlamak olacağı ifade edilmiş ve Merkez Bankasına araç bağımsızlığı sağlanmıştır (TCMB, 2017).

Para politikaları ile varılmaya çalışılan hedefler ülkelere göre önemli değişiklikler gösterebilmektedir. Ancak, kriz öncesi yıllarda politikanın temel hedefinin fiyat istikrarı üzerinde odaklandığı görülmektedir. Fiyat istikrarı ise para politikasının uzun dönemli temel amaçlarına (büyüme ve istihdam) yönelik olarak ekonomik birimlerin karar alma süreçlerinde ihmal edilebilir ölçüde düşük ve istikrarlı bir enflasyon oranını ifade etmektedir. Başka bir deyişle fiyat istikrarı ile kastedilen ekonominin dengelerini bozmayacak fiyat düzeylerinin oluşması ve bunun sürdürülebilmesidir.

Merkez bankalarının para politikası uygulamaları ile fiyat istikrarını sağlıyor olmaları ekonomideki tüm aktörler için oldukça önemlidir, çünkü fiyat istikrarı sağlanmış ekonomilerin hem ekonomik kalkınma hem de gelir dağılımı yönünden diğer ülkelere göre nispeten daha iyi durumda oldukları açıktır. Para politikasının bağımsızca ve başarılı bir şekilde uygulandığı gelişmiş ekonomiler hem ekonomik kalkınmışlıkları hem de daha sağlıklı gelir dağılımına dayanan sosyal sistemleri ile bu duruma en güzel örneği teşkil etmektedirler. Aynı zamanda fiyat istikrarı ekonomik kalkınma ve adil gelir dağılımı yanında sağlıklı bir finansal sistem için de büyük önem arz etmektedir (ÖZCAN, 2006, s. 4-5).

Para ekonomisindeki son teoriler merkez bankalarının para politikalarında başarılı sonuçlar elde etmesine katkı sağlamaya dair 7 temel ilke önerir (Mishkin 2014: 39):

- Fiyat istikrarı büyük öneme haizdir
- Maliye politikası para politikasına destek olmalıdır
- Zamansal tutarsızlık kaçınılması gereken önemli bir sorundur
- Para politikası ileriye yönelik olmalıdır
- Hesap verebilirlik demokrasinin temel prensibidir
- Para politikası fiyat dalgalanmaları kadar çıktı ile de ilgili olmalıdır
- En önemli ekonomik dalgalanmalar finansal istikrarsızlık ile ilgilidir.

Merkez bankalarınca kullanılan geleneksel para politikası stratejilerine ait temel yönelimler 3 ana başlık altında toplanmak suretiyle aşağıda ele alınmaktadır.

Döviz Kuru Hedeflemesi Stratejisi

Döviz kuru hedeflemesi stratejisine bağlı para politikası oldukça uzun yıllardan beri uygulanan bir politikadır. Döviz kuru hedeflemesi stratejisi, yerel para biriminin altın fiyatlarına bağlı olması seklinde uygulanabileceği gibi, yine yerel para biriminin düşük ve istikrarlı enflasyonun var olduğu bir ülkenin para birimine sabit bir kurdan bağlanması şeklinde de uygulanabilir. Söz konusu para politikası stratejisi, önceden açıklanmak kaydıyla döviz kurunun belli oranlarda ve belirli dönem aralığıyla devalüe edilmesi şeklinde de gerçekleşebilmektedir (ÖZCAN, 2006, s. 41-47).

Mishkin çalışmasında döviz kuru hedeflemesi stratejisinin önemli avantajlara sahip olmak yanında bazı riskleri beraberinde getirdiği tespitinde bulunmaktadır. Bunlar;

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Avantajlar yönünden bakıldığında öncelikle döviz kuru hedeflemesi stratejisinde uluslararası ticarete konu olan malların fiyatlarındaki değişimler, 'bu malların enflasyonu', yerel para biriminin kur karsısında sabit olması nedeniyle kontrol altına alınmış olmaktadır. Öte yandan kredibilitesi yüksek bir döviz kuru hedeflemesi stratejisi, enflasyon beklentilerinin döviz kurunun sabitlendiği ülkenin enflasyon oranına göre şekillenmesini sağlamak suretiyle fiyat istikrarına katkıda bulunmuş olmaktadır.

Diğer bir avantaj; politika uygulamalarında karşılaşılabilecek zamansal uyumsuzluk sorununu ortadan kaldırmasıdır. Çünkü söz konusu strateji yerel para biriminin devalüe edilmesi yönünde bir eğilim olması durumunda sıkı para politikası uygulanmasını zorlayacak, tersi durumda ise para politikasının gevşemesine sebep olacaktır. Böylece otomatik bir para politikası zamanlaması sistemi uygulama şansı doğacaktır (ERDOĞAN, 2005, s. 37).

Parasal Hedefleme Stratejisi

Parasal hedefleme stratejisi, istikrarlı bir para talebi fonksiyonunda, uzun dönemde enflasyonun para arzındaki büyümeye bağlı olarak geliştiği varsayımıyla ortaya çıkmıştır. Bu durumda para talebinin para politikasından bağımsız bir şekilde hareket ettiği de kabul edilmiş olmaktadır. Bu varsayımlar altında merkez bankaları nominal para arzını kontrol etmek suretiyle enflasyon değişimlerini kontrol altına alabilecek ve böylece nihai hedef olan fiyat istikrarına ulaşabileceklerdir. Burada parasal hedefleme stratejisinin kullanılabilmesi, enflasyon ile hedeflenen parasal büyüklük arasında sıkı bir ilişkinin bulunması ve buna ek olarak hedeflenen parasal büyüklük üzerinde ülke merkez bankasının tam bir etkinliğinin var olması ile mümkün olacaktır.

Enflasyon Hedeflemesi Stratejisi

Enflasyon hedeflemesi stratejisinde para politikası uygulamalarında hedef fiyat istikrarıdır. Bunun için belirli bir dönem içinde ve belirli bir enflasyon hedefi veya hedef aralığı konulmak suretiyle uygulanmaktadır. Enflasyon hedeflemesinde çapa görevini enflasyonun kendisi yapmakta ve söz konusu hedef veya hedef aralığına ulaşılması için gerekli koşullar para politikası araçları kullanılmak suretiyle oluşturulmaktadır. Bu stratejide fiyat istikrarının sağlanabilmesi için hedeflenen amaç enflasyonun kendisi olduğundan ara hedef kullanılmasına da gerek kalmamaktadır. Enflasyon hedeflemesi stratejisinin diğer bir özelliği ise, geçmiş ya da cari dönem enflasyon rakamlarının değil gelecek dönem enflasyon tahminlerinin hedeflemede kullanılıyor olmasıdır. Gelecek dönem enflasyon tahminleri merkez bankalarınca yapılmakta ve yapılan tahminler sonucu belirlenen enflasyon hedefi veya hedef aralığı politika uygulamalarında temel alınmaktadır.

Bu stratejinin en önemli avantajı parasal hedefleme stratejisine benzer şekilde merkez bankalarının özellikle ülke içi ekonomik koşullara uygun bağımsız bir para politikası uygulamasına olanak vermesidir. Söz konusu stratejinin uygulanabilmesi için temel koşulların başında gelen merkez bankalarının şeffaflığı ve hesap verebilirliği ilkelerinin sağlanabilmesi için merkez bankalarının kamuoyuna sürekli ve detaylı para politikası bilgileri veriyor olmaları da bu stratejinin avantajlarındandır. Enflasyon hedeflemesi stratejisinde merkez bankaları hesap verebilirlik ve şeffaflık önkoşullarına bağlı kaldıklarını düzenli olarak hazırladıkları bağımsız denetim ve para politikası raporları ile göstermektedirler. Bu stratejide de para politikasının kamuoyu tarafından anlaşılması kolaylaşmış olmaktadır.

Enflasyon hedeflemesi stratejisinin dezavantaj yönü bu stratejinin düşük ve istikrarsız bir ekonomik büyüme yaratma olasılığı barındırıyor olmasıdır. Mishkin bu durumla ilgili olarak, enflasyonun düşüş sürecinde enflasyon hedeflemesinin ekonomik büyümede bazı sorunları beraberinde getirebileceğini, ancak düşük ve istikrarlı enflasyon oranlarına ulaşıldıktan sonra söz konusu stratejiye bağlı bir büyüme sorunun ortadan kalkacağını, Yeni Zelanda örneğini vermek suretiyle ortaya koymaktadır.

Söz konusu stratejiye ilişkin diğer bir dezavantaj ise Friedman ve Kuttner (1996) tarafından ele alınan ve stratejinin merkez bankalarının para politikası uygulamaları açısından katı kurallar getiriyor olmasıyla ilgilidir. Söz konusu yazarlara göre enflasyon hedeflemesinde başarıya ulaşılması açısından konulan hedefin yakalanmasında merkez bankalarına hiç bir tavizin tanınmıyor olması, bu kurumların gerekli hallerde yeterli takdir yetkisini kullanamayacakları anlamına gelmektedir. Enflasyon hedeflemesi stratejisinde döviz kurlarının dalgalanmaya bırakılıyor olması da bu stratejiye ilişkin olumsuz olarak değerlendirilen yönlerinden bir diğeridir.

Döviz kuru hedeflemesi, parasal hedeflemesi ve enflasyon hedeflemesi politikaları günümüzde en çok uygulama alanı bulmuş olan stratejiler olmakla beraber, bunlara ilave olarak literatürde faiz hedeflemesi politikasının da önemli bir para politikası stratejisi olduğunu belirtmek gerekir. Faiz hedeflemesi stratejisinin en önemli avantajı bu politikanın temel üretim faktörlerinden olan işgücü üzerinde optimal sonuçlar almaya müsait bir politika olmasından kaynaklanmaktadır. Para politikasının işgücü üzerindeki optimal etkisi, dolaylı olarak üretim ve tüketim dengeleri üzerinde de olumlu etkilerde bulunabilmektedir. Literatürde faiz hedeflemesi stratejisinin diğer önemli bir avantajı olarak, bu politikanın enflasyon vergisini minimize etmesi gösterilmektedir. Özellikle faiz getirisine sahip olmayan varlıklar üzerinde nominal faizlerin enflasyon vergisi hükmünde olması, faiz hedeflemesi yoluyla bu yükün minimuma inmesinin temel mantığını oluşturmaktadır.

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Merkez bankalarının son zamanlarda politika hedefleri konusunda önemsedikleri diğer bir husus ise finansal istikrarın sağlanması hedefidir. Merkez bankaları finansal istikrarı sağlama konusunda oldukça önemli araçlara sahip bulunmakta ve bu konuda geniş bir araç yelpazesine sahip olukları söylenebilir (ÖZCAN, 2006, s. 41-47).

Faiz politikasına ilişkin bir diğer seçenek te faiz koridoru uygulamasıdır. Avrupa Merkez Bankası, Japonya, İngiltere, Kanada, Avustralya, Endonezya, İsveç, İsviçre, Norveç, Polonya, Romanya, Yeni Zelanda, Macaristan, Sırbistan ve İzlanda gibi birçok ülkede faiz koridoru sistemi uygulanmıştır. Bu ülke Merkez bankaları gecelik borç verme faiz oranını koridorun tavanı, borç alma faiz oranını koridorun tabanı olarak belirlemişler ve politika faiz oranı etrafında simetrik fakat oldukça dar bir yayılma alanını takip etmişlerdir. Böylece faiz koridoru bölgesi içinde kalmak suretiyle piyasa faizlerinin politika faizinden belirgin şekilde sapmasına engel olmuşlardır. Avustralya Kanada Yeni Zelanda, gecelik faiz oranlarını politika faizinin 25 baz puan üzerinde ve 25 baz puan altında belirleyerek şeffaf bir yöntem tercih etmişlerdir. Bankaların Merkez Bankası bünyesindeki gecelik mevduat hesapları borç alma faiz oranından değerlendirilirken, öte yandan standart borç verme faiz oranından da krediye dönüştürülmüş olmaktadır. İsveç'te hedef repo faiz oranının 75 baz puan üstünde ve altında yayılma uygulanırken, İsviçre'de üçer aylık libor faiz oranı hedef olarak alınmış ve hedefin 50 baz puan üstünde ve altında yayılma uygulanmıştır. 2001 Haziran ayı sonlarında, İngiltere Merkez Bankası, politika hedefinin etrafında 100 baz puan yayılması çerçevesinde faiz koridoru sistemini uygulamaya koymuştur (YÜCEMEMİŞ, ALKAN, & DAĞIDIR, 2015, s. 452-453).

Faiz oranlarının stabil olması finansal istikrar açısından kaçınılmazdır. Merkez bankasının istikrarlı faiz uygulaması finans kesimin istikrarını doğrudan etkileyecektir. Yukarıda değinildiği üzere her ülke uygulamasında faiz koridorunun tavanı ve tabanı arasında değişen oranlar bulunmaktadır. Faiz koridorunun tabanı ve tavanı arasındaki aralık, aslında o ülkedeki kredi ve mevduat faiz farkının da bir göstergesi olarak kabul edilebilir. Ekonominin daralma dönemlerinde bankaların kredi arzı azalmakta ve sıkı bir kredi arz politikası izledikleri görülmektedir. Bu durum faiz koridorundaki aralığın fazla olduğunu göstermektedir. Diğer yandan ekonominin genişleme dönemlerinde ise kredi ve mevduat faiz oranı arasındaki fark diğer bir ifadeyle faiz koridoru daralmaktadır. McCulley ve Toloui (2008) ile Curdia ve Woodford yaptıkları çalışmalarda para politikası aracılığıyla faiz farkının (mevduat-kredi faiz farkı) daraltılmasının ve dalgalanmaların azaltılmasının finansal piyasalarda istikrarı sağlayacağı ve toplumsal refahı arttıracağı sonucuna ulaştığını gösteren ampirik araştırmalar bunun kanıtı olarak gösterilebilir (YÜCEMEMİŞ, ALKAN, & DAĞIDIR, 2015, s. 453).

Faiz koridoru piyasa likiditesini ayarlamak açısından da önem arz etmektedir. Likidite, açık piyasa işlemleri yoluyla da etkin olarak yönetilebilirken, yapısal nitelikteki daha kalıcı dengesizlikler için zorunlu karşılıkların kullanılması daha uygun bir seçenek olacağı savunulmaktadır. Para piyasasındaki likiditenin talepten fazla ya da az olması durumunda merkez bankası zorunlu karşılıkları, likidite fazlasını ya da açığını bertaraf edecek şekilde ayarlayarak, söz konusu dengesizliğin para piyasasındaki faiz oranları ya da döviz kurları üzerinde baskı oluşturmasının önüne geçebilir. Zorunlu karşılıklar politikasının 90'lı yıllarda enflasyon hedeflemesi ile birlikte kısa vadeli faiz oranlarının temel politika aracı olması ve kamu borçlarının Merkez Bankaları tarafından finanse edilememe zorunluluğu gibi nedenlerle, özellikle gelişmiş ülkelerde, kullanımı seyrekleşmiştir. Bu durumun Merkez Bankalarının zorunlu karşılıkların finansal aracılığa getirebileceği potansiyel maliyetlerin farkına varmalarının ve finansal yeniliklerin de etkisiyle ortaya çıktığı da söylenebilir. Finansal krizinin ardından azalan sermaye akımlarının olumsuz etkisini bertaraf etmek için Brezilya, Peru, Kolombiya gibi birçok gelişmekte olan ülke merkez bankası önce zorunlu karşılık oranlarını düşürmüşlerdir. Diğer yandan ise başta FED olmak üzere gelişmiş ülke merkez bankalarının genişlemeci politikalarının etkisiyle artan sermaye akımlarına karşı zorunlu karşılıkları daha aktif olarak kullanmaya ve zorunlu karşılık oranlarını arttırmaya başlamışlardır. Finansal istikrar kaygılarının öne çıktığı bu dönemde, faiz artırımı yapılması halinde artabilecek sermaye girişlerinin, faiz oranlarını artırmak yerine zorunlu karşılıkların artırılması suretiyle finansal istikrar üzerinde yaratabileceği olumsuz baskının engellenmesi hedeflenmiştir (BÖCÜROĞLU, 2015, s. 12-14). Burada kısaca değinilen merkez bankası para politikası stratejileri bugün birçok merkez bankası tarafından belirli para politikası hedeflerine ulaşmak amacıyla kullanılmaktadır.

Bu konuya son vermeden önce hedeflere ulaşabilmek için ekonomik birimlerin bekleyişlerine de değinmemiz gerekir. Bekleyişlerin yönlendirilmesinin gerekli olduğuna dair literatürde son dönemde sıklıkla vurgulamalar yapılmaktadır. Buna göre, uygulanan politikaların etkinliği ile ekonomik birimlerin bekleyişlerinin yönlendirilebilmesi arasında doğrudan ve güçlü bir bağ bulunmaktadır. Bu çerçevede para politikası uygulamaların niteliğini belirleyen bazı unsurdan söz edebilir. Bu unsurlara ilişkin bilgilerin kamuoyuna aktarılması para politikası uygulamalarının şeffaflığının sağlanmasında ve başarı sağlanmasında önemli bir rol oynamaktadır. Para politikası uygulamalarının genel niteliğini belirleyen söz konusu unsurlara ilişkin bilgiler kamuoyuna gerektiği gibi duyurulmazsa, Merkez Bankası ile kamuoyu arasında asimetrik bilginin oluşması kaçınılmaz olacaktır. Bu çerçevede para politikalarına ilişkin üç tür bilgi noksanlığının asimetrik bilginin doğmasına kaynaklık ettiği söylenebilir. Bunlar, politikaların *amacına* ilişkin bilgi noksanlığı, politikaların *isleyişine* yani *aktarım mekanizmasına* ilişkin bilgi noksanlığı ve politikaların *uygulanması sürecinde gerçekleşen verilere* ait bilgi

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noksanlığıdır (Karahan, 2006:153). Politika amaçlarının ayrıntısı ile açıklanması kamuoyunun özellikle uygulamalara ilişkin olarak tahmin yapma imkânlarını güçlendirmekte ve bu açıklama sayesinde kamuoyu ile Merkez Bankası uygulamalarına ilişkin uzun dönemli bir güven ve istikrarlı beklenti oluşması mümkün olabilmektedir. Zira ekonomik birimler ancak bilgi edinebildikleri ve böylece izleyerek değerlendirme yapabilme imkanına sahip olabildikleri politikalara güvenebilirler.

Özetle; Merkez Bankaları politika uygulamalarında ne kadar şeffaf ve açık olurlarsa, kamuoyunun para politikalarındaki gelişmeleri izlemeleri, değerlendirmeleri ve denetlemeleri o derece mümkün olacaktır. Bu şekilde politikalara güvenilirliğin sağlanması ekonomik birimlerin beklentilerinin yönetilmesine imkan tanıyacak, uygulamaların etkinliğini artıracaktır (KARAHAN, 2006, s. 152).

Kriz Dönemlerinde Uygulanan Para Politikaları

Global krizden önce çoğunlukla fiyat istikrarını hedefleyen para politikaları tercih edilirken, krizin ardından söz konusu para politikalarının finansal ve makroekonomik istikrarın da kapsanması bir zorunluluk haline gelmiştir (TCMB Enflasyon Raporu, 2013: 107). Yalnızca fiyat istikrarına odaklı bir para politikasının aynı zamanda görece olarak daha kısa süreli bir enflasyon hedeflemesine sahip olması merkez bankalarına etkin bir risk gözlem imkânı sunmamaktadır. Bu nedenle para politikası uygulamalarında alternatif yaklaşımlar önem kazanmaya başlamış ve tüm dünyada makro finansal risklerin azaltılması hususunda merkez bankalarının rolü dönüşüme sahne olmuştur.

Kriz ortamlarında, geleneksel para politikası araçları merkez bankalarının amaçlarına ulaşmasında yeterli olmamaktadır. Bunun sebeplerinden ilki, nominal faiz oranlarının sıfır düzeyinin altına çekilememesi nedeniyle kriz dönemlerinde ihtiyaç duyulan parasal hızlandırıcıların yalnızca geleneksel olmayan para politikası araçları ile işlerlik kazanabilmeleridir. İkinci neden ise geleneksel olmayan para politikalarının nominal faiz oranı sıfırın üstünde olsa dahi etkin sonuçlar verebilmesidir.

Çok geniş bir yelpazede çeşitli araç ve önlemler paketini kapsayan geleneksel olmayan para politikaları, genellikle 5 alt başlıkta irdelenmektedir (ARICAN & OKAY, 2014 , s. 12-16). Bu kapsamda;

a) Miktar Genişlemesi
b) Kredi Genişlemesi
c) Faiz Taahhüdü Politikası
d) Zorunlu Karşılık Oranı Uygulaması
e) Faiz Koridoru Politikası yer almaktadır.

a) Miktar genişlemesi ile ilgili uygulama şöyle özetlenebilir; Global krizin ardından birçok ülke merkez bankası politika faiz oranlarını düşürerek likidite sıkışıklığı yaşayan birimlere kredi tahsis etmesi esasına dayanır. Faiz oranları sıfıra yaklaşmasına rağmen yeterli likiditenin sağlanamadığı hallerde ise merkez bankaları alternatif bazı önlemlerle likidite sağlamayı hedeflemişlerdir. Bu nedenle faiz oranı temel politika aracı olmaktan çıkarak yerini paranın miktarına bırakmıştır. Merkez bankaları miktar genişlemesi politikası vasıtasıyla çoğunlukla varlık alımları yaparak piyasaya yüklü miktarda para enjekte etmektedirler. Söz konusu alımlar, kısa vadeli finansal varlık alımları ya da uzun vadeli devlet tahvilleri şeklinde gerçekleşmekte, kimi zaman ise varlığa dayalı menkul kıymetler, bu alımlar içinde merkez bankalarınca tercih edilmektedir. Miktarsal genişleme süreçlerinde alınan varlıklar geleneksel politikaların kullanıldığı zamanlara kıyasla çok daha fazla miktarda olmaktadır. Kriz dönemlerinde devlet iç borçlanma senetlerinin haricinde özel sektör ihraçlarının da merkez bankaları tarafından satın alınması, özel sektör harcamalarını arttırarak ekonomiyi daha fazla canlandırmakta ve piyasadaki likiditeyi olumlu yönde etkilemektedir. Özel sektör ihraçları ile şirketler daha ucuza borçlanabilmekte, diğer yandan ise ticari bankalar artan mevduatları kredi olarak yine ekonomiye yönlendirerek borçlanma maliyetini düşürmektedirler.

b) Geleneksel olmayan para politikası araçlarından olan *kredi genişlemesinde* piyasadaki menkul kıymetlerin likidite sorunu ortadan kaldırılarak ve kaynakların etkin dağıtımı sağlanarak vadeli ticari menkul kıymetler dorudan satın alınmaktadır. Buradaki amaç, fonksiyonelliğini kaybetmiş piyasaların yeniden faaliyete geçirilmesi ve/veya regüle edilerek likidite sıkışıklığının ve risk priminin azaltılmasıdır. Bu şekilde ekonomideki finansal aktivitelerin tekrar olağan haline dönebileceği düşünülmektedir. Miktar genişlemesinden farklı olarak kredi genişlemesinde, merkez bankası bilançolarının kompozisyonu değiştirilmekte ve doğrudan para yaratmak yerine ticari menkul kıymetler merkez bankalarınca satın alınarak piyasa likiditesi yükseltilmesi yoluna gidilmektedir.

Bir Merkez Bankası kredi genişlemesi yapmak istiyorsa, kısa vadeli hazine bonolarını ihraç edip elde ettikleri fonlarla vadeli ticari menkul kıymetleri satın alırlar. Bu sayede yalnızca bilanço kompozisyonunu değiştiren merkez bankaları, vade ve bilanço büyüklüğünü değiştirmeden piyasadaki riskli menkul kıymetlere bir likidite sağlamış olacaklardır. Bu yöntem sayesinde merkez bankaları risksiz menkul kıymetlerle riskli menkul kıymetleri değiş tokuş ederek piyasada kredilerin hem maliyetini hem de uygunluğunu olumlu yönde etkilemiş olmaktadırlar. Merkez bankaları riskli varlık alımı yapınca öze sektör için söz konusu menkul kıymetlerin arzı daralmakta, bu durum ise kağıdın fiyatını yükseltip getirisini düşürmektedir. Özellikle riskli varlıklar için talebin mevcut olmadığı

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hallerde merkez bankalarının bu alımları piyasadaki kredileri daha cazip getirmektedir. Aynı zamanda bu tür politika araçları merkez bankalarının sahip olduğu varlıklarda bir çeşitlendirme imkânı sağlar. Bilanço büyüklüğü değişmeden yapılan bu tür çeşitlendirmeler merkez bankası portföyündeki riskin dağıtımı için en uygun yollardan biri olarak görülmektedir. Ayrıca bu tür para politikası araçları, fon aktarım mekanizmasının etkin olmadığı kriz dönemlerinde piyasalara doğrudan borç verme görevini de yerine getirirler. Böylece kredi maliyetleri düşerken, kredi piyasalarının daha fonksiyonel olması sağlanır.

c) Faiz taahhüdü politikası; politika faiz oranının merkez bankalarınca belirli bir süre düşük seviyede sabit tutulacağının taahhüt edilmesi ile sağlanır. Böylece merkez bankaları ekonominin yönü ve kısa dönemde faiz oranları ile ilgili özel sektörün beklentilerini kullanarak ülkenin ekonomisini istediği yönde etkileyebilecektir.

Faiz taahhüdü politikasının zayıf yönü enflasyon oranıdır ve faiz taahhüdü bir politika aracı olarak kullanıldığı sürece merkez bankaları enflasyon beklentilerine dikkat etmeleri gerekecektir. Düşük faiz taahhüdü; talebi arttırıp enflasyonist bir baskı oluşturabilmektedir. Bu durumda merkez bankaları taahhütlerini çiğneyip faiz oranlarını yükseltirlerse merkez bankalarının itibarında bir zedelenme yaşanacaktır.

d) Küresel kriz öncesi fiyat istikrarını temel hedef olarak gören merkez bankaları, *zorunlu karşılık oranı*nın kullanımını önemli ölçüde azaltmışlardı. Ancak küresel kriz sonrasında bu tür uygulamalar giderek merkez bankalarınca daha fazla rağbet görerek özellikle gelişmekte olan ekonomilerde sıklıkla kullanılan bir politika halini almıştır.

Zorunlu karşılıklar, başta bankalar olmak üzere finansal kurumların kredi olarak kullandırabilecekleri mevduat, menkul değerler ve yurt dışı borçlanma imkânlarına karşılık olarak merkez bankasında tutmak zorunda oldukları kaynaklardır. Bu araçlarla merkez bankaları para arzını kontrol edebilmekte ve özellikle kriz dönemlerinde kredi büyümesinin belli sınırlar içinde tutulması açısından önem arz etmektedir. Kriz dönemlerinde kredi büyümesi devam ederse ekonomideki riskler artar; bu nedenle para arzının merkez bankalarınca kontrol altında tutulması zorunludur.

Günümüzde kredi piyasalarının kontrolsüz genişlemesinin engellenmesi hususunda zorunlu karşılıklar önemli bir belirleyicidir. Para arzı hacminin kontrolü dışında merkez bankalarının likidite yönetimine katkı sağlayan ve istikrarlı kısa vadeli faiz oranlarının tahsisi hususunda da fayda sağlayan zorunlu karşılıklar, konjonktüre göre ekonominin canlandırılması için azaltılabilir.

e) Önceleri Merkez bankalarınca nadiren kullanılan *faiz koridoru* aracı, küresel kriz sonrası giderek önem kazanan bir politika olmuştur. Üçlü faiz sisteminin geçerli olduğu bu uygulamada, borç verme faiz oranı, politika faiz oranı ve borç alma faiz oranı gibi kavramlar karşımıza çıkmaktadır. Borç verme faiz oranı geçici likidite sıkışıklığına bir çözüm oluştururken, likidite fazlası olan bankalar borç alma faiz oranı üzerinden merkez bankalarında paralarını değerlendirebilmektedir. Diğer önemli kavram olan faiz koridoru ise merkez bankalarının gecelik borç verme ve borç alma faiz oranları arasındaki bandı ifade etmektedir. Bu doğrultuda politika faiz oranı da bu koridorun orta noktasını işaret etmektedir. Faiz koridoru sisteminin amacı gecelik faiz oranını belli bir seviyede tutabilmektir. Merkez bankaları müdahaleci görünmek istemediklerinde direkt politika faizini belirlemek yerine faiz koridorunda daralma ve genişlemeler yaparak piyasalardaki döviz kurlarını kontrol edebilmektedirler. Diğer bir ifade faiz oranları üzerinde "ince ayar" yapılmaktadır. Faiz koridoru politikası ile amaçlanan hem gelecekteki belirsizlikleri ortadan kaldırmak hem de konjonktüre bağlı olarak gelişen ve değişen koşullar altında faiz oranı hususunda esnek davranabilmektir (KARA, 2012, s. 8-9).

Küresel finans kriz Amerikan Merkez Bankası (FED) faiz oranını minimum düzeylere indirerek ucuz kredi maliyetleri aracılığıyla ekonomide büyüme dinamiğini harekete geçirmeyi amaçlamıştır. Ancak takip eden geçen beş yıl sonunda hızlı bir büyüme dinamiği yakalanamamış ve yatırım piyasalarında hızlı bir patlama olmamıştır. Sadece olumlu yönde bir gelişme olarak kabul edilebilecek bir husus, hisse senetleri piyasası ile döviz piyasalarındaki oynaklığın en alt düzeye indirilmesinin sağlanması olmuştur (EROL & EROL, 2015: (I), s. 56)**.**

Türkiye'de Para Politikasında Paradigma Değişimi ve Gelişmeler

Bu başlık altında, Türkiye'nin kriz sonrası uyguladığı para politikası incelenecektir. Bu amaçla Türkiye Cumhuriyet Merkez Bankası veri ve kaynaklarına dayanılarak gözleme dayalı bir değerlendirme yapılacaktır. 2008 yılının son çeyreğinde küresel krizin tüm dünyayı kapsayacak şekilde derinleşmesini takiben bütün ülkelerde ekonomi politikaları krizin tahribatını azaltmaya odaklanmıştır. Türkiye de bu doğrultuda hareket ederek para ve maliye politikalarını krizin olumsuz etkilerini minimize edecek şekilde yönlendirmiştir. Bu çerçevede TCMB, likidite desteğini artırırken aynı zamanda hızlı ve dinamik faiz indirimleriyle finansal sistemin ve kredi piyasalarının işlerliğini korumayı amaçlamıştır. TCMB, 2008 yılının Kasım ayından itibaren yaklaşık bir yıllık süreçte politika faizlerini 1025 baz puan indirerek gelişmekte olan ülkeler arasında en erken faiz indirmeye başlayan ve toplamda en fazla faiz indiren merkez bankası olmuştur (BAŞÇI & KARA, 2011, s. 3).

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Türkiye'de yeni politik düzenlemeler çerçevesinde kullanılan temel araç ve amaçlar ile aktarım mekanizması Şekil 1'deki gibi özetlenebilir. Şemanın solunda politika araçları yer almaktadır: (i) faiz koridoru, bir haftalık repo faizi ve likidite yönetimi araçları (ii) zorunlu karşılıklar. TCMB, bu araçlarla nihai olarak fiyat istikrarını ve finansal istikrarı etkilemeyi amaçlamaktadır. Bütün bu süreçte, krediler ve döviz kuru kanalı ise araçlarla nihai amaçlar arasında köprü niteliği taşımaktadır.



Şekil 1: TCMB'nin Politika Araçları ve Amaçları

Kaynak: (KARA, Küresel Kriz Sonrası Para Politikası, 2012, s. 6)

Faiz Politikaları ve Faiz Koridoru Uygulaması

Türkiye, 2001 yılından itibaren örtük bir şekilde, 2006 yılından itibaren ise resmi olarak enflasyon hedeflemesi rejimini benimsemiştir. Bu çerçevede para politikası "fiyat istikrarı" odaklı bir strateji olarak kurgulanmıştır. Bu amaç için, kısa vadeli faizler politika aracı olarak kullanılmıştır.

Uygulanan strateji enflasyonla mücadeleye büyük katkıda bulunmuş, bu dönemde yaşanan küresel şoklara karşı esnek bir şekilde tepki verilebilmesini ve enflasyon beklentilerinin kontrol altında tutulabilmesini sağlamıştır. Böylece, uzun yıllardan sonra enflasyon kalıcı olarak tek haneli seviyelere düşürülmüştür.

Küresel krizin literatürde en fazla vurgulanan yanı; finansal istikrarın göz ardı edilmesinin orta ve uzun vadede makroekonomik istikrarı fiyat istikrarını birlikte tehdit edebileceğidir. Nitekim, merkez bankalarının finansal sistemde biriken riskleri ve varlık fiyatlarındaki balonları tamamen göz ardı etmemesi gerektiği görüşü küresel platformlarda giderek yaygınlık kazanmaktadır

Diğer bir husus, merkez bankalarının tek bir araçla birden fazla değişkeni kontrol etmesi mümkün değildir. Fiyat istikrarını ve finansal istikrarı dengede tutacak faiz oranı her zaman aynı olmayabilmektedir. Örneğin, verimlilik artışlarıyla desteklenen hızlı büyüme dönemlerinde enflasyonun kontrol altında tutulabilmesi için düşük faiz oranları yeterli olabilmekte, ancak finansal risklerin oluşmasını engelleyememektedir.

Bu durumun daha somut bir şekilde ortaya konulması gerekir. Gelişmekte olan ülkelerde, fiyat istikrarı ve finansal istikrarın gerektirdiği faiz oranları arasındaki fark daha da yüksek olabilmektedir. Çünkü küresel büyüme dönemlerinde artan risk iştahı gelişmekte olan ülkelere yönelik sermaye akımlarını hızlandırmakta, bilançolardaki vade ve kur uyumsuzluklarını artırmakta, reel kur değerlenmesi ve hızlı kredi genişlemesi yoluyla kaynak dağılımını bozarak finansal istikrara ilişkin risklerin birikmesine zemin hazırlamaktadır. Böyle bir konjonktürde, sermaye girişlerinin yavaşlatılarak makro finansal dengesizliklerin azaltılmasına ihtiyaç vardır. Bu bakımdan, kısa vadeli faizlerin düşük düzeylerde tutulması doğal bir politika seçeneği olarak karşımıza çıkmaktadır. Ancak öte yandan, faiz oranlarının uzun süre düşük düzeylerde tutulması, hızla büyüyen iç talebi destekleyerek fiyat istikrarını tehdit edebilmektedir. Diğer bir ifadeyle, dış dengeyi sağlayan faiz oranı iç dengeyi sağlayan faiz oranından belirgin ölçüde farklılaşması kaçınılmaz olmaktadır. Dolayısıyla, fiyat istikrarını amaçlayan bir merkez bankasının, aynı zamanda makro finansal riskleri gözeten politikalar uygulayabilmesi için, özellikle hızlı sermaye girişlerinin yaşandığı bu gibi dönemlerde, birden fazla politika aracını kullanması önem arz etmektedir.

Nitekim TCMB, biriken makro finansal dengesizlikleri sınırlamak amacıyla temel olarak iki ara hedef benimsemiştir: Kısa vadeli sermaye girişlerini azaltmak ve kredi genişlemesini yavaşlatmak. Bu doğrultuda, fiyat istikrarından taviz verilmeden finansal istikrarın gözetilebilmesi amacıyla, politika faizine ek olarak zorunlu karşılıklar ve faiz koridorunun (gecelik borç verme ve borçlanma faizi arasındaki fark) aktif para politikası araçları olarak kullanılmasına karar verilmiştir (BAŞÇI, KARA, 2011:3-7).

Sonuç olarak, TCMB'nin uyguladığı yeni politika stratejisi çerçevesinde; faiz koridorunun genişletilmesi, politika faizinin tahmin edilebilirlik derecesinin azaltılması ve zorunlu karşılıkların artırılarak vadelere göre

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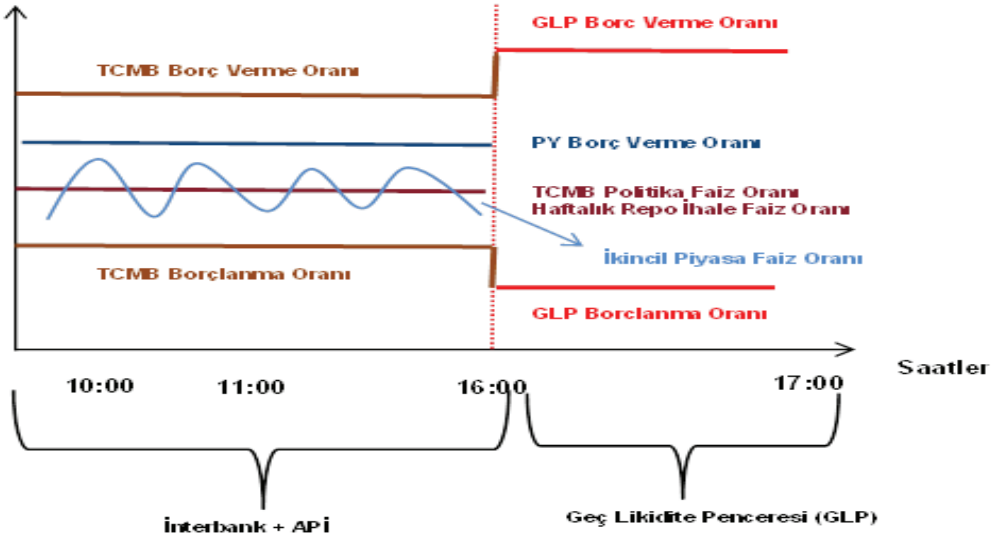
farklılaştırılması şeklindeki düzenlemeler, kısa vadeli sermaye girişlerinin ve kredi genişlemesinin yavaşlatılmasına yönelik birbirini tamamlayan araçlar olarak tasarlanmıştır.

TCMB para politikasındaki nihai amacı olan fiyat istikrarı ve finansal istikrara ulaşabilme konusunda 2010 yılı sonu itibariyle araç çeşitliliğine gitmiştir. Bunu yaparkende, krediler ve döviz kuru kanallarını ayrı ayrı etkileyebilecek nitelikte bir strateji hedeflemiştir. TCMB bu yeni politikada faiz koridoru çerçevesinde bir haftalık repo faizi ve likidite yönetim araçları ile zorunlu karşılıkları politika araçları olarak benimsemiştir (TCMB, 2010). TCMB para politikasını uygularken piyasa faizlerini ve likiditesini etkilemek için kullandığı faiz koridoru ile piyasada ihtiyacı olan bankalara kısa vadeli (günlük veya haftalık) likidite sağlayabildiği gibi, fon fazlası olanlardan da gecelik vadede borç alabilmektedir. TCMB'nin bankalardan gecelik vadede borçlanabileceği ve borç verebileceği faiz seviyelerinin arasında kalan bu alan "faiz koridoru" olarak adlandırılmaktadır (KARA, Küresel Kriz Sonrası Para Politikası, 2012, s. 8).

Şekil 2: Para Politikasının Operasyonel Yapısı



Kaynak: (KARA, Küresel Kriz Sonrası Para Politikası, 2012, s. 8)

TCMB'nin ilan ettiği bu faizlerin yanı sıra, para politikası duruşu açısından gecelik piyasada oluşan faizlerin seviyesi de önem taşımaktadır. Yeni sistemde, bir haftalık vadede yapılan fonlamanın miktarının günlük olarak değiştirilmesi suretiyle piyasada oluşan faizin seviyesi günlük frekansta ayarlanabilmektedir. Özetle, likidite operasyonları aracılığıyla kısa vadeli piyasa faizinin koridor içinde arzu edilen seviyelerde oluşması sağlanabilmektedir. Bu yapıda, faiz koridorunun genişliği, TCMB'nin likidite operasyonlarını kullanarak kısa vadeli piyasa faizlerinde günlük olarak yapabileceği değişikliklerin boyutunu (kısa vadeli faizin hangi aralıkta dalgalanabileceğini) belirlemektedir.

Burada açıklanan bu yapı büyük ölçüde geleneksel enflasyon hedeflemesinde de kullanılmaktadır. Ancak, TCMB'nin son dönemde uyguladığı sistem ile eski yapı arasında temel olarak iki fark bulunmaktadır.

a) Geleneksel sistemde kısa vadeli ortalama fonlama faizi ile piyasada oluşması hedeflenen faiz arasında bir fark gözetilmemektedir. Yeni sistemde ise likidite operasyonlarıyla bu iki faiz birbirinden ayrıştırılabilmektedir. Söz konusu farklılaşma, bazı dönemlerde TCMB'nin kredi ve döviz kuru kanallarını ayrı ayrı etkilemesine imkan sağlamaktadır.
b)) Geleneksel sistemde ortalama kısa vadeli fonlama faizinin seviyesi aylık frekanslarda Para Politikası Kurulu toplantılarında gözden geçirilmektedir. Yeni çerçevede ise küresel risk iştahındaki oynaklıklara vakitli olarak tepki verebilmek amacıyla ortalama fonlama faizi (yine Kurul üyelerinin onayı dâhilinde) gerek duyulduğunda günlük frekansta ayarlanabilmektedir (KARA, 2012, s. 9).

Türkiye'de faiz koridoru uygulaması başka gerekçelere de dayandırılabilir. Örneğin artan sermaye girişlerinin sonucunda kredilerin hızla yükselmesi ve bu kanalla artan cari açık ile içeri giren sermayede herhangi bir ani duruş (sudden stop) riski doğabilecektir. İşte bu riske karşı kullanılabilecek bir hamle seçeneğine ihtiyaç doğmuştur. Böylece enflasyon hedeflemesinde fiyat istikrarı için tek faiz yeterli iken, devreye ikincil bir amaç - cari açık kontrol-girince, tek faiz yeterli olmadı ve TCMB araç çeşitliliğine gitmeyi tercih etmiştir.

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18 Mayıs 2010 tarihli "Para Politikası Kurulu Kararı" ile teknik faiz ayarlamasına gidilerek faiz koridorunun arasında kalan 1 hafta vadeli repo ihale faiz oranı politika faiz oranı olarak belirlenmiştir. Kurul kararında; "*Para Politikası Kurulu (Kurul), Bankamız bünyesindeki Bankalararası Para Piyasası ve İstanbul Menkul Kıymetler Borsası Repo–Ters Repo Pazarı'nda uygulanmakta olan gecelik faiz oranlarının .... sabit tutulmasına, ayrıca teknik faiz ayarlamasına gidilerek bir hafta vadeli repo ihale faiz oranının yüzde 7 olarak belirlenmesine karar vermiştir*" ifadelerine yer vermiştir (TCMB, Para Politikası Kurulu Kararı, 18 Mayıs 2010).

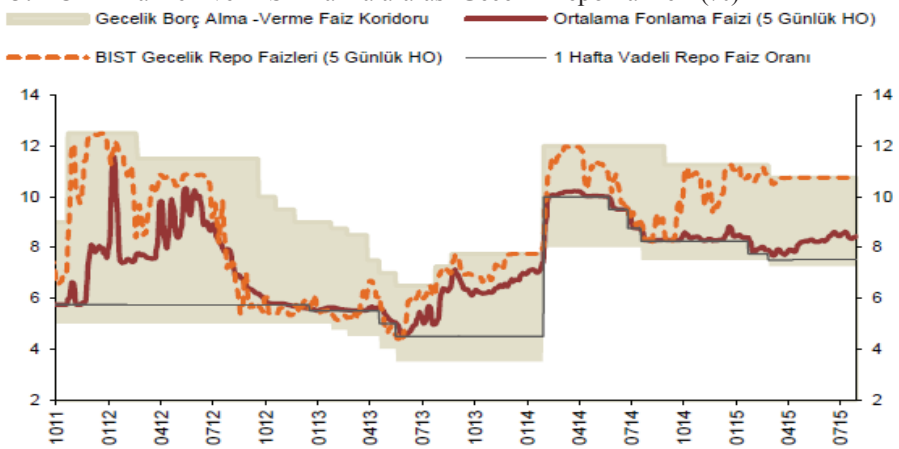
TCMB 2010 yılında hem geniş faiz koridoru uygulamasına geçti, hem de fonlama kompozisyonu sayesinde piyasada ortalama bir fonlama maliyeti oluşturdu. Bu da para piyasası için referans faiz niteliğinde oldu. Böylece TCMB günlük bazda dahi para politikası duruşuna istediği şekilde müdahale edebilecek esnekliği kazandı. Bu bir anlamda piyasayı TCMB'ye daha da bağımlı hale getirdi.

Enflasyon hedeflemesi yapan dalgalı kur rejimi altındaki ülkelerde para politikasının temel aracı kısa vadeli faiz oranıdır. Ülkeler arasında teknik olarak farklı uygulamalar olsa da, merkez bankaları kısa vadeli faiz oranını esas olarak kendi bilanço büyüklüklerini değiştirmek suretiyle belirlemektedir. Bu da en doğrudan şekilde bono alım ve satım işlemleri ile sağlanabileceği gibi, TCMB'nin yaptığı biçimde finansal kuruluşlara kısa vadeli borç (likidite) verilmesi şeklinde de gerçekleşebilmektedir. Örneğin TCMB bunu bir haftalık ve gecelik repo işlemleri ile yapmaktadır.

Yaşanan konjonktür çerçevesinde piyasanın net likidite pozisyonu uygulanmak istenen para politikası açısından önem taşımaktadır. Türkiye'de yaşanan derin krizlerden olan 2001 krizi sonrası banka bilançolarının yeniden yapılandırılması sürecinde ortaya çıkan nicel genişleme, bankacılık sisteminin uzun süre likidite fazlası vermesini sağlamış, bu da merkez bankasının borç alma faizinin referans faizi teşkil etmesine neden olmuştu. 2010 yılından sonra TCMB piyasaya net borç verici konumunda olması yanı sıra para politikasının duruşunda merkez bankasının fonlama faizleri daha önemli hale gelmiştir (KARA, Faiz Koridoru ve Para Politikası Duruşu, 2015, s. 3).

Şekil 3, faiz koridoru çerçevesinde TCMB'nin 2011-2015 yılları arasında uyguladığı faiz oranları ile gecelik piyasada oluşan faizi bir arada göstermektedir (KARA, Faiz Koridoru ve Para Politikası Duruşu, 2015, s. 5). Konvansiyonel bir koridor politikasında bütün kısa vadeli faizler aynı yönde ve benzer ölçüde hareket ederken, TCMB'nin uyguladığı politikada koridor içerisinde birden fazla kısa vadeli faiz birbirinden farklı oranlarda hatta bazı dönemlerde ters yönlü hareketler bile göstermiştir. Dolayısıyla bu hareketlerin karmaşıklığı para politikası duruşu açısından tartışmalara kapı aralamıştır.

Şekil 3: TCMB Faizleri ve BIST Bankalararası Gecelik Repo Faizleri (%)



Kaynak: Kara, H. (2015) "Faiz Koridoru ve Para Politikası Duruşu", TCMB Ekonomi Notları, Sayı No: 2015-13, Ankara, s:2)

Faiz koridorun genişliği konjonktüre göre esnek tutulmuştur; zaman zaman 2.5 puanlardan, 7.5 puana kadar yükselmiştir (alt bant %1.5 üst bant %9); bazı dönemde, fonlama maliyeti dipte %4.5'ları görürken, tepede %12'lere kadar ulaştığı dönemler olmuştur. Her ne kadar bu politikaların, gelişmiş merkez bankalarının uygulamış olduğu sürece uyum amacıyla ve gerekli olsa da; piyasa tarafından TCMB hem bu politikaların karmaşıklığı hem de iletişimin verimli olmamasından ötürü oldukça eleştirilmiş, hatta belli dönemler önemli kredi kayıpları yaşamıştır. Özellikle enflasyonun arzu edilen seviyelere çekilememiş olması da, kredi kaybının yaşanmasına sebep olmuştur. Bu durum ekonomideki büyüme potansiyelinin de sınırlı kalmasına yol açacağı endişelerini güçlendirmiştir.

Reeskont ve Avans İşlemleri

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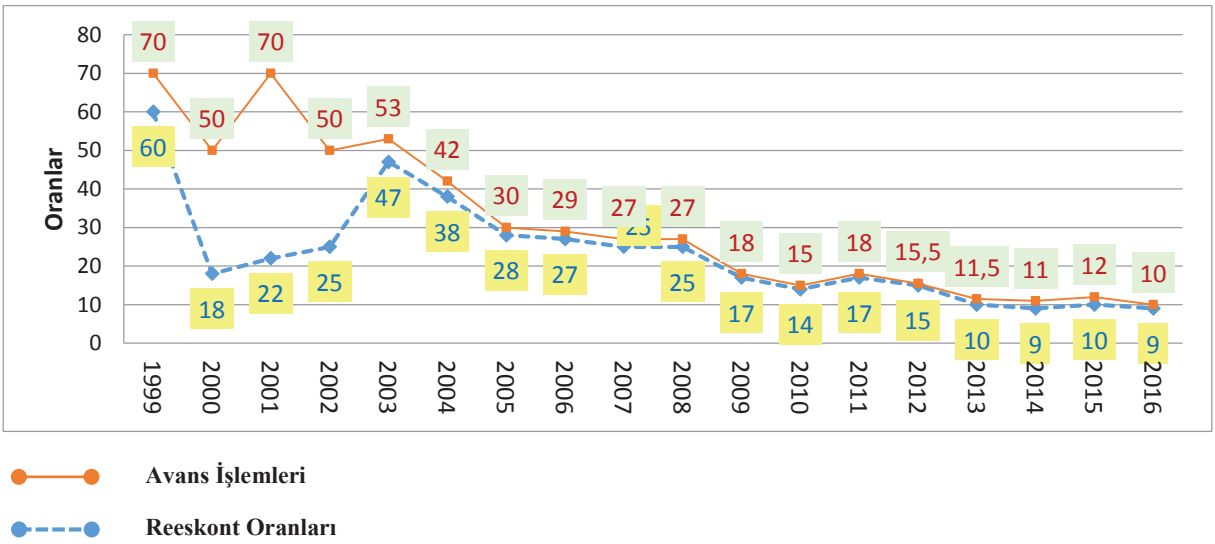
Para politikası hedefleri çerçevesinde, Banka Meclisi'nce belirlenecek esas ve şartlar çerçevesinde bankalar tarafından verilecek ticari senet ve vesikaları reeskonta veya avansa kabul etmek, reeskont ve avans faiz oranlarının tespiti aşamasında gerekli çalışmaları yaparak Banka Meclisi'ne sunmak Krediler Müdürlüğü'nün görev alanında bulunmaktadır. Reeskont ve avans işlemleri, Merkez Bankası Kanunu'nun 45. maddesinde düzenlenmiştir (ÖNDER, 2005, s. 278-279)

Şekil: 4 TCMB Reeskont Ve Avans İşlemlerinin Oransal Seyri (%)



Kaynak: TCMB verilerinden hareketle yıllık ortalamalar şeklinde oluşturulmuştur.

Ancak ekonomideki para arzı ve kredi genişlemesi dikkate alınarak belirlenen reeskont faiz oranı, aktif bir para politikası aracı olma özelliğini kaybetmiş olduğu söylenebilir. Bununla birlikte Merkez Bankası, muteber saydığı asgari üç imzayı taşımak şartıyla kendi belirleyeceği esaslar dahilinde bankacılık kesiminin geçici likidite ihtiyaçlarının karşılanması için, bankalar tarafından verilecek ticari senet ve vesikaları reeskonta kabul edebilir. Reeskonta kabul edilecek ticari senet türleri ve imzalardan biri yerine geçebilecek teminatlar ile diğer koşullar Merkez Bankasınca belirlenmektedir.

Avans işlemleri Hazine adına TCMB tarafından yapılmakta idi, ancak bu olanak büyük ölçüde sınırlandırılmıştır (ÖZATAY, 2011, s. 63). Kanunda kendisine yetki verilen işlemler dışında avans veremez ve kredi açamaz, vereceği avans ve açacağı kredi teminatsız veya karşılıksız olamaz, her ne şekilde olursa olsun kefil olamaz ve doğrudan kendisi ile ilgili işlemler dışında teminat veremez. Merkez Bankası, Hazine ile kamu kurum ve kuruluşlarına avans veremez ve kredi açamaz, Hazine ile kamu kurum ve kuruluşlarının ihraç ettiği borçlanma araçlarını birincil piyasadan satın alamayacağı hükme bağlanmış olduğundan bu alanda bir politika oluşturabilmesi mümkün olmamaktadır.

Zorunlu Karşılıklar

Merkez bankasının, bankaların kabul ettikleri mevduat karşılığında bankaların kendisinde tutulmasını zorunlu kıldığı miktarlar olan zorunlu karşılık uygulamaları, Türkiye özelinde bazı dönüşümlere konu olmuştur. Önceleri Türkiye'de hem disponibilite hem de munzam karşılıklar uygulaması söz konusu iken günümüzde; disponibilite ve munzam karşılıklar kalkmış, yerini bankaların TCMB'ye yatırmak zorunda oldukları zorunlu karşılıklar veya kısa ifadesiyle "karşılıklar" almıştır. Bankaların günlük işlemlere ilişkin ödemelerini karşılayabilmeleri için kasalarında serbest karşılıklar şeklideki hazır likit anlamında olan ankes uygulaması ise sürmektedir (Mahfi Eğilmez: 2012). TCMB, para politikası aracı ve makroihtiyati bir araç olarak zorunlu karşılıkları kullanmaya devam etmektedir. 2015 yılı sonu itibarıyla TL ve yabancı para ağırlıklı ortalama zorunlu karşılık oranları sırasıyla yüzde 11,1 ve yüzde 12,8 olarak gerçekleşmiştir.

TCMB 2010 yılından itibaren zorunlu karşılık oranı politikalarında mevduatın vade ve cinsine göre ve ayrıca yükümlülüklere göre karşılık oranları belirmektedir. Mevduatları; 1-3-6 ay Vadeli, bir veya bir yıldan uzun vadeli mevduat, ihbarlı mevduat, vadesiz mevduatlar şeklinde ayrıca TL ve YP gibi ayrımlara tabi tutarak farklı karşılık oranları uygulamaktadır. Tablo 1 de bir yıl ve/veya daha uzun vadeli mevduat/katılım fonları zorunlu karşılık oranları seyri görülmektedir.

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Buradan da görüleceği üzere 2010 yılından başlayarak TL karşılık oranları; 2016 yılına kadar % 5.0 düzeyinde tutulurken bu yılda iki kez karşılık oranında indirime gidilmiş, önce 4.5 daha sonra 4.0'a indirilmiştir.

Yabancı para mevduat oranlarının 2011 yılında %11 den önce % 10'a, daha sonra %9.5 ve en nihayetinde % 9 oranına kadar düşürülüp bu oranın 2016 yılına kadar muhafaza edildiği görülmektedir. Bu yılda yarım puan düşürüldükten sonra 2017 itibariyle % 8.0 düzeyine indirilmiştir. Bu seyirden anlaşılacağı üzere zorunlu karşılık oranları, bankaların rezervlerinin daha fazla miktarını serbest kullanabilmelerini mümkün kılacak düzeyde tutulması hedeflenmiştir.

Tablo: 1 Bir Yıl Ve/Veya Daha Uzun Vadeli Mevduat/Katılım Fonları Zorunlu Karşılık Oranları

TÜRK LİRASI		**YABANCI PARA**	
TEBLİĞ	ORAN (%)	TEBLİĞ	ORAN (%)
2002/1	6.0	2002/1	11.0
2005/1	6.0	2008/7	9.0
2009/7	6.0	2010/5	9.5
2010/9	5.5	2010/7	10.0
2010	5.0	2010/9	11.0
2011	5.0	2011	11.0 - 9.0
2012	5.0	2012	9.0
2013	5.0	2013	9.0
2014	5.0	2014	9.0
2015	5.0	2015	9.0
2016	4.5 - 4,0	2016	8.5
2017	4.0	2017	8.0

Kaynak: TCMB Tebliğ ve Duyurularından Yararlanılarak Oluşturulmuştur.

Finansal istikrarı desteklemek, makro finansal riskleri sınırlamak amacıyla 2015 yılının ilk yarısında bankaların ve finansman şirketlerinin yabancı para cinsinden yükümlülükleri için uygulanan zorunlu karşılık oranları, çekirdek dışı yükümlülüklerde vadenin uzamasını teşvik edici yönde değiştirilmeye başlanmıştır. 29 Ağustos 2015 tarihinden itibaren yenilenen ve yeni kullanılan yabancı para cinsinden yükümlülükler için geçerli olacak şekilde çekirdek dışı yükümlülükler için zorunlu karşılık oranları, üç yıldan uzun vadeyi teşvik edici yönde değiştirilmiştir (TCMB Yıllık Rapor, 2015, s. 40).

Rezerv Opsiyon Mekanizması (ROM) ve Rezerv Opsiyon Katsayısı (ROK)

Rezerv Opsiyon Mekanizması için öncelikle vurgulanmasını gerekli gördüğümüz yönü, bu mekanizmanın ilk olarak TCMB tarafından tasarlanmış olmasıdır. Özünde TL cinsi zorunlu karşılıkların yabancı para ve altın cinsinden de yatırılabilmesine imkan tanıyan bir sitemdir. Diğer merkez bankalarından farklı olarak TCMB, bankaların yerli para olarak yatırmak zorunda oldukları zorunlu karşılıklarını döviz ya da altın cinsinden yatırmalarına izin verebilmektedir. Bu, bankalar için bir zorunluluk olmak yerine bir opsiyon anlamı taşımaktadır. Diğer bir ifade ile bu uygulama bankalar için alternatif bir seçenek niteliği arz etmektedir. Bu uygulama, rezerv opsiyon mekanizması olarak adlandırılmaktadır.

İlk bakışta, bu mekanizma ile bankalara getirilen bu imkan merkez bankası hükümranlığı açısından tezat teşkil ediyor görülebilir. Ancak, Türkiye'de yıllara dayanan para ikamesi olgusu ve küresel kriz sonrasındaki istikrarsızlık yaratabilecek sermaye akımları göz önünde bulundurulduğunda, ROM'un para ikamesinden yararlanma amacı da taşıdığı gözden kaçırılmamalıdır. Bununla birlikte, ROM'un en önemli amacının sermaye hareketlerindeki aşırı oynaklığın makroekonomik ve finansal istikrar üzerindeki olumsuz etkilerini sınırlandırmak

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olduğu da ayrıca vurgulanmalıdır (BÖCÜROĞLU, 2015, s. 18-19). Uygulama Türkiye'de aktif bir şekilde kullanılmaktadır.

Rezerv opsiyon mekanizması (ROM) otomatik stabilizatör fonksiyonu üstlenmesi bu politika aracının en önemli özelliklerinden biridir. Örneğin sermaye girişlerinin hızlandığı ve yabancı para kaynaklarına erişimin nispeten kolay ve maliyetin daha düşük olduğu dönemlerde, bankalar TL zorunlu karşılık yerine daha fazla YP koymayı tercih eder. Böylece TL'nin aşırı değerlenmesinin engellenmesi mümkün hale gelir. Buna karşılık sermaye girişlerinin yavaşladığı dönemlerde ise bankaların rezerve koydukları dövizi kullanmayı tercih ederek TL üzerindeki baskıyı hafifletebileceği de tersi durumda ortaya çıkabilecek en önemli beklentilerden biridir. Böylece, ROM "otomatik stabilizatör" rolü üstlenerek finansal piyasalardaki oynaklığı azaltmada önemli bir katkı sağlayacak olması çok büyük bir avantajdır.

Mekanizmaya yapılan eleştirilerde söz konusudur. ROM'un bir finansal mühendislik çalışması olduğu, bankalara TL ve döviz likidite yönetimlerinde esneklik kazandırması ve TCMB'nin brüt dış rezervlerine katkı yapması gibi avantajlı yönlerinin yanı sıra bankaları yurtdışı borçlanmaya teşvik ederek para ikamesini artırıcı etki yapmak gibi olumsuzluklara sebebiyet verebileceği yönünde eleştiriler de yapılmıştır (BÖCÜROĞLU, 2015, s. 21).

Bankacılık sektörünün kısa vadeli yabancı para cinsi borçları ile bankacılık sektörünün ROM dahil olarak TCMB'de tuttuğu yabancı para zorunlu karşılıklarını kıyasladığımızda, ROM'un yürürlüğe girdiği 2011 Eylül ayından itibaren bankaların TCMB'de tuttukları ROM kapsamında getirdikleri miktar dahil YP zorunlu karşılıkların toplamının kısa vadeli YP dış borçlarına oranının arttığı görülmektedir. Bu durum bankaların TL likiditeye erişmede ya da TCMB'den elde edilen likiditeyi daha kalıcı hale getirmede döviz borçlanmayı ya da mevcut döviz varlıklarını aktif olarak kullanabileceklerini de göstermektedir (BÖCÜROĞLU, 2015, s. 24).

Türkiye'de yabancı para cinsinden yükümlülüklere uygulanan zorunlu karşılık oranları uygulaması çerçevesinde; ROM'un otomatik dengeleyici özelliğinin güçlendirilmesi, bankalar ve finansman şirketlerinin döviz likiditesinden istikrarlı olarak yararlanması için rezerv opsiyon dilimlerinde ve katsayılarında teknik ayarlamalar yapılmış ve rezerv opsiyon mekanizması böylece aktif bir şekilde kullanılmıştır.

13 Şubat 2015 yükümlülük tarihinden itibaren geçerli olmak üzere, en üst yüzde 5'lik dilim, yüzde 1'lik 5 yeni dilime ayrılmıştır. 27 Şubat 2015 yükümlülük tarihinden itibaren geçerli olmak üzere, döviz likiditesi ihtiyacını karşılamak amacıyla katsayılar yüzde 30'luk ilk dilimde düşürülürken yüzde 1'lik son beş dilimde artırılmıştır. 2015 yılı sonu itibarıyla döviz ve altın rezerv opsiyonunun son dilimine denk gelen katsayılar sırasıyla 4,7 ve 2,5 düzeyindedir. 18 Aralık 2015 tesis tarihi itibarıyla, sektör genelinde döviz imkânının kullanım oranı yüzde 91,2; altın imkânının kullanım oranı ise yüzde 89,8 olarak gerçekleşmiştir. Öte yandan, bankalar kıymetli maden depo hesapları için de standart altın tesis edebilmekte olup söz konusu imkânın kullanım oranı aynı tesis dönemi itibarıyla yüzde 70,4 olarak gerçekleşmiştir. Böylece ROM aracılığı ile toplam döviz rezervlerine katkı sağlanırken, aynı zamanda sermaye akımlarındaki oynaklıkların döviz piyasası üzerindeki olumsuz etkileri azaltılmaktadır. Ayrıca, yurt dışı fonlama imkanlarında yaşanabilecek olası değişimlere karşı otomatik dengeleyici özelliği ile bir güvence sağlamaya devam etmiştir.

Dengeli büyümeyi desteklemek ve yurt içi tasarrufları güçlendirmek amacıyla TL olarak tesis edilen zorunlu karşılıklara faiz ödenmesi uygulamasında, 2015 yılından itibaren çekirdek yükümlülükleri teşvik edici yönde, mevduat ve öz kaynak toplamının açılan kredilere oranı sektör ortalamasından daha yüksek olan kuruluşlara kendi durumlarını bozmadıkları sürece daha yüksek oranda faiz ödenmiştir. Bu çerçevede, 8 Mayıs 2015 tesis döneminden itibaren TL cinsinden tesis edilen zorunlu karşılıklara ödenen faiz oranında 50 baz puan artırıma gidilmiştir. Bankacılık sektörünün aracılık maliyetlerinin azaltılması ve çekirdek yükümlülüklere sağlanan desteğin artırılması amacıyla TL cinsinden tesis edilen zorunlu karşılıklara ödenen faiz oranlarının 1 Eylül 2015 tarihinde 50 baz puan, 1 Ekim 2015 tarihinde 50 baz puan ve 1 Aralık 2015 tarihinde 50 baz puan olmak üzere toplamda 150 baz puan artırılmasına karar verilmiştir.

Diğer yandan değişen küresel ve yerel finansal piyasa koşulları çerçevesinde, 5 Mayıs 2015 tarihinden itibaren bankalar ve finansman şirketleri tarafından TCMB nezdinde ABD doları cinsinden tutulan zorunlu karşılıklara, rezerv opsiyonlarına ve serbest hesaplara da faiz ödenmeye başlanmıştır.

Bankaların yurt dışı şubelerinin zorunlu karşılığa tabi yükümlülüklerinin kapsamı, 29 Mayıs 2015 tarihinden sonra oluşan yeni yükümlülükler için genişletilmiş, böylece bankaların yurt dışı şubelerinin de borçlanmalarında uzun vadeyi tercih etmeleri teşvik edilmiştir (TCMB Para ve Kur Politikası, 2015, s. 15).

SONUÇ

TCMB, global kriz sonrası para politikasını kurgularken, nihai amacı olan fiyat istikrarı ve finansal istikrara ulaşabilme konusunda 2010 yılı sonu itibariyle araç çeşitliliğine giderek, krediler ve döviz kuru kanallarını ayrı ayrı etkileyebilecek şekilde bir strateji oluşturmuştur. TCMB bu yeni faiz koridoru politikası çerçevesinde bir haftalık repo faizi ve likidite yönetim araçları ile zorunlu karşılıkları politika araçları olarak benimsemiştir.

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TCMB, biriken makro finansal dengesizlikleri sınırlamak amacıyla ilki k*ısa vadeli sermaye girişlerini azaltmak* ve diğeri *kredi genişlemesini yavaşlatmak* olmak üzere iki ara hedef benimsemiştir. Bu doğrultuda, fiyat istikrarından taviz vermeden finansal istikrarın gözetilebilmesi amacıyla, politika faizine ek olarak, zorunlu karşılıklar ve gecelik borç verme ve borçlanma faizi arasındaki farktan oluşan faiz koridorunu aktif para politikası aracı olarak kullanmayı tercih etmiştir. Böylece iç ve dış belirsizliklerin Türkiye ekonomisine olan olumsuz etkilerini sınırlamaya ve ekonomik istikrarsızlıkları gidermeye yönelmiştir.

TCMB'nin uyguladığı yeni politika stratejisi çerçevesinde; faiz koridorunun genişletilmesi, politika faizinin tahmin edilebilirlik derecesinin azaltılması ve zorunlu karşılıkların artırılarak vadelere göre farklılaştırılması şeklindeki düzenlemeler, kısa vadeli sermaye girişlerinin ve kredi genişlemesinin yavaşlatılmasına yönelik birbirini tamamlayan araçlar olarak tasarlanmıştır

Diğer yandan TCMB tarafından tasarlanıp uygulanan rezerv opsiyon mekanizması sayesinde, toplam rezervlerde bir artış sağlanırken, aynı zamanda sermaye akımlarındaki ani oynaklıklar karşısında tampon görevi ifa edeceğine dair yapılan yorumları haklı çıkarmıştır. Sermaye akımlarında gözlenen dalgalanmalar karşısında ROM'un otomatik dengeleyici özelliğinin güçlendirilmesi bağlamında, rezerv opsiyon dilimleri ile katsayılarında ve zorunlu karşılık oranlarında teknik ayarlamaları içeren bu politikalar, ihtiyaç duyulan döviz likiditesini de sağlayacak biçimde, TCMB tarafından aktif biçimde uygulanmıştır.

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INCREASED POLITICAL EFFECT OF SOCIAL MEDIA IN THE UNITED STATES PRESIDENTIAL ELECTION 2016: REPUBLICAN CANDIDATE TRUMP'S DIGITAL STRATEGY

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Social media continues to create a rising reference point, especially among young people. Especially, "virtual social environments", in which content such as politics, economy, art, sports and humor enter into circulation, confront supporters and critical opponents who defend political figures at all levels during political elections. A similar picture has taken place in recent United States presidential elections, whose results are highly anticipated all over the world. Social communication applications such as Facebook, Twitter, Youtube, Instagram, and Whatsapp have been used primarily by candidates to make a convincing effect on voters in the election process where a race is being held on the way to Presidency. Obama's presidential victory in 2008 and 2012 which observed as an important factor in social media has once again displayed "increased political power" in election results on November 8, 2016. This article researches Donald Trump's digital strategy during the presidential candidate who competes with the Democrats for presidency. The study also claims that popular and widespread social communication applications such as microblogs, message boards, instant messaging services are new and effective tool in determining the 45th president of the United States.

Keywords: Social Media, Facebook, Twitter, Instagram, Whatsapp, American Elections, Digital Political Election Strategy, Donald Trump

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INFORMATION SECURITY EDUCATION: WATCHING YOUR STEPS IN CYBERSPACE

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Abstract: This paper discusses the importance of providing at least a basic education in information security to all users of any information and communication system, regardless of whether they are information technology professionals, students of computer or information sciences, or not. It explores how any person sharing and communicating their information assets with others could be subject to information security threats, and studies certain known cyber-criminals and black-hat hackers, and their cyber-actions and cyber-crimes in order to depict the importance of acquiring an understanding and awareness of information security, so that users of information and communication systems may prepare and strengthen themselves against imminent information security threats.

Keywords: Information Security Education, Awareness, Risk Perception, Cybercrimes, Cybercriminals, Information Security Behavior

Introduction

Information technology (IT) education has become an integral part of education regardless of the subject being taught. Even for professionals and students not working or majoring in computer science or information science related fields, the use of IT may come in multiple forms; sometimes as a tool for delivering the subject matter and assessments such as in learning management systems, presentation slides, etc., and at other times as a tool for creating systems to make practice of that subject convenient and more efficient, i.e. health management systems, online banking applications, and numerous other such subject-specific computer and information technology systems. Thus, basic skills such as basic programming, database development, web interface development, etc. are also studied by most non-computer professionals in order to help them put their knowledge of their specialized subject into practice. A most important concept regarding computer and information science which is often overlooked, however, is information security. Yet, information security is an integral part in any computer system which stores information and allows its users to access and share that information, since a good system should be more about proper and secure sharing and communication of information instead of simply allowing access to available information regardless of whether each user should be allowed access to that information or not. According to Harris and Maymi (2016), the IT industry is growing much faster than people can be educated to properly maintain it, thus leaving less time for IT specialists and security professionals to discover new security practices and procedures and giving more time for hackers to learn how to circumvent these security mechanisms (Harris & Maymi, 2016). Additionally, any user of an information and communication system, whether it be an online banking application containing digitized financial information, a health information system containing both digitized and non-digitized information regarding medical history and so on, or a seemingly simple social networking site which allows the user to share their personal information with other users, should have sufficient knowledge about information security in order to properly utilize the information and communication system they use, while ensuring that their privacy is protected and that the information is only shared and communicated with the proper people through proper channels. Therefore, this paper discusses the importance of information security education not only for students majoring in computer and/or information science, but also for designers, developers and users of any information and communication system.

Importance of Information Security Education and Awareness

A thorough education in information security would have to cover certain basic, yet mandatory, subject areas. These information security subject areas comprise of Access Control Systems and Methodology, where specific

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users or user roles are identified and access to information is controlled based on user privileges by user authentication and authorization to access, Telecommunications and Network Security, where communication systems, network structures, devices, protocols, remote access, etc. are considered, Security Management Practices, which entail classification of data, policies, procedures, standards, guidelines, risk assessment and management, personnel security training and awareness, security budget versus needed protection, etc., Application and Systems Development Security, where the way information security is integrated in the software development life cycle is considered, along with change control, application security, development practices and risks, malicious code, etc., Cryptography, which is the art and science of disguising data using symmetric or asymmetric algorithms, hashing, etc., Security Architecture and Models, where operating states of the operating system, kernel functions, memory mapping, security models and architectures are studies, Operations Security, which takes personnel and job functions, training, auditing, resource protection, preventive, detective, corrective and recovery controls, and standards compliance and due care, etc. into consideration, Business Continuity Planning and Disaster Recovery Planning, where resource identification and value assignment is conducted and business impact analysis is performed to enable crisis management, plan development, implementation and maintenance, Security Laws, Investigations and Ethics, where laws, regulations, crimes, software licensing and privacy, evidence types and admissibility into court, incident handling, etc. are considered and how to perform digital forensics while maintaining the chain of custody etc. are studied, and Physical Security, where perimeter security, restricted areas, authorization methods and controls such as biometrics, swipe cards and tokens, pass codes and personal identification numbers, etc., motion detectors, sensors, alarms, intrusion detection and intrusion prevention, fire detection, prevention and suppression, heating, ventilation and air conditioning, fencing, security guards, etc. are considered. Certified Information Systems Security Professional (CISSP) exam defines eight CISSP domains as Security and Risk Management, Asset Security, Security Engineering, Communication and Network Security, Identity and Access Management, Security Assessment and Testing, Security Operations, Software Development Security (Harris & Maymi, 2016), which comprise of the above subject areas.

Even though the concept of information security began with its focus being mainly on technological aspects (Bishop, 2003), the importance of the role played by the human aspect pertaining to information security was recognized during the past two decades (Fernando, 2014), with international standards such as ISO/IEC 270001 (2005), etc. emphasizing why human resource security needs to be taken into consideration when managing information security. In fact, the users of a system are considered as the weakest link in security, and according to Lacey (2009), information security has of late shifted its focus where its role has changed from being technology-oriented to one that is more management-oriented (Lacey, 2009). Companies and organizations dealing with vast amounts of data and information are not the only subjects at risk of information security breaches. Anyone with a computer or any other communication device connected to a network could be subjected to information security threats and attacks. Most present day attacks such as social engineering, spear phishing, or collusion from an insider, etc. require a human component to succeed (Williams, 2011), where people are mostly tricked into revealing confidential information to others. Thus, it is important not only for information security professionals and computer or information science students to be aware of information security, but simply any person using any communication device for any purpose, whether it be professional or personal, needs to be aware of information security threats, vulnerabilities, and basic countermeasures against these threats and vulnerabilities.

The information security subject areas and domains listed above are important for information security professionals to perform risk analysis, identify countermeasures, and implement solid security practices to help protect facility, network, system, and information by efficiently and predictably balancing risk with service (Harris & Maymi, 2016). For most users of information and communication systems, however, a basic information security education on how to protect oneself in cyberspace would suffice. In the present day where everyone is more or less digitally interconnected with each other, being ignorant of information security vulnerabilities and possible threats is not an option. Yet, for most users of information and communication systems, ignorance is bliss. In fact, Schneier (2008) discusses how the human brain perceives security and explains how when one's perception of security diverges from the reality, and the perceived risk is thereby less than or greater than the real risk, the countermeasures implemented in order to avert that security risk also diverge from what is actually necessary (Schneier, 2008). Further, Gonzalez and Sawicka (2002) state that proper perception of risk can help keep risk below the 'accident zone' by maintaining security measures above a certain threshold (Gonzalez & Sawicka, 2002). Thus, it is of utmost importance to properly understand the very real security risk taken by all users when sharing and communicating information in today's world. An interesting approach to this is to study about the adversaries from whom one should protect their information assets. These adversaries, the dark knights of cyberspace, are cyber criminals who perform illegal actions and are called black-hat hackers or crackers, to distinguish them from white-hat or ethical hackers. The approach adopted in this paper to provide an understanding of the very real information security threats to users of information and communication systems, is to study certain practices which were followed by some known black-hat hackers, in order to understand the importance of

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information security education, where information security vulnerabilities lay, and how to strengthen oneself against information security attacks by taking required countermeasures against such vulnerabilities. The remaining sections of this paper explores practices of certain known hackers in order to educate users of information and communication systems on possible threats, vulnerabilities and countermeasures that can be taken to minimize these risks.

Certain Notorious Black-Hat Hackers and Their Hacks

This chapter will explore three notorious black-hat hackers who pulled off some of the largest and most incredible hacks of all time. The hacks pulled by these black-hat hackers, their actions in cyberspace, how they were apprehended by the authorities, and the mistakes that led to their capture, etc. will be discussed here. For the remainder of this paper, the term 'hacker' will be used to identify or describe a black-hat hacker or cybercriminal. In this paper, the cyber actions of the hackers Jeanson James Ancheta, Kevin Poulsen, and Albert Gonzalez are studied.

Jeanson James Ancheta

Selecting certain hackers out of the numerous known destructive hackers for this study was difficult, but placing Jeanson James Ancheta within the top-ranked hackers is not surprising as he was the first person to be accused of controlling a large number of hacked computers.

Ancheta was a high school dropout who invented 'rxbot' – a software robot program also known as a bot. Bots or software robots are malicious software created to take over the control of a computer remotely by a third party (Pegg, 2016). With this software, Ancheta took over a large number of computers connected to the Internet under his control. These networks where the computers are connected with malicious bot programs are called botnets. Ancheta used a botnet to send spam and connection requests to online servers by launching spam distributed denial of service (DDoS) attacks. Even though these computers were involved in these sorts of criminal activities, the real owners of these computers would never know what took place. Ancheta started building his botnet in June 2004 and his collection included two military sites as well (FBI, 2006).

After his success in creating a large botnet, Ancheta hosted a website to sell or rent infected computers for other hackers and in this website, he listed guidelines on how to use bots and estimations about how many botnets someone would need to crash a corporate website, etc. The rate he charged for his bots were four cents apiece and a client needed to rent or purchase a minimum of ten thousand bots. According to the Federal Bureau of Investigation (FBI), when they finally caught up with him, Ancheta was successful in conducting business with ten clients. 'SoBe' was a teen from Florida who joined with Ancheta in August 2004 and helped him to grow the number in his botnet up to four-hundred-thousand computers. Using his botnet, he made nearly $60,000 by joining as an affiliate for online advertising. Ancheta got paid every time an owner of a computer in the botnet had to download adware and visited the advertisement. He earned all that money in just under six months (FBI, 2006).

The FBI got the scent of Ancheta after seeing the price list in his website. The FBI nick-named him the 'Zombie King' as the computers he hacked and controlled perfectly matched the concept of zombies. FBI agents got to him by posting in an online chat room asking for Ancheta's help in launching an attack using his bots. In the chat room, he bragged about making a thousand dollars within just two weeks with his botnets and he made a deal with the undercover agents for two-thousand bots. He finalized the deal by saying that two-thousand bots were "enough to drop a site". As a result of this undercover operation, the FBI seized his computer in December 2004 and disabled his server in May 2005. Ancheta was arrested in November 2005 and pleaded guilty to federal charges of hijacking computers for profit. He was the first person to plead guilty to this crime. After the trial, he was sentenced to fifty-seven months in prison followed by supervised release. He was also ordered to make restitution for damages caused to the two military sites which he had added to the computer collection in his nationwide botnet (FBI, 2006).

Kevin Poulsen

Among notorious hackers, the man named as 'the Hannibal Lecter of Computer Crime', Kevin Poulsen is one of the most talked about due to the steep turn he took in his career. Before the nickname given him by the FBI, he was known in the world of hackers as 'Dark Dante'. He can be called one of the luckiest hackers of all time. In 1988, when he was just twenty-three years of age, Poulsen was successful in hacking into a federal computer network. After gaining illegal access, he started to poke around the file regarding the investigation of the president of the Philippines, Ferdinand Marcos. This was the hack that cost him his invisibility over the Internet.

After realizing that the FBI has caught scent of him, Poulsen fled for his freedom. Unlike most outlaws, Poulsen managed to stay untouched for seventeen months. Even during this period of laying-low, he was not the type of person who could keep quiet. He hacked into FBI servers and revealed wiretaps that had been set up for mobsters,

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foreign politicians, and the American Civil Liberties Union (Lammle, 2011). The hack he was most notorious for is the one he pulled on KIIS FM, a Los Angeles-based radio station, to win a brand-new Porsche 944 S2 and $20,000 in cash (Poulsen, 2017). Poulsen hacked into all the phone lines connected to this radio station and jammed them so that no one else could call the radio station until he became the 102nd called and won the grand price. To accomplish this feat, Poulsen engaged the help of some of his disciples such as Ronald Austin and Justin Peterson, and got them to work with him (Soylent Communications, 2014).

Poulsen's dance of mischief came to an end after a television show broadcast by NBC network called Unsolved Mysteries caught wind of him and featured an episode based on him and his hacks. This turned out to be the final blow to end the destruction caused by Dark Dante. While the episode was on air, telephone lines opened to get tips from civilians got blocked. It was not difficult for anyone to figure out the cause behind that block. Broadcasting this episode and educating the people in the US about this most-wanted cyber-criminal, led to Poulsen's arrest. Even having been one of the FBI's most wanted criminals, Poulsen could not be prosecuted for any major charges. Prior to his hearing, however, he was incarcerated in a federal facility for five years without bail until the FBI could build a case against him since he was too deeply involved in the national secrets by hacking into classified information, before being released to serve his court sentence (Littman, 1993).

Once having being considered as one of the most-wanted criminals, Poulsen can also be considered the most reformed hacker of all time. After his release, he took a completely different path and went on to become a journalist and a cyber-security consultant. He is also famous for helping to find seven-hundred-and-forty-four sex offenders who were phishing for underage victims using social media such as MySpace (Lammle, 2011).

Albert Gonzalez

There are two main reasons why people explore the darkness of hacking. One reason is the curiosity or the excitement which they get from breaking the law, and the other reason, which is the most addictive reason, is monetary gain. When it comes to cyber-crimes resulting in financial damages, the name Albert Gonzalez is ranked at the top with the largest cyber-crime of all time, even though he eventually had to pay his dues with twenty years in prison, a $25,000 fine, and restitution for the losses caused in the companies which he hacked. Before looking at the prosecution and punishment of Gonzalez, it is required to understand the actual crime he was accused of (Verini, 2010).

Gonzalez was a twelve year-old boy when he bought his first computer out of his own money. One day, while downloading some content, he accidentally downloaded a computer virus and had to call the computer technician to fix the issue. That planted the seed of curiosity about computer security in his mind. This interest that came out of the blue, led to his dive in the advanced science of computer and cyber-security. At age fourteen, Gonzalez was paid a visit by an FBI agent, because he had hacked into the National Aeronautics and Space Administration (NASA) Agency's database. According to Gonzalez's best friend, the person responsible for providing Gonzalez with the packet sniffing tool which he used in his crime was Stephan Watt (Verini, 2010).

Before being the mastermind of the largest cyber-crime of all time, Gonzalez started his career in a smaller scale scam, which was caught by the police in 2003. One night, a detective who was undercover investigating a string of car thefts, accidently noticed a random person who looked a little suspicious. The detective followed him to an automated teller machine (ATM) and pretended to withdraw money from a different ATM while observing the suspicious character. Gonzalez inserted an ATM card and withdrew a few hundred-dollar bills. Instead of stopping after using one card, he pulled out one card after the other. Since it was close to midnight, his plan was to withdraw money from the ATM until the cards reached their limits for that particular day and to use them again once their limits reset after 12:00am. The detective took Gonzalez into custody, and it was not until he was interrogated by the police that they came to know that he was Albert Gonzalez, who was in an administrative position in a website called 'shadowcrew.com', which was one of the black-market sites for illegal products and stolen credit card information. This information made the story of Gonzalez take a new and unexpected turn when the Secret Service came into play (Verini, 2010).

The Secret Service of United Stated was investigating about credit card and identity theft and even had a special task force dedicated to the task. When they got to know that a person associated with 'Shadow Crew' was in custody, they saw a golden opportunity to bring 'Shadow Crew' down. When the proposal to work as a confidential informant for the Secret Service in exchange for his freedom and a salary of $75,000 was offered, Gonzalez accepted the deal without any hesitation. His job was to lure the users of that website to a virtual private network (VPN), claiming that it was a safe channel. This VPN, of course, was wire-tapped by the Secret Service. With the help of Gonzalez, the Secret Service was able to bring down twenty-eight members of 'Shadow Crew' who were involved in dealing stolen credit card information. This mission, which ended in 2008, was code named 'Mission

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Farewell'.

After that, Gonzalez moved to Miami, but unbeknownst to the Secret Service, while serving his country, he had also laid out a master plan. While conducting a war-driven expedition along Miami highways and other locations to find poorly protected wireless networks, he also found some well-known retailers. Among them, he spotted a company called TJX. Together with his crew of misfits, Gonzalez connected to the local network of TJX. It was only a matter of time until they made their way up to the corporate network in Massachusetts. Gonzalez now needed a way to get the data from the transactions happening in the network. For that, he turned to his best mate, Stephan Watt, who equipped him with the packet sniffing tool. With that, Gonzalez and his crew could get their hands on all the transaction data from the network including credit card information. He used the SQL Injection technique to extract information from company databases. After retrieving that data, he stored it in two servers he had rented in Ukraine and in Latvia. When he finally got caught, there was information about 16.3 million credit and debit cards stored in the Latvian server, and about twenty-seven-point-five million cards in the server in Ukraine. In order to sell this information, he joined forces with a Ukrainian black-market credit card dealer called Maksym 'Maksik' Yastremskiy. When he received the information from Gonzalez, he would distribute them to other small scale black-market credit and debit card dealers for e-Gold, web money, and even for normal bank transactions in to Eastern European bank accounts. The whistle was blown on their perfect fairytale when Yastremskiy was arrested in Turkey in 2007 from the leads the authorities got about the hack on Dave and Buster's company. In his computers, they found large amounts of data which was linked to the e-mail address 'soupnazi@efnet.ru'. 'Soup Nazi', which was an early nickname used by Gonzalez, gave away the hacker who Yastremskiy was in cohorts with: Albert Gonzalez. This information dropped the final nail on the coffin of Gonzalez's arrest and prosecution, and he was sentenced to the lengthiest punishment ever given to a cyber-criminal, which is 20 years imprisonment, by also taking into consideration his plotting and planning other cyber-crimes even while working as a confidential informant for the Secret Service (Verini, 2010).

Lessons Learned

There are a few lessons that can be learned from studying these hackers and their hacks. First, it can be seen that digitized information can be easily shared and communicated with others, but limiting its access to a select few is a difficult task in today's heavily interconnected world. Thus, unless one is absolutely certain that a certain piece of information needs to be shared they should refrain from sharing it on the Internet or on any network. One should diligently follow best practices in creating passwords, etc., follow proper protocol and procedures when sharing information and refrain from trying to cut corners to make their task at hand easier. Security always comes at a cost, and if a required security standard has been established, then the users of that system should comply with that standard and all it entails. One should refrain from clicking on unnecessary or unfamiliar buttons and links, etc. and if it is required, one should always validate certificates or other credentials before performing such actions.

Further, looking at the reasons why these hackers got caught can also provide guidance on behavior in cyberspace. For instance, Ancheta got caught not due to any technical issue, lack of skill, or a misstep in his hacking methods. Instead, it was his psychological reaction to brag about his achievements, along with publicly marketing his malicious work in order to earn a few extra bucks that led to his destruction. When looking at how Gonzalez got captured, it can once again be seen that his need to sign his work by using his previous nickname in the e-mail address which he used for dealings with other criminals, led to his downfall. In fact, this need for taking credit for their work, making their mark, and the behavior resulting from such psychological acclaim is something common not only to most criminal masterminds, but also to people in general. Thus, it can be seen that watching one's step is more important in cyberspace than advertising one's achievements, whereabouts, and habitual patterns.

Conclusion

In conclusion it can be seen that any user of an information and communication system needs information security education and awareness so that they may know the security risks they are taking, and device a security plan to suit the risk, as well as to be able to safeguard their information assets and protect them from perceived threats. A complete and thorough education in information security covering all security domains will only be required for students of computer or information science, and IT professionals and software engineers who design and develop software programs, applications, and information and communication systems. Yet, any person who uses such a system should have a basic understanding and awareness of information security before publicly publishing their information in any such system or network. Thus, it can be concluded that just as important as it is to give a basic IT skills education to students of many different subject fields and people of many different professions, it is also important – perhaps to even a greater extent – to give them an information security education to provide the basic understanding and awareness of information security. If unable to prevent information security breaches and attacks, this will at least help all users of information and communication systems to at least minimize the damage of such a breach or an attack, and thereby protect the majority of their information assets.

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Günümüzde gelişen CNC teknolojisi ile malzemelerde mekanik işlem yapmak kolaylaşmıştır. Üç ve beş eksenli işleme tezgahları, frezeler ve tornalarda CNC teknoloji kullanımına rastlanmaktadır. Bu teknolojinin kullanıldığı bir yerde CNC Plazma kesim makinalarıdır. Farklı geometrik şekilli parçaların, farklı kalınlıklardaki sac plakalardan kesimi, CNC Plazma kesim makineleri ile kolaylaşmıştır. Sac kalınlığının artması ile birlikte kesilen malzeme yüzeylerinde pürüzlülük oluşmakta ve yanlış ayarlamalar sonucunda kesim yüzeyleri açılı olmaktadır. Pürüzlü kesilen yüzeylerde kesim sonrasında temizleme ve düzgünleştirme işlemleri gerekli olmaktadır. Bu çalışmada 15mm kalınlığında yapısal çelik sac plakanın, farklı kesim hızlarında, farklı amper ve farklı voltajlarda kesim işlemi sonucu yüzey kaliteleri incelenmiştir.

Keywords: CNC Plazma Kesim, Makroyapı, Pürüzlülük

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KİTLE KÜLTÜRÜ, POPÜLER KÜLTÜR VE HALK KÜLTÜRÜ EKSENİNDE SOSYAL ETKİLEŞİM

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Kitle kavramı 1900'lerde ön plana çıkan bir kavram olarak dönemin sosyolojik gerçekliği içinde önemli bir yer tutmuştur. Özellikle Batı'da modernite sonrasında kitle kavramı daha fazla ön plana çıkmış toplumsal yapının inşasında ve her tür değişimde kitle etkisinin olduğu ortaya konulmuştur. Kitle kendine ait kültürel formu içinde toplumsal gerçekliği anlama noktasında önemli bir yere sahiptir. Bu kültür bağlamında kitle kültürü**;** sanat, estetik, din, felsefe ve sosyoloji alanlarında daha önceki çağların düşünce sistemlerini arkada bırakmış daha büyük çaptaki paradigmalara, ideolojilere, toplumsal hareketlere açık hale gelen bir yapı ortaya koymuştur. Öte yandan popüler kültür ise özellikle 20. yüzyılda etkisini gösteren ve toplumsal modernleşmenin yan etkileri arasında yer alan bir kavram olarak üzerinde oldukça tartışılmış ve kapitalist ekonomi modeli içinde besleyici unsur olarak değerlendirilmiştir. Halk kültürü ise Türkdoğan'ın da belirttiği gibi bir nitelikçerçevesi oluşturmaktadır. Bu nitelik içinde gelenek değerleri dahilinde nitelikli unsurlar barındıran ve o halka ait değerleri yansıtabilen bir yapıya sahiptir. Bu bağlamda, kitle kültürü ise daha ziyade nicelik-yığın kavramıyla belirlenmektedir. Çalışmada kitle-popüler ve halk kültürü özellikleri, paralellik gösteren ve ayrışan unsurlar ile bu kültürler ekseninde sosyal etkileşimin de geçirdiği farklılık ortaya konmuştur. Buna göre halk kültürü ekseninde sosyal etkileşim değer temelli unsurlar çerçevesinde iken popüler kültür ve kitle kültürü ekseninde sosyal etkileşim ise daha çok kapitalist ekonomik model inşası ile ortaklık gösteren bir formdadır.

Keywords: Kitle kültürü, popüler kültür, sosyal etkileşim, halk kültürü

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LIMONI SERVI (*CUPRESSUS MACROCARPA*) ÇELIKLERININ KÖKLENMESINE HORMONUN ETKISI

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Peyzaj çalışmalarında kullanılan türlerin üretiminde vejetatif üretim yöntemleri generatif üretimden daha çok kullanılmaktadır. Bu üretim tekniği ıslahçıya, üstün genotiplerin genetik yapılarını koruyarak daha kaliteli anaçlardan daha kaliteli fidanların üretime olanak vermektedir. Vejetatif üretim yöntemlerinden biri olan çelikle üretim diğer vejetatif yöntemlerle kıyaslandığında ucuz, hızlı, basit bir teknik olup, aşı ve mikro üretim tekniklerinde olduğu gibi özel teknikler uygulamayı gerektirmez. Çelikle üretimde aşı ile üretimdeki gibi anaçla uyuşmazlık sorunu yoktur ve çelik materyalinin alındığı bireyle aynı genetik özellikte bitkilerin üretilmesine imkan sağlar.

Bu araştırmada; gerek kokusu gerekse rengi ile peyzaj düzenlemelerde en çok kullanılan süs bitkilerinden biri olan limoni servinin (*Cupressus macrocarpa*) sert çelikle, hormon kullanılarak sera ortamında üretilmesi amaçlanmıştır. Araştırmada kullanılan çelikler Hendek Orman Fidanlığı'ndaki anaç bireylerden temin edilmiştir. Çeliklerin köklendirilmesi sera koşullarında, torf (%60) + perlit (%20) ve kumdan (%20) oluşan ortamda kaplarda yapılmıştır. Hormon olarak, köklenme yüzdesini ve kök miktarını arttırmada etkili olan IBA (İndol bütirik asit) ve NAA (Naftalin asetik asit) hormonları kullanılmıştır. Hormon seviyeleri zayıf (kontrol, 25, 50, 100 ve 200 ppm) ve yoğun (kontrol, 500, 1000, 2000, 4000 ve 8000 ppm) çözelti olmak üzere farklı dozlarda hazırlanmıştır. Çelikler zayıf dozdaki çözeltilerde 24 ve 48 saat bekletilirken, yoğun dozda ise 5 ve 10 saniye bekletilmiştir.

Elde edilen veriler, zayıf ve yoğun çözeltilerde, hormon, doz, süre faktörü ile bunların ikili ve üçlü etkileşimleri değerlendirilmiştir. Zayıf çözeltilerde hormon, doz, hormon-süre ve hormon-doz, yoğun çözeltilerde ise, hormon, doz, hormon-süre ve hormon-süre-doz faktörlerinde köklenme yüzdesine etkisinin önemli olduğu belirlenmiştir ($p<0.05$). Kontrol denemesinde %15 civarında köklenme elde edilirken, zayıf çözeltilerde NAA hormonu ile yapılan köklendirmeler kontrolden daha düşük olmuştur. Buna karşılık IBA ile yapılan köklendirmeler genelde kontrolden daha yüksek olmuş ve en yüksek köklenme 50 ppm dozunda elde edilmiştir. Yoğun çözeltilerde ise kontrol ve zayıf dozlu çözeltilere göre daha yüksek köklenmeler elde edilmiştir. Bu çalışmada en yüksek köklenme %65'in üzerinde bir köklenme oranıyla yoğun dozların kullanıldığı IBA hormonun 1000 ppm dozunda 5 saniye işleme tabi tutulan çeliklerde olmuştur. Çalışma sonucuna göre türün bundan sonraki sert çelikle üretiminde IBA hormonunun 1000 ppm dozlu çözeltisine çeliklerin 5 saniye daldırma işlemi uygulanabilir.

Keywords: Limoni servi (Cupressus macrocarpa), çelikle üretim, köklenme, hormon

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MUSIC, SOCIETY, POLITICS: ROCK MUSIC IN AMERICA AS COUNTER-CULTURE BETWEEN 1960-1980

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The Beat generation, which emerged as a defeated youth after the war in 1950s, caused the birth of a new trend in the 1960s that opposition, dispossessed and unbelonging, values centered and advancing on the basis of counter-culture and music became the most influential art branch. The reaction to the Vietnam War on the world level has contributed to the formation of the youth movement and counter-culture of American society. Decisions made by political ruling have created a reaction in the society and found itself in rock music, which emerged as a counter-cultural area of opposition. Rock music has become a popular genre that reaches out to the masses by gaining widespread popularity in the United States and the international arena with a movement called Black American music "blues" and "British Invasion". In the 1960s, when the citizens expressed themselves in a wide range of fields, the music movements and the years of rapid transformation of the youth movement, this type of music mediated the massification of oppositional forms of political discourse. This study will examine the 1960s, the beginning of the 1960s, when the opposition developed in the United States and the spread of the rock music genre as the starting point and will examine what Rock music represents in the 1980s when the influence of the opposition diminished. For this purpose, the historical background of the political and social events in the period will first be revealed. In the next stage, the songs of the performing groups of the rock genres between the years will be examined by analyzing the discourse and the findings obtained will be evaluated.

Keywords: Politics, rock music, discourse, American society, counter-culture.

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ODUN İTHALATI VE YEREL EKOSISTEMLERE OLASI RISKLERI

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Dünyadaki yıllık uluslararası endüstriyel odun ticareti 123 milyon m³, yakacak odun ticareti ise 2,5 milyon m³ civarında gerçekleşmektedir. Türkiye'nin yaklaşık 21.7 milyon hektar orman alanından yıllık ortalama 17 m^3 odun üretimi yapılmaktadır. Türkiye'de üretilen kerestenin yaklaşık %70'i inşaat, %20'si mobilya, %10'u ise ambalaj sanayinde kullanılmaktadır. Fakat Türkiye'nin odun hammaddesi üretimi bu talebi karşılamadığından odun hammaddesi ihtiyacının % 30-35'ini ithal yoluyla karşılamaktadır. Üretimin yetersizliğinin dışında ürünlerin *yurt dışında Türkiye'deki* odun fiyatlarının, Avrupa'ya göre 2 kat**,** Amerika, Brezilya, Kanada, Venezuela, Ukrayna ve Rusya'ya göre 3 kat daha pahalı olması ithalatı arttıran nedenler arasındadır. Türkiye'de *üretilen odunların fiyatının yüksek olmasının sebebi ise tevzii (üretim maliyetlerinin) ve fiyat üzerinde bulunan vergi-fonların yüksek olması olarak gösterilmektedir.*

Ithal edilen türler genelde Meşe, Teak, Iroko, Maun (sapelli), Ayous ve Lareks ağırlıklı olup tomruk ithalinin çoğunluğu *Ukrayna, Rusya, Bulgaristan, Kamerun ve diğer ülkelerden yonga ithalinin çoğunluğu ise Amerika, Brezilya, Kanada, Ukrayna ve Bulgaristan gibi ülkelerden yapılmaktadır.*

Talebi karşılamak üzere yapılan bu ithalatlar doğal ekosistemler üzerinde tehditler de oluşturmaktadır. Her ne kadar odunların, fırınlanması veya başka yollarla steril hale getirilmesi için yasal düzenlemeler olmasına rağmen, uygulamadaki aksaklıklar sonucu son yıllarda başka ülkelerden ithal edilen odun ve bitkilere bağlı, mantar, böcek, nematod ve virüsler tespit edilmiştir. Doğal ekosistemlerde yeni hastalık ve zararlılara karşı savunma mekanizması oluşmadığından veya zayıf olduğundan sisteme yeni yeni gelen bu hastalık ve zararlıların birçok türlerin yok olmasına neden olabilecek bir tehdit unsuru oluşturduğu düşünülmektedir. Dolayısıyla odun hammaddesinin en azından yarı işlemmiş halde ülkeye sokulmasının bu tehdidi azaltacağı düşünülmektedir.

Anahtar kelimeler: Odun ithalatı, doğal ekosistemler, zararlılar

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OKUL ÖNCESİ ÖĞRETMENLERİNDE "DUYGUSAL BAĞLILIK" "İŞ TATMİNİ" VE "ÖRGÜTSEL GÜVENİN" BİREYSEL İŞ PERFORMANSI ÜZERİNDEKİ ETKİLERİ

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Özet: "Erken çocukluk dönemi" çocuğun gelişiminde, kişiliğinin oturmasında, sağlıklı bir birey olarak yetişmesinde temel yapı taşlarının atıldığı kritik bir dönemdir. Bu dönemde çocuklara iyi eğitim verilmesi ve olumlu çevre şartları sunulması çocuğun fiziksel, zihinsel, duygusal, sosyal gelişimini desteklemede çok önemli rol oynar. Kuşkusuz okul öncesi öğretmenleri bu sürecin temel taşıdır. Bu sebeple işletme yöneticilerine örgüt içindeki var olan ya da olması istenen örgüt ikliminin oluşmasında önemli görevler düşmektedir.
Bu çalışmanın amacı, okul öncesi eğitim alanında çalışan öğretmenlerin okullarına dair hissettikleri duygusal bağlılık, iş tatmini ve örgütsel güvenin bireysel iş performansı üzerindeki etkilerini ortaya koymaktır. Araştırmanın çalışma evreni Sakarya'daki okul öncesi eğitim kurumlarıdır. Araştırmada kullanılan veriler, 19 işletmeden toplam 135 öğretmene ulaşılmak suretiyle elde edilmiştir. Veriler, doğrulayıcı faktör analizinden sonra korelasyon analizi ve regresyon modelleri ile analiz edilmiştir.
Duygusal bağlılık, iş tatmini ve örgütsel güvenin bireysel iş performansı üzerinde olumlu bir etkiye sahip olduğu bulgulanmıştır. Ancak diğer değişkenlere göre iş tatminin bireysel iş performansı üzerindeki olumlu etkisi daha güçlüdür. Ayrıca yöneticiye güvenin bireysel iş performansı üzerindeki olumlu etkisi tespit edilmiştir. Oysa örgüte güvenin bireysel iş performansını üzerinde etkisinin araştırıldığı testlerde anlamlı bulgulara rastlanamamıştır.

Anahtar Kelimeler: Duygusal bağlılık, iş tatmini, örgütsel güven, bireysel iş performansı

THE EFFECTS OF ORGANIZATIONAL ASSURANCE, AFFECTIVE COMMITMENT AND JOB SATISFACTION ON INDIVIDUAL JOB PERFORMANCES OF PRESCHOOL TEACHERS

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Abstract: "Early childhood" is the most critical period in the development of a person. Supplying the children with good education and positive environmental conditions plays a vital role in their physical, mental, emotional and social development. Of course, preschool teachers are the main actors in this learning and development process.
The purpose of this study is to examine the effects of organizational assurance, affective commitment and job satisfaction on individual job performances of preschool teachers.
The study covers the preschool education institutions in the province of Sakarya. The data were collected from 135 preschool teachers in 19 institutions. After the exploratory factor analysis, data were analyzed by correlation analysis and separate regression models. It was found that the positive effect of job satisfaction on individual job performance is stronger than other variables. Assurance to the manager also increases the individual job performance. On the other hand, a meaningful relation between organizational assurance and individual job performance could not be found.

Keywords: Organizational assurance, affective commitment, job satisfaction, job performance, preschool education

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Giriş

Son yıllarda küreselleşme koşullarında rekabetin artması Türkiye'deki okul öncesi eğitim kurumlarının üzerinde de etkili olmaktadır. "Erken çocukluk dönemi" çocuğun gelişiminde, kişiliğinin oturmasında, sağlıklı bir birey olarak yetişmesinde temel yapı taşlarının atıldığı kritik bir dönemdir. Çocuk okula başladığında gelişiminin büyük bir kısmını tamamlamış olmaktadır. Eğitim, doğumla başlayıp hayat boyu süren bir süreçtir. Hayat boyu sürecek öğrenmenin temelleri ise ilk altı yaşta, yani erken çocukluk döneminde atılır. Bu dönemde çocuklara iyi eğitim verilmesi ve olumlu çevre şartları sunulması çocuğun fiziksel, zihinsel, duygusal, sosyal gelişimini desteklemede çok önemli rol oynar. Kuşkusuz okul öncesi öğretmenleri bu sürecin temel taşıdır. Bu sebeple işletme yöneticilerine örgüt içindeki var olan ya da olması istenen örgüt ikliminin oluşmasında önemli görevler düşmektedir. İşletmenin sahip olduğu örgüt kültürü ve örgütün amaçları, çalışanlarının tutum ve davranışlarının uyumlu bir biçimde oluşturulmasında kilit pozisyondadır. Bu uyumun sağlanması ile çalışanların örgütsel bağlılık, örgütsel vatandaşlık davranışı, örgütsel sadakat, iş tatmini, örgütsel güven, örgütsel adalet algısı, iş ve örgüt performansı vb. değişkenlerinde olumlu etkiler görülecektir. Bu olumlu etkiler geleceğimiz olan çocukların eğitim temellerinin sağlam atılmasını sağlayacaktır. Bu nedenlerle araştırmanın konusunu, duygusal bağlılık, iş tatmini, örgütsel güven ve bireysel iş performansı ilişkileri oluşturmuştur. Daha önce literatürde Sakarya'da okul öncesi eğitim kurumlarında duygusal bağlılık, iş tatmini, örgütsel güven ve bireysel iş performansı ilişkilerini içeren araştırmaların az olması, bu araştırmanın çıkış noktasını oluşturmaktadır. Bu araştırma, Sakarya'daki okul öncesi eğitim kurumlarında çalışan öğretmenlerden toplanan verilerin analizi üzerine kurulmuştur.

Kuramsal Çerçeve

İş Tatmini ve Duygusal Bağlılık

İş tatmini genel olarak bireyin ihtiyaçları ile iş ve iş şartlarından elde ettiklerine ilişkin algılamasının bir sonucudur (Francies ve Milbourn, 1980). Bu algılamalara bağlı olarak kişi organizasyonuna duygusal bir tepki verir. Bu tepki, kişinin iş ve işten elde ettikleri, beklentileri, arzuladıkları, ihtiyaç duydukları ile kıyaslaması sonucunda oluşan eşitlik veya adalet algısıdır. Kıyaslama sonucunda adalet algılaması iş tatmininin oluşumunu sağlar (Lambert, Barton ve Hogan, 1999). İş tatmini, iş şartlarının (işin kendisi, yönetimin tutumu) ya da işten elde edilen sonuçların (ücret, iş güvenliği) kişisel bir değerlendirmesidir. İş tatmini, bireyin normlar, değerler, beklentiler sisteminden geçerek işlenen iş ve iş koşullarına ilişkin algılarına karşı geliştirdiği içsel tepkilerden oluşmaktadır (Schneider ve Snyder, 1975: 31). Bu anlamda, iş tatmini, çalışanların iş ve işin sağladıklarına ilişkin bir algısı ve bu algıya karşılık olarak verdiği duygusal bir cevaptır (Luthans, 1994: 114). İş tatmini genellikle çalışanın iş ortamındaki deneyimlerinin onun üzerinde bıraktığı olumlu etki olarak düşünülür. Kişi işinden gerekli tatmini buluyorsa işine ve iş ortamına karşı olumlu bir tutuma sahip olacaktır (Erdoğan, 1991: 376).

Örgütsel bağlılık, bireylerin örgüte karşı hissettikleri psikolojik bağlılıktır. Bağlılık, işe duyulan ilgi, sadakat ve örgüt değerlerine karşı duyulan güçlü inançtan kaynaklanmaktadır (O'reilly, C., 1995). Örgütsel bağlılık faklı şekillerde tanımlanmıştır. Örgütsel bağlılık literatüründe en çok kabul gören Porter ve arkadaşlarının örgütsel bağlılık tanımında, örgütsel bağlılığın aşağıda yer alan üç önemli özelliğe sahip olduğu vurgulanmaktadır (Porter, Steers, Mowday ve Boulian, 1974: 656):

a- organizasyonun amaç ve değerlerinin kabulüne ilişkin güçlü inançlar,
b- organizasyon amaçlarının başarılması yönünde çaba harcama,
c- organizasyon üyeliğini sürdürmeye ilişkin güçlü arzu.

Örgütsel bağlılık konusunda Meyer & Allen (1984) tarafından geliştirilen çok boyutlu örgütsel bağlılık modeli oldukça kabul gören ve kullanılan bir model olarak bilinmektedir. Meyer & Allen'in duygusal, normatif ve zorunlu bağlılıktan oluşan üç unsurlu örgütsel bağlılık modelinde, duygusal bağlılık, örgüte duyulan ilgi, kendini örgütle özdeşleştirme ve örgüt amaç ve değerlerini benimseme olarak tanımlanmaktadır. Zorunlu bağlılık ise kişinin örgütten ayrılması ile birlikte işsiz kalması durumunda katlanması gereken maliyete ilişkin algısından kaynaklanan örgüte devam bağlılığıdır. Normatif bağlılık ise, ahlaki değerleri, inançları içermekte ve örgütte kalmanın ahlaki bir zorunluluk olarak algılanmasından kaynaklanmaktadır (Meyer, J.; Stanley, D., Herscovitch & Topolnytsky, L., 2001). Çalışan, sadakat, görev, yükümlülük gibi hislerinden dolayı örgütte kalmayı tercih etmektedir (Clugston, M., 2000).

Pozitif bir iş tutumu olarak iş tatmini kişinin iş ve iş şartlarına karşı geliştirdiği bir tepki iken, örgütsel bağlılık, kişinin örgütün bütününe karşı olan tutumlarını ifade eder (Luthans, 1994: 108-113).

Örgütsel Güven

Matthai(1989)'a göre güven, çalışanların belirsizlik ve riskli bir durumla karşı karşıya geldiklerinde, örgütün yardımcı olmada söz ve davranışları ile tutarlı olup olmamasıdır (Ertürk, 2008). Zaheer vd.'e(1998) göre güven diğer tarafın, zorluklarını yerine getireceğine, söylediği şekilde davranacağına, faydacı durumlarda adil müzakere edeceğine yönelik beklentisidir (Tüzün, 2007). Örgüt üyelerinin iyiliği için karşılıklı saygıya ve nezakete dayalı uyumlu davranışların bir sonucu olarak kazanılan bir olgudur (Taylor, 1989).

Mishra ve Morrissey'e göre örgütsel güven dört temel boyuta bağlı olarak gelişebilir. Birincisi, örgüt içi açık bir iletişim, ikincisi karar alma sürecinde çalışanların etkin rol alması, üçüncüsü bilgi ve enformasyon paylaşımı ve

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dördüncüsü ise hislerin ve beklentilerin doğru olarak paylaşımıdır (Gilbert ve Tang, 1998).

Örgütsel güvenin sağlanmasında örgütün strateji ve politikaları da etkili olmaktadır. Söz konusu bu durum bir örnekle pekiştirilebilir. Örgütler için üst düzey bir eleman tedarik eden Milanolu Kustermann'a göre "*Terfi etmek için koşullar apaçık ortadadır. İşe yeni alınanlara ne bekleyecekleri ve kendilerinden ne beklendiği anlatılır. İşe yeni alınanların hepsi ya büyü ya da ayrıl diye bir sistemimizin olduğunu bilir. Eğer çalıştıkları alanda itibarlarını güçlü bir şekilde artırıcı sürekli bir ilerleme göstermezlerse, eninde sonunda firmayı terk edeceklerdir. Birisi ayrıldığında bu bir sürpriz olmaz, çünkü bu kişi firmadaki bütün geçmiş yılları boyunca birçok değerlendirme almıştır ve uygulama liderden ya da ilgili yöneticiden aldığı özgül geribildirimlerden yararlanma fırsatına defalarca sahip olmuştur*." Anlaşıldığı üzere güvenin izlenen strateji ve politikaların şeffaflığına bağlı olarak geliştiği görülmektedir. Örgütü bu şekilde algılayan veya kabullenen çalışanın ise örgüte olan bağlılık ve güven duygusu da kendiliğinden oluşmaktadır (Cohen ve Prusak, 2001). Bu örneği de dikkate alarak örgütsel güvenin sağlanabilmesi için öncelikle güvenilir bir organizasyon oluşturmak gerekir (Demirel, 2008). Güven, örgüt ikliminin, işgören performansının ve örgüte olan bağlılığın oluşmasında önemli bir faktör olmaktadır (Laschinger, Finegan ve Shamian, 2001).

Güven konusunda yapılan çalışmalarda farklı ayrımlar bulunmaktadır. Fakat en önemli ayrım bireye ve örgüte güven şeklinde olmaktadır (Luhman, 1979; Nyhan ve Marlowe, 1997; Tan ve Tan, 2000). Luhman (1979)'ın bireye güven ve örgüte güven ayrımına göre, bireye güven kişiler arası kişilik farklılıklarına dayalıdır ve kişiye özeldir. Örgütsel güven ise kişilerden çok kurumlarla ilgilidir. Shockeley vd. (2000), bireye güvenin bireysel ilişkiler ve davranışlar hakkındaki beklentileri ifade ederken, örgüte güvenin bireyin örgüte ilişkin ilişkiler ve davranışlar ile ilgili beklentilerini yansıttığını ifade etmişlerdir. Bireye güvenden hareketle ele alınan yöneticiye güven, çalışanın yöneticinin sözlerini tutacağı, tutarlı ve adil davranacağı, açık ve doğru cevaplar vereceği inancıdır (Reinke, Baldwin,2001). Tan ve Tan(2000)'a göre; örgüte ve yöneticiye güven birbiriyle ilişkili unsurlar olmakla beraber; aynı zamanda farklı kavramlardır. Örgüte güvenin algılanan örgütsel destek ve örgütsel adalet gibi örgütün bütününü etkileyen değişkenlerle bütünleştirilebileceğini, yöneticiye güvenin ise yöneticinin kabiliyeti, saygınlığı ve yardımseverliği gibi yakınsal değişkenlerle ilişkisi olduğunu tespit etmişlerdir. Ayrıca çalışanın örgüte ve yöneticisine güvenin sonuçlarının da farklılık gösterdiğini tespit etmişlerdir. Örgüte güven, örgütsel bağlılığı arttırıp işgören devir düzeyini etkilerken, yöneticiye güven, çalışan memnuniyeti ve yenilikçi davranış sergilemeyi etkilemektedir.

Bireysel İş Performansı

Performans değerlendirme, örgüt ve çalışan açısından yardımcı bir araç olarak benimsenmiş durumdadır. Performans değerlemenin, iki önemli amacı vardır. Bu amaçlardan birisi, iş performansı hakkında bilgi edinmektir. Çünkü bu bilgi yönetsel kararlar alınırken gerekli olacaktır. Ücret artışlarına, ikramiyelere, eğitime, disipline, terfilere, kariyer planlamasına ve başka yönetsel etkinliklere ilişkin kararlar genellikle performans değerlendirmesinde elde edilen bilgilere dayanır. Bir örgütün yönetim kadrosu, performans değerlendirmesinden elde edilen kararlar olmadan, yönetsel kararlar vermemelidir. İnsan kaynaklarına ilişkin diğer politikalarda olduğu gibi performans değerlendirmeleri de herhangi bir gruba karşı ayrımcılık yapılmasını engelleyen yasal standartlara uygun olarak düzenlenmiştir (Micolo, 1993).

Performans değerlendirme yapmanın ikinci amacı, çalışanların iş tanımlarında ve iş analizlerinde saptanan standartlara ne ölçüde yaklaştığına ilişkin geri besleme sağlamaktır. Bu geri besleme çalışanlara olumlu bir yaklaşımla verildiği ve mesleki eğitimle desteklendiği zaman çok yararlı olabilir. Çoğu çalışan bu türden yapıcı ve özgüveni arttırıcı geri besleme almaktan hoşlanır. Bu geri besleme aynı zamanda çalışanların örgüt içindeki kariyerlerinin ne yönde ilerlediğini görebilmelerini sağlar. Örneğin, bir çalışanın daha büyük bir sorumluluk almaya hazır olduğunu ya da mevcut durumunu sürdürebilmesi için eğitime ihtiyacı olduğunu gösterir (Palmer, 1993).

Paşa (2007)'ya göre bireysel performansı oluşturan üç unsur bulunmaktadır:

• Odaklanma: Bireysel performansı artırmanın birinci adımı odaklanmayı sağlamaktır. Çalışma yaşamında performansın, diğer bir ifadeyle başarının şansla bir ilgisi yoktur. Doğru yerde, doğru zamanda olmak ya da doğru kişiyi tanımak gibi genel geçerliliği olan başarı yolları yoktur. Bunların belki bir yardımı olur. Gerçek performans, ancak, onun için nasıl hazırlık yapılacağını bilerek elde edilir. İş yaşamında bunun anlamı, kimin, neyi, ne zaman yapacağını belirleyen geliştirilmiş bir yönteme sahip olmaktır

• Yetkinlik: Daha iyi performans göstermeye yol açan, yetenek, bilgi ve beceriye yetkinlik denir. Yetenek, doğuştan gelir. Beceri deneyimle gelişir. Bir başka tanıma göre yetkinlikler, kişilik, yetenek, ilgi, motivasyon gibi özellikleri içeren ve gözlenebilen davranışlar gurubudur. Çalışanların organizasyon, departman ve kişisel düzeyde sonuçlar elde etmek için kurumsal inanç ve değerler sistemiyle uyumlu olarak sahip oldukları yada geliştirdikleri bilgi, beceri ve tutumlarla gerçekleştirdikleri eylemler yetkinlikler olarak isimlendirilmektedir.

• Adanma: Adanma, çalışanın içinde bulunduğu işletmeyle kendini özdeşleştirmesi ve işletme amaçlarına ulaşmayı sağlamak için kendi amaçlarının işletme amaçlarıyla uyumlu hale getirilmesi ve o işletmede uzun süreli kalma ihtiyacı hissetmesi sürecidir (Büte, 2011).

Hume (1998)'e göre performans yönetimi ise, bir kuruluştaki insan kaynağının maksimum potansiyelini

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gerçekleştirmeye yönelik olarak motive edilmesi bağlamında performans kullanma, amaçlar, ölçütler, geri besleme ve tanınmaya yönelik olarak insan yönetimi için geliştirilmiş sistematik bir yaklaşımdır (Özmutaf, 2007).

Duygusal Bağlılık, İş Tatmini, Örgütsel Güven ve Bireysel İş Performansı Üzerindeki Etkiler

Örgütsel bağlılık ile ilgili yapılan çalışmalarda, bağlılığın örgütsel etkinlik ve verimlik ile iş performansı üzerinde pozitif etkilere sahip olduğu bulgulanmaktadır (Meyer, J.vd, 2001, Steers, R.M,1977, Porter L. vd, 1973). Chaw (1994) yüksek seviyede duyulan bağlılığın çoğu zaman daha fazla sorumluluk sahibi olma, daha fazla sadakat ve daha yüksek verimlilikle sonuçlandığını ifade etmektedir. Yüksek performansa sahip bir çalışanın örgütte kalma isteği örgütsel verimliliği arttırmaktadır. Örgütsel bağlılık düzeyi yüksek çaba sarf ettiklerinden ayrılmayı düşünmemektedirler (Çöl G, 2004).

Çalışmalar örgütsel bağlılık unsurlarından özellikle duygusal bağlılık ile performans arasında normatif bağlılık ile performans arasındaki ilişkiden daha kuvvetli pozitif bir ilişkinin olduğunu ve zorunlu bağlılık ile performans arasındaki ilişkinin negatif olduğunu göstermektedir (Meyer J.; Becker, T. & Vandenberghe, C. 2004).

Aryee ve Heng, (1990) yaptıkları araştırmalarda bağlılık ile performans arasında yeterince güçlü bir ilişki olmadığını bulguladılar. Benzer olarak Zajac (1990) bu ilişkinin zayıf olduğunu belirttikten sonra, bu zayıf ilişkinin en önemli nedenlerinin ekonomik şartlar ve beklentiler ile aile mecburiyetleri olduğunu ifade etmiştir. Yüksek ücret, sosyal imkânlar, ödüllendirme ve prim gibi maddi beklentilerin yüksek olması örgütsel bağlılık ile performans arasındaki ilişkiyi olumsuz yönde etkilerken, maddi beklentilerin düşük olması bu ilişkiyi olumlu yönde etkilemektedir. Becker (1996), göre bağlılık ile performans arasındaki zayıf ilişkinin bir nedeni de yöneticiye duyulan bağlılık ile örgütsel bağlılığın iç içe olmasıdır. Yöneticinin performansa verdiği önem ile adil performans değerlendirmesi örgütsel bağlılığı ve performansı arttırabilmektedir (Gül, M. & İnce, H. (2005).

İş tatmini ile performans arasındaki ilişki değerlendirildiğinde, çoğu araştırmacının iş tatmininin örgütsel etkinliği anlamada önemli bir konu olduğunu ve iş tatmini ile performans arasındaki ilişkinin pozitif olduğu yönünde bir kabulü vardır (Organ, D.W.,1988, Rusbelt; F. & Rogers; M. 1988, Saari, L. & Judge, T. 2004).

İş tatmini ve performans ilişkisini konu alan son 301 çalışmayı inceleyen Judge, Thoresen, Bono ve Patton (2001) tatmin ve performans arasında yüksek bir korelasyon olduğunu bulmuştur. Özellikle iş tatmini ile performans arasındaki ilişkiler kompleks işlerde daha çok olmaktadır (Saari, L. & Judge, T.,2004). Çalışanların işlerinden hoşlanmaları ve iş becerilerinin yüksek olması durumunda, iş tatmini ile verimlilik arasında bir ilişki olduğu görülmektedir (Mullins, L.J.,1993). Pozitif açıdan bakılacak olursa iş tatmini duyan kişinin diğer çalışanlara müşterilere yardımcı olma işbirliğine yönelik olma gibi daha fazla prososyal davranış sergilediği bulunmuştur. Sonuç olarak çoğu örgütsel davranış araştırmacısı yöneticilere iş tatminine önem vermeleri gerektiğini ve bunun örgüt etkinliği açısından önemli olduğunu ifade etmektedir. Diğer taraftan iş tatmininin düşük olmasının örgüt açısından pek çok negatif etkisi olabilecektir (Luthans, F., 1994).

Büte (2011) tarafından Gaziantep'te 298 kişi üzerinde yapılan bir araştırmada güvenin performans üzerindeki olumlu etkisi bulgulanmıştır. Yousef (2000: 15) ve Uygur (2007: 81), örgütsel bağlılık ile performans arasında pozitif ancak zayıf ilişki olduğunu belirlemişlerdir. Altaş ve Çekmecelioğlu'nun (2007: 54) çalışmasında, duygusal ve normatif bağlılığın iş performansını pozitif olarak etkilediği, normatif bağlılığın etkisinin daha da güçlü olduğu belirtilmiştir.

Araştırmanın Metodolojisi

Araştırmada veri toplama aracı olarak, anket kullanılmıştır. Anket formunda Şekil- 1'deki temel araştırma modelindeki değişkenlerin her biri ile ilgili olarak sorular sorulmuştur. Ankette 5'li likert tipi ölçek kullanılmıştır. Ölçekte yer alan katılma düzeyleri, kesinlikle katılmıyorum=1, kısmen katılmıyorum=2, kararsızım=3, kısmen katılıyorum=4, kesinlikle katılıyorum=5 değerleri ile belirtilmiştir. Veriler araştırmacı tarafından Eylül-Şubat 2012-13 tarihleri arasında toplanmıştır. Araştırma verilerinin değerlendirilmesinde SPSS 16.0 for Windows istatistik paket programı kullanılarak analiz edilmek üzere bilgisayar ortamına aktarılarak, faktör analizine, güvenilirlik, korelasyon ve regresyon analizlerine tabi tutulmuş, demografik değişkenler için frekans dökümü yapılmış, ortalama ve standart sapma değerleri bulunmuştur.

Araştırmada "duygusal bağlılık" değişkeninin ölçümünde kullanılan 4 soru Meyer ve Allen(1991), "iş tatmini" ile ilgili soru 5 soru Rusbelt, Farrell, Rogers ve Maınous (1988), "örgütsel güven" ile ilgili 12 soru, Nyhan ve Marlowe (1997), "bireysel iş performansı" ile ilgili 4 soru Kirkman ve Rosen(1999) çalışmalarından uyarlanarak kullanılmıştır. Duygusal bağlılık, iş tatmini, örgütsel güven ve bireysel iş performansı arasındaki ilişkiyi belirleyen sorular beş faktör altında sınıflanmıştır. Bu faktörler ve faktörleri saptayan sorular, duygusal bağlılık, iş tatmini, örgütsel güven boyutlarından yöneticiye ve örgüte güven ve bireysel iş performansıdır.

Araştırmanın Modeli ve Hipotezleri

Duygusal bağlılık, iş tatmini, örgütsel güven ve bireysel performans arasındaki ilişkinin incelendiği bu araştırmada, duygusal bağlılık, iş tatmini ile örgütsel güvenin yöneticiye güven, örgüte güven boyutları ve bireysel performans değişkenleri kullanılmıştır.

Araştırmada beş tane değişken kullanılmıştır. Bağımsız değişken olarak duygusal bağlılık, iş tatmini ile yöneticiye

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ve örgüte güven boyutları kullanılmıştır. Bağımlı değişken ise; bireysel iş performansıdır. Araştırmada test edilecek hipotezler ise şunlardır:
Hipotez 1: Duygusal bağlılığın bireysel iş performansı üzerinde olumlu bir etkisi vardır.
Hipotez 2: İş tatmininin bireysel iş performansı üzerinde olumlu bir etkisi vardır.
Hipotez 3: Yöneticiye güvenin bireysel iş performans üzerinde olumlu bir etkisi vardır.
Hipotez 4: Örgütsel güvenin bireysel iş performans üzerinde olumlu bir etkisi vardır.

Bulgular

Demografik Özellikler

Tablo-1'de de görüldüğü üzere, anketlere cevap veren 135 çalışanın %0,74'ü erkek, %99,25'i ise bayandır. Ankete katılanların %58.7'si evli, %38.4'ü bekârdır. Ankete katılanların %65.9'u 1-5 yıl arasında, %18.8'i 6-10 yıl arasında, %4.3'ü 11-15 yıl arasında, %5.1'i ise 16 yıl üzerinde kıdeme sahiptir. Anket sorularını cevaplayanların %95.7'si lisans ve %2.2'si lisansüstü eğitime sahiptir. Ankete katılanların %63'ü 50 kişinin altında çalışanı bulunan eğitim kurumlarında, %25.4'ü 50 kişinin üzerinde çalışanı bulunan eğitim kurumlarında çalışmaktadırlar. Ankete katılanların %47.8'i 30 yaşın altında, %35.5'i 31-35 yaş aralığında, %7.2'si 36-40 yaş aralığında, %4.3'ü 41-50 yaş aralığında ve %2.9'u 50 yaş üzerindedir.

Tablo 1: Demografik Özellikler.

ÖZELLİKLER	Frekans	Yüzde	ÖZELLİKLER	Frekans	Yüzde
CİNSİYET			MEDENİ DURUM		
-Erkek	1	.7	-Evli	81	60.0
-Kadın	134	99.3	-Bekâr	54	40.0
KIDEM			EĞİTİM DURUMU		
1-5 yıl	91	67.4	-Lisans	132	97.8
6-10 yıl	26	19.3	-Lisansüstü	3	2.2
11-15 yıl	6	4.4			
16 yıl ve üstü	12	8.9			
ÇALIŞAN SAYISI			YAŞ		
			-30 ve altı	66	48.9
-50 ve altı	87	64.4	-30-35	49	36.3
-50-100	48	35.6	-36-40	10	7.4
			-41-50	6	4.4
			-51 ve üstü	4	3.0

Araştırma Değişkenlerine İlişkin Faktör Analizi

Araştırmanın bu kısmında modeldeki beş değişkene ilişkin ifadeler faktör analizine tabi tutulmuştur. Modeldeki duygusal bağlılık, iş tatmini, yöneticiye güven, örgüte güven ve bireysel iş performansı faktörlerine ilişkin 24 ifade analiz edilmiştir. Analiz sonucu KMO değeri 0.900>0.5 çıkmıştır. Araştırma modelinde beş değişken bulunmaktadır. Söz konusu değişkenler ve faktörlere ilişkin ankette yer alan sorular Tablo 2'de ayrıntılı olarak sunulmuştur.

Tablo 2: Araştırma Değişkenlerine İlişkin Faktör Analizi Sonuçları.

	Duygusal Bağlılık	İş Tatmini	Yöneticiye Güven	Örgüte Güven	Bireysel İş Performansı
1.Kariyerimin geri kalanını nu kurumda geçirmekten mutluluk duyarım.	,733				
2.Kurumumun problemlerini kendi problemlerim gibi hissediyorum.	,786				
3.Bu kurum benim için çok fazla kişisel anlam taşıyor.	,591				
4.Çalıştığım kurumdan dışarıda gururla bahsediyorum.	,676				
1.İşim, tüm koşulları düşündüğümde beni memnun ediyor.		,684			
2.Yaptığım işi seviyorum.		,636			
3.Yaptığım işi bir başkasına tavsiye ederim.		,737			
4.Şu andaki işim hayalimdeki işe uyuyor.		,804			
5.Şu andaki işim, işe girdiğim zaman ki bu işle ilgili beklentilerime uyuyor.		,841			
1.Yöneticimin işiyle ilgili önemli konularda teknik olarak yeterli olduğuna güvenim tamdır.			.834		

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2. Yöneticimin işiyle ilgili üzerinde iyi düşünülmüş kararlar alacağına güvenim tamdır.			.805		
3. Yöneticimin görevinden ayrılmayacağına güvenim tamdır.			.698		
4. Yöneticimin işiyle ilgili olarak makul düzeyde kavrama yeteneğine sahip olduğuna güvenim tamdır.			.881		
5. Yöneticimin işini makul bir biçimde yaptığına güvenim tamdır.			.853		
6. Yöneticimin herhangi bir konuda söylediklerinin doğruluğuna güvenim tamdır.			.763		
7. Yöneticimin işini başka sorunlara yol açmadan yapabileceğine güvenim tamdır.			.860		
8. Yöneticimin işi sırasında yaptıklarını dikkatlice düşüneceğine güvenim tamdır.			.866		
1.Bu kurumda yöneticiler ve çalışanlar arasındaki güven düzeyi çok yüksektir.				,873	
2.Birlikte çalıştığım insanlar arasındaki güven düzeyi çok yüksektir.				.932	
3.Bu kurumda birbirimize güvenme düzeyi çok yüksektir.				.919	
1.İşlerimi zamanında tamamlarım.					.872
2. Hedeflerimi gerçekleştiririm ya da aşarım.					.904
3. Problem çıktığında hızla çözerim.					.877
4. Mutlaka kalite standartlarında ya da üzerinde ürünler üretirim.					.871

KMO=0.900>0.5
Barlett's Test p=0,00
Açıklanan Toplam Varyansın Yüzdesi=71.13

Değişkenlere Ait Analiz Sonuçları

Tablo 3'te tüm değişkenlere ait ortalama, standart sapma ve pearson korelasyonları sunulmuştur. Bu tabloda da görüldüğü gibi, duygusal bağlılık, iş tatmini ile yöneticiye güven, örgüte güven ve bireysel iş performansı arasında %1 anlamlılık düzeyinde olumlu yönde ilişkiler söz konusudur. Yöneticiye güven değişkeni ile duygusal bağlılık arasındaki ilişki örgüte güven boyutuna göre daha kuvvetlidir. Fakat yöneticiye güven boyutu ile bireysel iş performansı arasında %1 anlamlılık düzeyinde olumlu bir ilişki söz konusuyken, örgüte güven ve bireysel iş performansı arasında anlamlı bir ilişkiye rastlanamamıştır.

Tablo 3: Tüm Değişkenlere Ait Ortalama, Standart Sapma ve Pearson Korelasyonları.

	Ort.	S.S.	1	2	3	4	5
1.Duygusal Bağlılık	*4,10*	*,77*	,642(a)	,427**	,403**	,278**	,263**
2.İş Tatmini	*4,23*	*,74*		,795(a)	,365**	,343**	,549**
3.Yöneticiye Güven	3,957	,72			,949(a)	,561**	,268**
4.Örgüte Güven	3,735	,95				,938(a)	,152
5.Performans	4,208	,65					,903(a)

*.05 düzeyinde anlamlı (çift taraflı) **.01 düzeyinde anlamlı (çift taraflı)

Tablo 4: Değişkenler ile Demografik Özelliklere Ait Pearson Korelasyonları.

	Yaş	Cinsiyet	Medeni Durum	Eğitim Durumu	Kıdem	Çalışan Sayısı
1.Duygusal Bağlılık	,193*	,050	-,161	-,019	,176*	,055
2.İş Tatmini	,076	,035	,008	-,009	,069	,066
3.Yöneticiye Güven	-,034	,342**	,139	,009	,001	-,093
4.Örgüte Güven	-,039	,192*	,057	,044	-,141	-,025
5.Performans	,132	-,040	-,114	-,50	,103	-,008

*.05 düzeyinde anlamlı (çift taraflı) **.01 düzeyinde anlamlı(çift taraflı)

Demografik değişkenler ile duygusal bağlılık, iş tatmini, yöneticiye güven, örgüte güven ve bireysel iş performansı arasındaki ilişkiler değerlendirilmiştir. Duygusal bağlılık ile yaş ve kıdem %5 anlamlılık düzeyinde olumlu yönde ilişkilidir. Cinsiyet ile ilgili bulgular dikkat çekmektedir. Cinsiyet ve yöneticiye güven arasında %1 anlamlılık düzeyinde olumlu yönde ilişkiye rastlanmıştır. Cinsiyet ve örgüte güven arasında %5 anlamlılık düzeyinde olumlu yönde ilişkiye rastlanmıştır.

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Tablo 5: Duygusal Bağlılığın Bireysel İş Performansı Üzerindeki Etkisi.

Bağımsız değişkenler	Bireysel İş Performansı (Model 1)
	β t
Duygusal Bağlılık	,263 3,091**
Model F Model R²	9,555 ,0069
**p< .01 *p<. 05 (tek taraflı)	

Tablo 6: İş Tatminin Bireysel İş Performansı Üzerindeki Etkisi.

Bağımsız değişkenler	Bireysel İş Performansı (Model 2)
	β t
İş Tatmini	.549 7,517**
Model F Model R²	56,501** 0.301
**p< .01 *p<. 05 (tek taraflı)	

Tablo 7: Yöneticiye ve Örgüte Güven Boyutlarının Bireysel İş Performansı Üzerindeki Etkisi.

Bağımsız değişkenler	Bireysel İş Performansı (Model 3)
	β t
Yöneticiye Güven	.249 2,371**
Örgüte Güven	.016 ,155
Model F Model R²	4,383** 0.067
**p< .01 *p<. 05 (tek taraflı)	

Hipotez Testi Sonuçları
Bu araştırma için oluşturulan hipotezlerin test sonuçları aşağıda tablo 8'de özetlenmiştir.

Tablo 8: Test Edilen Hipotezlere İlişkin Sonuçlar.

Hipotez	Sonuç
Hipotez 1: Duygusal bağlılığın bireysel iş performansı üzerinde olumlu bir etkisi vardır.	Kabul
Hipotez 2: İş tatmininin bireysel iş performansı üzerinde olumlu bir etkisi vardır.	Kabul
Hipotez 3: Yöneticiye güvenin bireysel iş performans üzerinde olumlu bir etkisi vardır.	Kabul
Hipotez 4: Örgütsel güvenin bireysel iş performans üzerinde olumlu bir etkisi vardır.	Red

Sonuç ve Öneriler

Bu araştırmada, okul öncesi öğretmenlerinin duygusal bağlılık, iş tatmini ile yöneticiye ve örgüte güven boyutlarının bireysel iş performansı üzerindeki etkileri incelenmiştir. Araştırma sonuçları, duygusal bağlılık, iş tatmini ve yöneticiye güvenin bireysel iş performansı üzerinde oldukça kuvvetli ve olumlu bir etkisinin olduğunu göstermektedir. Elde edilen sonuçlar literatürdeki benzer araştırma sonuçları ile örtüşmektedir (Büte, 2011).
Yöneticiye güvenin bireysel iş performansı üzerindeki olumlu etkisi tespit edilmiştir. Yani okul öncesi

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öğretmenlerinin yöneticilerine güveni arttıkça bireysel iş performansları da artmaktadır. Oysa örgüte güvenin bireysel iş performansını üzerinde etkisinin araştırıldığı testlerde anlamlı bulgulara rastlanamamıştır.
İş tatmininin iş performansı üzerindeki etkileri incelendiğinde hem korelasyon hem regresyon analizleri kişilerin yaptıkları işten tatmin olmalarının bireysel iş performanslarını arttırdığını göstermektedir. Örgütsel bağlılık unsurlarının bireysel iş performansı üzerindeki etkileri incelendiğinde ise korelasyon ve regresyon analizi, duygusal bağlılığın iş performansını pozitif olarak etkilediğini göstermektedir. Meyer ve arkadaşlarının (2001) Kuzey Amerika'da yaptıkları araştırmalar ise duygusal bağlılığın iş performansı üzerinde daha büyük bir etkiye sahip olduğunu göstermektedir. Bu nedenle örgütsel performansı arttırmak isteyen işletme yöneticileri çalışanların iş performansını arttıran örgütsel güven, iş tatmini ve duygusal bağlılığa odaklanarak bu davranışları arttırıcı etkenlere ve yönetsel düzenlemelere önem vermelidirler.

Teşekkür

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ON THE DECIPHERMENT OF LINEAR A INSCRIPTIONS IN THE COMMON COLCHIAN LANGUAGE: MATHEMATICS

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"The meaning of one Linear A word is certain:
ku-ro is the word which introduces totals, and
must mean something like *'total'* or *'so much'*.
If we could find such a word in a known language,
the problem of Linear A might be solved."
J. Chadwick (1970, p. 154 ff.)

Abstract: Some Cretan Linear A tablets with agricultural accounts are studied from the point of mathematical methods. Natural numbers, simple fractions and combination of fractions are quite accurately denoted in these accounts. 'Algebraic expressions' and 'algebraic equations' deduced in the process of research present the most sophisticated mathematical system.
The LA words for addition: *ku-ro* and *po-to-ku-ro* are especially interesting and important. Their meanings are presented by the method of algebraic and graphical analyses.

Keywords: *ku-ro*, *po-to-ku-ro*, natural numbers, fractions, algebraic method.

Introduction

The paper presents the ancient Kartvelian Crete scripts dated to the nineteenth-fifteenth century BC. The mathematical data given in ancient Crete inscriptions is presented on clay Linear A (LA) tablets of the Common Colchian (CC) language.

The vast bulk of LA syllabic signs are graphically and phonetically identical to the graphic and phonetic properties of the syllabic signs of Mycenaean Linear B (LB) and the Cypriot syllabic (CS) scripts. The problem of the language of LA inscriptions remained long unsolved, and it was declared to be impossible to read it because the language and its culture no longer existed. The meanings of the LA inscriptions remained unidentified, and the LA tablets were declared to be written in an unknown dead language.

1. Natural numbers of LA script

Natural (or counting) numbers of LA script are the following signs and their combinations: 𐄇 *one*, 𐄐 or 𐄑 *ten*, 𐄒 *one hundred*, 𐄓 *one thousand*. The numeral system of these arithmograms are shown in Table 1 as compared to those of other systems (comp. Sarton, 1936, p. 378; Ventris and Chadwick, 1973, p. 30, 36, 53; Olivier, 1986, p. 381; Olivier and Godart, 1996, p. 17, 19, 432–444; Chrisomalis, 2010, p. 35, 57, 59, 64, 67):

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Numeral systems	1	10	100	1 000	10 000	100 000	1 000 000
LA							
Mycenaean LB							
Cypriote syllabic							
Cretan hieroglyphic							
Hieroglyphic Luwian							
Egyptian hieroglyphic							
Sumerian pictographic							

Table 1

Each of these systems is a non-positional numeral system with the meaning of the number not influenced by the position of numerals (comp. Hollings, 2009, p. 16-17).

2. Fractions of LA script

The simple fractional signs of LA script are given in Table 2 (comp. Godart and Olivier, 1985, V, p. xxvii, 316–324; Kvashilava, 2011, p. 258):

701		A	709^2		L^2
702		B	709^3		L^3
703		D	709^4		L^4
704		E	709^6		L^6
705		F	710		W
706		H	711		X
707		J	712		Y
708		K	713		Ω
709		L			

Table 2

The combinations of the fractional signs 𐅷, 𐅸, and 𐅹 with other signs are presented in Table 3:

714			A B	724			EL⁴	734			J L²
715			B B	725			EL⁶	735			J F
716			B L⁶	726			EYYY	736			J H
717			D D	727			FK	737			J J
718			D D D D	728			F L	738			J K
719			E B	729			H K	739			J L²
720			E E	730			J A	740			K L²
721			E F	731			J B	741			L L
722			E J	732			J E	742			L L²
723			EL²	733			J E B	743			L² L⁴

Table 3

The details about the numerical values of fractional signs 𐄷, 𐄸, 𐄹, 𐄺, 𐄻, and 𐄼 will be presented by me in the paper below.

3. Reading of the LA sign-sequence 𐄁𐄂𐄃𐄀 [po-to-ku-ro]

The reading of the LA sign-sequence 𐄁𐄂𐄃𐄀 is given below. The LA signs 𐄁, 𐄂, 𐄃 and 𐄀 are read as the syllables *po*, *to*, *ku* and *ro*, which, as expected, coincides with phonological values of the corresponding signs of LB and the CS scripts. The signs are shown in Table 5:

LA						po					to
LB						po					to
CS						po					to
LA						ku					ro
LB						ku					ro
CS											lo

Table 5

So, the LA sign-sequence 𐄁𐄂𐄃𐄀 is thus read as po-to-ku-ro/*p^{h}o-t^{h}o-ku-roj.

Semantic interpretation of sequence po-to-ku-ro/*p^{h}o-t^{h}o-ku-roj are presented as CC archetypes:

*p^{h}ot^{h}-oj – "*wide*, *general*"[19];

*kur-oj – "*to bind*, *gather*, *collect, add*" (Kvashilava, 2017, p. 67);

*p^{h}o-t^{h}o-ku-roj – "*the general, whole sum, grand total*" (comp. Kvashilava, 2011, p. 266).

The reconstructed root morphemes *p^{h}ot-, and *kur- are of CVS- structure; suffixal morpheme *-oj is of -VS structure. These phonemic structures are canonical forms of morphemes in CC language (comp. Gamkrelidze and Machavariani, 1965, p. 304, 318, 368).

These sequences display regular phonological and semantic connections to Kartvelian materials.

[19] *p^{h}ot^{h}- < Georgian ფათ-ენ-ი [p^{h}at^{h}-en-i] – "*widely* (adj.)" (Orbeliani, 1993, II, 180, 184).

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4. Examples of LA Inscriptions

The sign-sequence 𐀳+ [ku-ro/*ku-roj] (addition) has been attested on clay LA tablets HT 9, HT 11, HT 13, HT 25, HT 27, HT 85, HT 88, HT 89, HT 94, HT 100, HT 102, HT 104, HT 109, HT 110, HT 116, HT 117, HT 118, HT 119, HT 122, HT 123, HT 127, PH(?) 31, and ZA 15. These tablets were found at Hagia Triada, Phaistos and Zakros in Crete. These are dated back to 1850–1450 BC and contain the inscriptions that could easily be interpreted as records of business accounts (Kvashilava, 2015, p. 139).

Example 4.1.

The inscription on tablet HT 9b as presented by L. Godart and J.-P. Olivier (1976, I, p. 18; comp. Consani and Negri, 1999, p. 53-54) is shown in Figure 1:

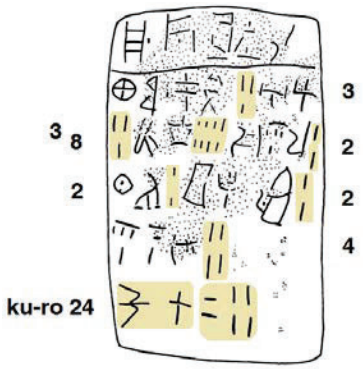
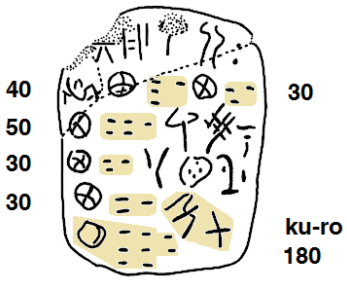


Fig. 1. LA tablet HT 9b

Let's find the sum of the natural numbers 3, 3, 8, 2, 2, 2, and 4. 𐀳+ [ku-ro/*ku-roj] or the total number is =‖ *24*.

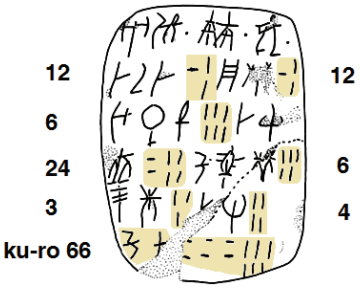
Examples 4.2-4.5.

𐀳+ [ku-ro/*ku-roj] is also attested on other LA script tablets as shown in Figures 2-5 (Godart and Olivier, 1976, I, p. 22, 130, 140, 196; comp. Consani and Negri, 1999, p. 55, 83, 85 ff., 100 ff.). The sum of a list of natural numbers can be calculated as follows:



40 + 30 + 50 + 30 + 30 = 180

Fig. 2. LA tablet HT 11b



12 + 12 + 6 + 24 + 6 + 3 + 4 = 66

Fig. 3. LA tablet HT 85a

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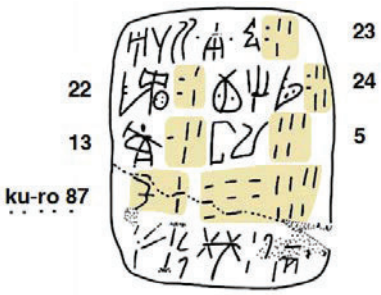


23 + 22 + 24 + 13 + 5 = 87

Fig. 4. LA tablet HT 89



1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +1 = 10

Fig. 5. LA tablet HT 117a

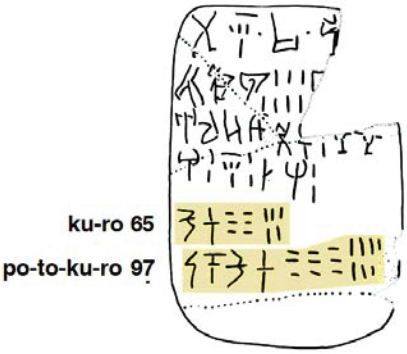
Example 4.6.

L. Godart and J.-P. Olivier (1976, I, p. 206, 208; comp. Consani and Negri, 1999, p. 103-104) also presented the inscriptions on both sides of tablet HT 122 as shown in Figures 6 and 7:



31 + 1 = 32

Fig. 6. LA tablet HT 122a



32 + 65 = 97

Fig. 7. LA tablet HT 122b

The arithmetical meaning of *ku-ro* on side A is 31 with 1 added to it equals 32. On side B *ku-ro* is 65; and below the sum of numbers on both sides – *po-to-ku-ro* (grand total) is given: 97 = 32 + 65.

Example 4.7.

The LA inscription of tablet HT 9a is presented in Figure 8 according to L. Godart and J.-P. Olivier (1985, V, p. 18; comp. Consani and Negri, 1999, p. 53):

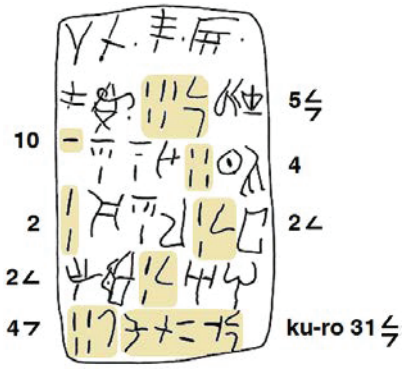


Fig. 8. LA tablet HT 9a

The sum of the natural numbers 10, 4, and 2 and mixed numbers 5𐄃, 2𐄁, 2𐄁, and 4𐄂 where 𐄃, 𐄁 and 𐄂 are unknown proper fractions, and also the combination of variables 𐄃 is 𐄁 + 𐄂 (comp. Was, 1971, p. 41) are given in Figure 8. The 'algebraic expression' 5 𐄃 +10 + 4 + 2 + 2𐄁+ 2𐄁 + 4𐄂 given here equals 31 𐄃. From the

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linear equation 5 ⅋ +10 + 4 + 2 + 2∠+ 2∠ + 4ㄱ = 31 ⅋ with mathematical operations of addition and subtraction of the proper fractions ⅋, ∠ and ㄱ on both sides of the 'algebraic equation' 2∠ + ㄱ = 2 in two variables is received.

Solutions of the 'algebraic equation' 2∠ + ㄱ = 2 are the points (∠, ㄱ) in the set of all ordered pairs of rational numbers $\mathbb{Q}^2$ such that when the abscissa ∠ of the points is multiplied by 2, and the ordinate ㄱ of the points is multiplied by 1, and those two numbers are added together, the answer equals 2.

Let's find the variables ∠ and ㄱ for the equation 2∠ + ㄱ = 2.

⅋ = ∠ + ㄱ, ∠ and ㄱ are different proper fractions (see Fig. 8). Under this condition, strict linear inequalities in two variables ∠ and ㄱ can be written in the following forms: 0 < ∠ + ㄱ < 1, 0 < ∠ < 1 and 0 < ㄱ < 1 where ∠ ≠ ㄱ. So the ordered pairs (∠, ㄱ) are the solutions to the following system:

$$(1)\ \begin{cases} 2\angle + \text{ㄱ} = 2 \\ 0 < \angle + \text{ㄱ} < 1 \\ 0 < \angle < 1 \\ 0 < \text{ㄱ} < 1 \\ \angle \neq \text{ㄱ} \end{cases}$$

The system (1) is solved by the graphical method on the Cartesian coordinate system. Then for every point on the line, the abscissa ∠ must be equal to the ordinate ㄱ. The graph of the system (1) is illustrated in Figure 9:

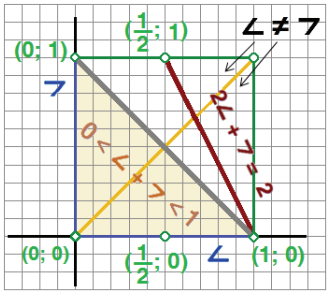

Fig. 9

Solutions to the system (1) are the ordered pairs that solve all the inequalities and the equation in the system. Therefore, to solve the system (1) I have graphed the solution sets of the inequalities on the same set of axes ∠ and ㄱ, and the points of their intersection are thus determined. This intersection will define the region of common ordered pair solutions. In Figure 9, there is no intersection of these shaded regions. Therefore, there are no simultaneous solutions. So the system (1) does not have a solution.

According to the note by L. Godart and J.-P. Olivier (1985, V, p. 19; comp. Was, 1971, p. 36; Facchetti, 1994, p. 143), the 'algebraic expression' 5 ⅋ +10 + 4 + 2 + 2∠+ 2∠ + 4ㄱ was calculated to be the total as 30 ⅋. I can collect the proper fractions on the left and the numbers on the right, and give the equation 2∠ + ㄱ = 1.

Let's solve the following system by the graphical method:

$$(2)\ \begin{cases} 2\angle + \text{ㄱ} = 1 \\ 0 < \angle + \text{ㄱ} < 1 \\ 0 < \angle < 1 \\ 0 < \text{ㄱ} < 1 \\ \angle \neq \text{ㄱ} \end{cases}$$

First, the graph of the linear equation 2∠ + ㄱ = 1 is the straight line whose ∠-intercept is (½, 0) and whose ㄱ-intercept is (0, 1). The graph of the system (2) is shown in Figure 10:

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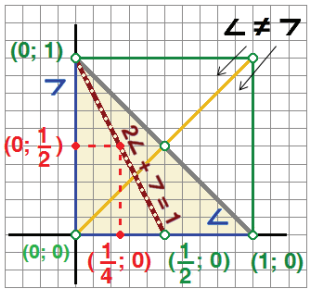


Fig. 10

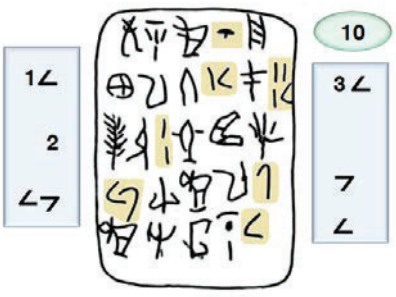
As is shown in Figure 10, it follows from system (2) that

$$(3)\quad \begin{cases} 2\angle + \urcorner = 1 \\ \urcorner = \frac{1}{2} \end{cases}$$

As is well seen, system (3) has exactly one solution ($\angle$ = ¼, $\urcorner$ = ½). Finally, the proper fraction $\frac{3}{4}$ is represented as the sum of unit fractions $\angle$ = ¼ and $\urcorner$ = ½, i.e., $\angle + \urcorner$ = ¼ + ½ = ¾.[20]

Example 4.8.

According to L. Godart and J.-P. Olivier (1976, I, p. 16; comp. Consani and Negri, 1999, p. 52 ff.), the inscriptions of tablet HT 8a and 8b are presented in Figures 11 and 12:



$1\angle + 3\angle + 2 + \urcorner + \angle\urcorner + \angle + 1 =$
$= 4\cdot\angle + 2\cdot\urcorner + 7 = 9$

Fig. 11. LA tablet HT 8a



$2 + 17\urcorner + \angle + 1\urcorner + \angle + \angle =$
$= 2\cdot\urcorner + 5\frac{1}{4}$

Fig. 12. LA tablet HT 8b

From Figures 11 and 12 the 'algebraic expressions' may be rewritten in the following matrix:

$$\begin{pmatrix} 10 & 9 \\ 5 & 2\cdot\urcorner + 5\frac{1}{4} \end{pmatrix}$$

where $\urcorner$ is an unknown proper fraction. Here we must to find the fraction $\urcorner$ such that the expression $2\cdot\urcorner$ + 5¼ is a member of the set of natural numbers $\mathbb{N}$.

The proper fraction $\urcorner\urcorner$ is represented as the sum of fractions $\urcorner$ and $\urcorner$, i.e., $\urcorner\urcorner = \urcorner + \urcorner$ where $0 < \urcorner + \urcorner < 1$, $\urcorner$ = ½, and $\urcorner \neq$ ¼.

From the obvious inequality $0 < \urcorner <$ ¼ or ¼ $< \urcorner <$ ½ we have

$5¼ < 2\cdot\urcorner + 5¼ < 5¾$

or

$5¾ < 2\cdot\urcorner + 5¼ < 6¼$.

In this case, the natural number is exactly 6:

[20] The LA fraction sign $\urcorner$ = ½ could be compared to the Egyptian demotic script sign $\urcorner$ = ½ (Johnson, 2014, p. 266).

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(4) $2 \cdot \text{𐅵} + 5\frac{1}{4} = 6.$

It follows from the equation (4) that 𐅵 = ⅜.

Conclusion

Mathematical data of some of the LA tablets is studied in the paper.
1. On tablets HT 9, HT 11, HT 85, HT 88, HT 89, HT 117, and HT 122 the word *ku-ro* is given to denote the sums of natural numbers.
2. Of special interest are the inscriptions on tablet HT 122 on both sides (A and B) of which the sums of natural numbers – *ku-ro* – is given. The arithmetical meaning of *ku-ro* on side A is 31 with 1 added to it – so the sum is 32. On side B *ku-ro* is 65; and below on the tablet the sum of both sides *po-to-ku-ro* – grand total – is given: 97 = 32 + 65.
3. The values of proper fractions 𐅴, 𐅵, 𐅷, 𐅵, 𐅵𐅵, and 𐅴𐅵 are presented in Table 6:

Signs	Value			
𐅴	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
𐅵	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$
𐅷	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	
𐅵	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$
𐅵𐅵	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	
𐅴𐅵	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	
	Kvashilava	Facchetti	Was	Bennett

Table 6

It could be seen that the results received by different authors coincide mostly, but the values received in this paper have been obtained as the result of strict algebraic calculations.

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OUTSIDE THE BOX: CHANGE – VARIOUS FORMS OF CONNECTING PRACTITIONERS IN THE PROCESS OF INTENSIVE KINDERGARTEN DEVELOPMENT

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Abstract: This article describes the characteristics of the traditional, outdated educational practice in the early education institution followed by the ways in which a good quality, modern practice can evolve, as well as the achievements accomplished in some of our institutions. These achievements, as well as the processes that lie within them, are termed *Outside the box*. It is emphasized how the quality of the education development in an early and preschool institution is more concerned with the process than the result (especially not the permanent result), that is, it presents a developmental rather than a static category. In this sense, action research is highlighted as a particularly valuable "tool" for the development of educational practices and curriculum of early education. Action research enables the creation of a community of critical, self-reflective actors who can change the practice on a much wider scale then the individual, and gradually create a new, more human, and more democratic educational policy. The ultimate consequences of action research should be viewed in a much broader context than merely as a means of improving educational practice of certain institutions, that is, as creating a *professional learning community* whose participants connect and support each other in a continuous learning and professional development by strengthening their autonomy and emancipation.

There is a description of various forms of connecting practitioners who show interest and motivation for the introduction of new forms of work in order to provide each other with professional and emotional support. The Facebook group *Outside the Box* is mentioned as a form of linking practitioners for the purpose of discussion and exchange of professional experience and expertise, to which the next subchapter is devoted. This Facebook group was created with the intention of bringing together practitioners involved in the process of intensive kindergarten development through action research so as to enable an exchange of important information, research experiences, and insights which they gained in the process of developing practices. However, a growing number of interested practitioners from many different kindergartens gradually joined this group reaching a total number of 4,200 practitioners from different Croatian cities, as well as from Serbia, Bosnia and Herzegovina, Slovenia, the USA, Finland, Norway, and Australia.

Keywords; Action research, Facebook group, Kindergarten, *Outside the box*

Introduction

Outside the box illustrates the Croatian concept of connecting theoreticians and practitioners of early education on the path to seeking new opportunities for development of early childhood education and early education curriculum. It began as an attempt by the theorists at the Faculty of Humanities and Social Studies, University of Zagreb and two hundred associates from about ten Croatian kindergartens to explore and shape the educational practice so that it would be in line with contemporary pedagogical requirements stipulated in the Croatian National Curriculum for Early and Preschool Education that entered into force in 2015. This document created the legal preconditions for the development of institutional education based on the plurality of pedagogical ideas and concepts whose backbone represents humanistic ideas and developmentally appropriate practices. However, domestic and world experiences testify to the fact that a new official document, even when it is based on very contemporary professional and scientific grounds, has very modest impact on the educational practice itself. The reason for this is that the traditional understanding of the child and childhood, as well as the traditional organization of the educational process that emerges from such an understanding, cannot easily and simply be abandoned or achieved through administrative procedures. Of the many traditionalisms that can be found in the practice of Croatian kindergartens, we will list only a few:

• practice of strict planning and management of children's activities in the educational institution

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- practice of direct teaching of children with the content which they need to memorize and reproduce, and which is therefore easily measurable
- practice of parceling children's educational activities according to methodical areas and strictly defined time sequences (so-called "guided activities")
- encouraging one-sided and one-dimensional thinking of children (supporting the expected response of children in joint activities with the preschool teachers) and
- a universal and unified educational approach (the criterion for chosing educational content is the chronological age of children rather than their personal and developmental characteristics or subjective preferences and needs).

Retaining these (and many other) traditionalism in the educational practice testifies to the fact that it is in fact not managed by "official concepts" even when it is prescribed by the state, i.e. the competent Ministry, but rather by the "personal concepts" of practitioners who are employees in the institution.

Action research

With this in mind, we conducted an action participatory research in about ten kindergartens so as to familiarize ourselves with and develop the educational practice and curriculum, as well as to provide support to those practitioners who want to step "outside the box." In this process, our scientific-research activities included several directions.

The first of these was the development of the practitioners' awareness that the quality of life, i.e. the education of the child, determines the entire context of his or her life inside the kindergarten. The context of a child's life within a kindergarten institution is a complex interaction of various structural and cultural dimensions of the kindergarten, since the kindergarten is a complex living system or "a living organism" (Rinaldi, 2006). It is a pulsating, changeable, and interconnected world of rapid interaction in which the order originates naturally from chaos without the necessity of supervision (Roberts and Kleiner, 2003). Because of this, its functioning, i.e. the processes that occur in it, cannot be fully predicted or controlled. On the contrary, the modern educational process, i.e. the resulting curriculum, resembles "a forecast of possibilities within an arena of opportunities" (Rinaldi, according to Male, 2012). It resembles a journey to new and unknown places that change the child's experience (Kalantzis et al, 2003). Such an understanding of the educational process is also the foundation of the development of an open development curriculum (Edwards et al., 1998, Slunjski, 2011). In that sense, the first direction of our "***outside the box***" journey was to develop the practitioners' awareness about the unpredictability of the educational process and to provide support to the development of an open development curriculum.

The second direction involved abandoning the divisions of the educational process into activities aimed at stimulating specific aspects of child development (physical, emotional, social, intellectual, moral, creative, etc.) through separate activities. Instead, it was attempted to help the practitioners to create a wholesome understanding of the processes of nurturing, educating, and teaching children throughout every segment of the educational process. Also, efforts were made to empower them to abandon the idea of partitioning the process of teaching children into areas that, when it comes to school, belonged to certain subjects (Croatian, Mathematics, Science, etc.). This direction of work with practitioners was based on the inauguration of contemporary understanding of children's learning (Petrović-Sočo, 2007; Tarini, 2008; White, 2008; Miljak, 2009), which emphasizes that the quality of children's learning corresponds to the quality of their everyday life in the kindergarten, i.e. that it is not limited to parceled-out and segmented teaching of children according to certain contents. At the same time, these concepts were the foundation for the development of an integrated curriculum that takes into account all areas of the child's development in a uniform manner, which would fit the nature of the child and his or her learning (Bredekamp, 1996). In that sense, "***outside the box***" refers to the development of a holistic understanding of the educational process as the basis for designing a curriculum that has integrated characteristics.

The third direction of our activity referred to abandoning traditional education that is characterized by understanding knowledge as something static, which can be transmitted to children in predictable ways. Instead, it was attempted to promote the idea of creating, i.e. constructing knowledge, which in itself represents a personal, subjective, and authentic construction by the person who learns (Malaguzzi, 1998, Bascia and Hargreaves, 2000, Vygotsky, according to Berk and Winsler, 1995). The way in which a child constructs his or her knowledge depends on his or her prediction and many other individual distinctions, the way in which he or she interprets a particular learning experience and the contextual characteristics in which that learning takes place. The correct way of teaching younger children is not by means of a lecture or a verbal lesson (Bredekamp, 1996), since younger children learn to participate actively, i.e. by creating and collaborating with others (Bredekamp, 1996, Rinaldi,

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2006, Penn, 2008). The understanding of knowledge as a dynamic and developmental category that is continually evolving, constructing, and reconstructing is the foundation for the development of a constructivist, i.e. a co-constructivist curriculum (Miljak, 2007, Slunjski, 2006, 2015, Rinaldi, 2006, Malaguzzi, 1998), and is also the third direction of our "***outside the box***" journey.

The fourth direction of our research focused on examining the existing practice in terms of promoting autonomy and emancipation of children as opposed to child manipulation in the organization of the educational process. Our activities in this part of research focused most on overcoming the traditional position of the child in the kindergarten, which is passive, receptive, and in many respects disempowered. Rather, we have endeavored to strengthen the preschool teachers to encourage independent and critical thinking in children, i.e. to encourage their autonomy as a prerequisite for responsible behavioral development. The reason for this is that an important goal of education is to create autonomous, i.e. respectful relationships that allow children to evaluate things from different perspectives and learn to act independently. In an educational process aimed at respecting the rights and individual freedoms of the child, it is possible to expect the development of those qualities that are necessary for a free, actively creative, and responsible life of the child. This requires a respectful and equal relationship between all participants in the educational process and it focuses on the development of the personality of the child with an emphasis on self-reliance. This understanding of the educational process and the repositioning of the child in it represented the underpinning of the development of a humanist-oriented curriculum (Stenhouse, 1975, Malaguzzi, 1998). This was the fourth direction of our attempt to establish "***outside the box***" practices, i.e. converting the kindergarten into a place where children are not obedient objects but rather equal participants in the process of mutual learning with other children and adults.

Throughout the entire research we observed a noticeable increase in the interest of a larger number of practitioners for the direction in which the educational practice is being developed as well as for the accomplishments that are being achieved. In this respect, they began to express their interest in an active engagement in this process. So we started looking for opportunities for a greater number of connections between the practitioners and for building strong learning communities that would enhance their motivation and further boost their professional learning. We considered this to be important because we have repeatedly assured that achieving good practice does not mean one-time fixing of problems that prevent its development or make it more difficult to develop than to provide the preschool teachers with the tools to continuously recognize and remove problems. In that respect, we have tried to encourage the connection of practitioners since we are convinced that they can change the practice to a much greater scale than the individual, i.e. they can gradually create a new, more humane and more democratic educational policy. In this context, the general direction of our research, which we have painted metaphorically as "outside the box," was to encourage the preschool teachers to move from a lack of freedom and restraint toward freedom, autonomy, equality, co-operation, and promotion of democracy.

Facebook group «Outside the box»

Over time, the number of practitioners involved in direct and many indirect ways of the research process and improvement of educational practices and curricula grew. In this regard, as a particularly innovative form of connecting preschool teachers and other professional kindergarten teachers, it is important to highlight the Facebook group "***Outside the Box***." This group was actually created with the aim of gathering practitioners who participate in intensive career development processes through action research, which enable them to exchange important information, their research experiences, and the insights they have gained in the process of developing the practice. Most of these experiences and insights are described in the research *Outside the Box* from 2015 and *Outside the Box 2: Change* from 2016 (Slunjski, 2015, 2016). Thus, the Facebook group gradually included an increasing number of practitioners from many different kindergartens, so that the total number of its members reached 4,900. In addition to members from the Republic of Croatia, colleagues from Serbia, Montenegro, Bosnia and Herzegovina, Slovenia, and even some from the USA, Finland, Norway, the Netherlands, and Australia jointed the group as well.

Although this is a completely unconventional form of connecting practitioners based on their common interest, this being the development of educational practices and the curriculum of kindergartens, it can still be stated that it provides a certain form of their professional learning. Especially considering the fact that the number of opportunities for participation of preschool teachers of different kindergartens in the Republic of Croatia in an

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organized professional training program is very small, and in particular in those programs that have a lasting character, which enables them to discuss everyday problems arising from their practice and which are organized to develop their research and reflexive competences.

Conclusion

The potential for professional development of practitioners through Facebook groups is considerably weaker than through direct contact that is intended for a common analysis of the existing practice and development of better practices. However, practitioners in this group could strengthen their motivation and have the opportunity to somehow sense the "pulse" of kindergartens with high-developed practice and, as far as possible, be "infected" with ideas that characterize the contemporary curriculum.

At the same time, this group also showed that the current level of kindergarten development in the Republic of Croatia is very different, just as the level of professional development of individual practitioners within those kindergarten is very different since preschool teachers understand and interpret the notion of quality of educational practice and curriculum very differently as well as perceive and interpret the problems that arise on the path of this development differently, not to mention that the problems in different kindergartens also greatly differ. But most members of the group share a common acceptance of the idea of joint and collaborative learning that can lead to the release of personal and institutional constraints that reduce the possibility of practicing legitimate human and democratic values.

That is why the ultimate consequence of the research that we undertook is much broader than the improvement of the educational curriculum and the kindergarten curriculum that were directly involved in it. Much greater contribution is seen in building the capacity of individuals and institutions, and creating a professional learning community (Leithwood et al., 2009) whose participants connect and support each other in continuous learning and professional development based on strengthening their autonomy and emancipation. Or, in other words, the empowerment of practitioners to actively, i.e. thoughtfully collaboratively join the idea of developing an "outside the box" practice that needs to be better, more humane, and more democratic.

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PERFORMANCE OF RUSSIAN-OLIVE, LOCUST, ASH AND BLACK-PINE USED IN ARIDLAND AFFORESTATION EXPERIMENT IN CENTRAL PART OF TURKEY

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An experimental arid land afforestation practice has been conducted in Acıpınar, İncesu, Karapınar, Sazlıpınar and Emirgazi located in the steppe region of Central Anatolia. Russian-olive (*Elaeagnus angustifolia)*, locust (*Robinia pseodoacacia)*, ash (*Fraxinus angustifolia)* and black-pine (*Pinus nigra)* are used as tree species in the experiment.

Soils were sampled for physical and chemical analysis. Following the planting diameter and height of the seedlings were measured. In the third vegetation seasons (July) fully expanded leaves and needles were sampled from seedlings for nutrient analysis.

Analysis of the data indicates that for the first 20 cm of the soil has high lime but low salt content. At the end of the third year, Russian olive had 29 and 98 % more survival rates that those of locust and pine. Absolute height growth of broadleaves was about 140 % higher than that of black pine. At the same period Russian olive had 27, 29 and 41 % higher absolute diameter growth than those of ash, locust and pine, respectively. The relative diameter growth rate for Russian olive is 9, 15 and 85 % higher than those of locust, pine and ash, respectively.

Nitrogen concentrations of Russian olive and locust were 26 and 150 % higher than those of of ash and black pine species, respectively. Phosphorus concentrations of broadleaves were 1/3 times higher than that of black pine. The most successful species in restoration practice are Russian olive, black locust and ash in order. And these species are recommended for aridland restoration.

Keywords: Arid-land, afforestation, plant nutrition, soil productivity

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PERLİT KULLANILARAK ÜRETİLEN CMAS ($CaO-MgO-Al_2O_3-SiO_2$) ESASLI SERAMİK MALZEMELER

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Özet: Yüksek refrakterlik, yüksek korozyon direnci ve çok iyi aşınma özelliklerinden dolayı endüstrinin birçok alanında yaygın kullanım alanı bulan CMAS ($CaO-MgO-Al_2O_3-SiO_2$) esaslı seramiklerin üretiminde mevcut çalışmada perlit hammaddesi kullanılmıştır. CMAS bileşimini oluşturmak üzere tartılan hammaddeler (Perlit, Alümina, Dolomit, Kuvars, Mermer Tozu ve Olivin) bilyalı değirmende yaş olarak 24 saat boyunca homojen olarak karıştırılmıştır. Karıştırma işleminden sonra elde edilen bileşimler 12 saat süre ile etüvde kurutularak toz haline getirilmiştir. Elde edilen tozlar hidrolik pres kullanılarak şekillendirildikten sonra 1100°C, 1150°C, 1200°C'lerde 1 ve 5 saat sürelerde sinterlenmiştir. CMAS seramiklerin mikroyapı ve faz yapıları incelenmiş, yoğunluk ve sertlik testleri gerçekleştirilmiştir.

Anahtar kelimeler: CMAS seramikler, sertlik, perlit

Abstract: Because of its high refractoriness, high corrosion resistance and very good abrasion properties, CMAS ($CaO-MgO-Al_2O_3-SiO_2$) based ceramics find wide use in many fields of industry. Raw materials (Perlite, Alumina, Dolomite, Quartz, Marble powder and Olivine) weighed to form CMAS composition and then were mixed homogeneously in a ball mill for 24 hours. The composition that obtained after mixing process were dried in an oven for 12 hours. The obtained powders were sintered at 1100°C, 1150°C, 1200°C for 1 and 5 hours after they were formed using a hydraulic press. The resulting product was characterized using SEM-EDS, density, microhardness test and XRD techniques.

Keywords: CMAS ceramics, hardness, perlite

Giriş

Günümüzde camlar, ihtiyaçların ve teknolojinin gelişmesiyle birlikte, kendilerine birçok yeni kullanım alanları yaratmaktadırlar. Seramikler, metaller ile ametallerin birbirleri ile iyonik veya kovalent bağ yapmasıyla oluşan metal dışı, inorganik malzemelerdir. Mevcut bağ yapıları sayesinde iyi bir kimyasal kararlılığa sahiptirler. Seramikler tipik olarak kırılgandırlar ve çok yüksek erime sıcaklığına sahiptirler. Isıl ve elektriksel iletkenlikleri düşüktür. Bir seramik türü olan cam-seramik malzemeler, kristalleşmeye uygun camların, çekirdeklenme ve kristal büyütme aşamaları sonucu kontrollü kristalleşmesi ile üretilen malzemelerdir. Üretildikleri camlara kıyasla cam-seramikler, çok daha yüksek mekanik mukavemete ve darbe direncine; daha yüksek refrakterliğe ve daha düşük ısıl genleşme katsayısına sahip, çok kristalli yapıdaki malzemelerdir (Öcal, 1997). CMAS ($CaO-MgO-Al_2O_3-SiO_2$) cam, cam seramikleri ve seramikleri birçok farklı hammadde kaynakları kullanılarak üretilmekle birlikte; (kaolen, atık cam, kırmızı çamur, kireç, magnezit atığı, lityum porselen kil atığı, feldspat, uçucu kül, kum, alümina-silika tuğla harcı, wollastonit (Ballıcaoğlu, 2016), Toplan, 2016) vb.) saf oksitlerden de üretilmektedir (Cannaerts, 2009, Augmented, 2014, Hechinger, 2000, Billinghurst, 2010).

Bu çalışmanın amacı; sıcaklık ve aşınma dayanımı yüksek olan CMAS esaslı seramikleri temel hammaddesi perlit olmak üzere çeşitli katkı maddeleri ile üretmek ve üretilen CMAS esaslı seramiklerin yoğunluk, faz, yüzey ve mikroyapı özelliklerini incelemektir. Perlit, alümina silika esaslı doğal volkanik bir camdır. Alümina silikat camları cam geçiş sıcaklığı üzerinde (yaklaşık 808-818°C) ani olarak ısıtıldığında içindeki bir miktar suyun açığa çıkmasıyla genleşme özelliği gösterir. Dünya üzerindeki perlit rezervinin yaklaşık %70'den fazlası Türkiye'de bulunmaktadır. (Gül 2016). Mevcut çalışmada, perlit rezervi açısından zengin topraklara sahip ülkemizde (İzmir Bergama, Kütahya Avdan, Erzincan Mollatepe Madeni, Manisa, Balıkesir, Eskişehir, Çankırı, Ankara, Nevşehir,

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Erzurum, Kars, Bitlis ve Van illerinde perlit rezervleri mevcuttur) bu hammaddeyi katma değeri yüksek ürünlere dönüştürmek hedeflenmiştir. Perlit, alümina, dolomit tozu kullanılarak hazırlanan CMAS P1 kodlu ve perlit, kuvars, olivin, mermer tozu kullanılarak hazırlanan CMAS P2 kodlu seramik tozları, hidrolik pres yardımı ile şekillendirilmiş daha sonra belirli sıcaklık ve sürelerde sinterleme işlemine tabi tutulmuştur. CMAS bileşimindeki ürünler, mükemmel aşınma direnci, kimyasal kararlılık, endüstriyel anlamda aşınma ve korozyon dayanımının gerektiği alanlarda kullanılabilirliği ve ucuz hammadde ve atıklardan üretilebilirliği gözönüne alındığında ekonomik olması ve ayrıca optik ve mekanik özellikler bakımından iyi sonuç verdikleri için endüstriyel olarak tercih edilirler.

Deneysel Çalışmalar

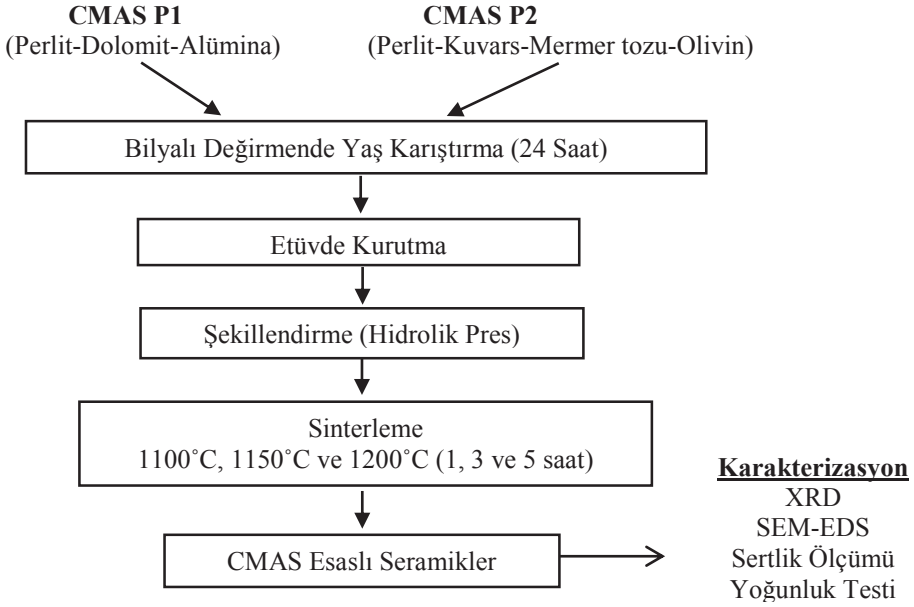
CMAS esaslı seramiklerin üretimi için belirlenen hammaddeler (Tablo 1) tartıldıktan sonra homojen bir karışım sağlamak amacı ile bilyalı değirmende yaş olarak 250 dev/dak hızla 24 saat süreyle karıştırılmıştır. Hazırlanan karışımlar etüvde 100°C'de 24 saat süreyle kurutularak toz haline getirilmiştir. Hazırlanan tozlar 1.5 cm çapında paslanmaz çelik kalıplar kullanılarak hidrolik pres yardımı ile CMAS P1 ve P2 kodlu bileşimler için 3,5 ton basınç uygulanarak şekillendirilmiş ve bu işlemin ardından numuneler 1100˚C,1150˚C ve 1200˚C sıcaklıklarında 1, 3 ve 5 saat sürelerle sinterlenmiştir. Perlit katkılı CMAS seramik üretim akım şeması Şekil 1'de görülmektedir. Sinterleme sonrası numunelerin mikroyapısal incelemeleri JEOL 6060 LV marka taramalı elektron mikroskobu ile faz analizleri ise Rigaku DMAX /2200 marka X-ray difraktometresinde CuKα ışınımı kullanılarak gerçekleştirilmiştir. CMAS-P1 ve CMAS-P2 kodlu 1100, 1150 ve 1200˚C sıcaklıklarda 1 ve 5 saat sinterlenen numunelerin mikrosertlik değerleri; Leica marka mikrosertlik cihazı ile 50 g yük altında 15 s bekleme süresi ile alınan 5 ölçümün ortalaması hesaplanarak Vickers (HV) sertlik değerleri tespit edilmiştir. Mikrosertlik testi öncesi numuneler metalografik yüzey hazırlama işlem kademelerine tabi tutulmuştur. 60-1200'lük SiC zımpara kâğıdı kullanılarak yüzeyler düzgün hale getirildikten sonra alümina pasta yardımıyla parlatılarak hazırlanmıştır. CMAS-P1 ve CMAS-P2 kodlu bileşimlerden hazırlanan numunelerin yoğunluk değerleri Arşimet yöntemi kullanılarak ASTM (c693-93) standardına göre eşitlik 1 yardımıyla hesaplanmıştır.

$$\rho = \frac{w_a}{w_c - w_b} \mathrm{ds} \qquad (1)$$

ρ= numunenin yoğunluğu (g/cm^3),
w_a= numunenin kuru ağırlığı (g),
w_b= sıvı içinde numunenin asılı haldeki ağırlığı (g),
w_c= sıvı emdirilmiş numune ağırlığı (g) ve d_s= sıvı yoğunluğu (g/cm^3)

Tablo 1: CMAS-P1 ve CMAS-P2 kodlu bileşimlerini oluşturan hammaddeler (ağ.%)

Hammaddeler	Perlit	Dolomit	Al_2O_3	Mermer Tozu	Kuvars	Olivin
CMAS-P1	80.98	52.71	2.85	-	-	-
CMAS-P2	34.89	-	-	31.41	30.71	14.3



Şekil 1. CMAS cam-seramik üretim akım şeması

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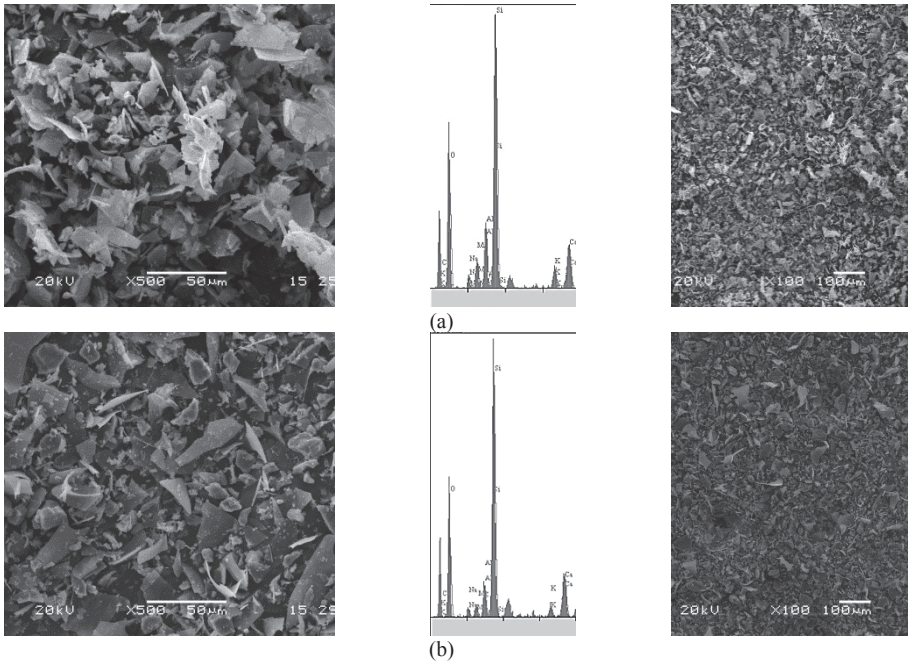
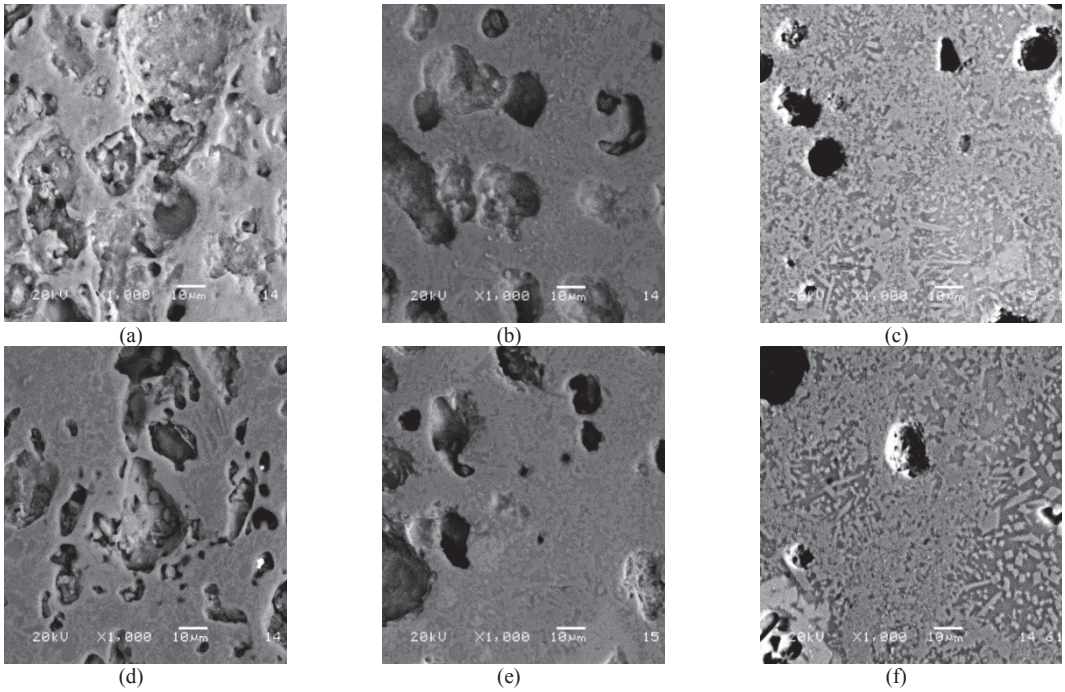
Deneysel Sonuçlar ve İrdeleme

Mikroyapı Analizi

Şekil 2'de üretilen CMAS-P1 ve CMAS-P2 kodlu tozların mikroyapı görüntüsü ve genel EDS analizleri Şekil 3'de CMAS-P1 ve Şekil 4'de CMAS-P2 kodlu numunelerin 1100ºC, 1150ºC ve 1200ºC'de 1 ve 5 saat sinterlenmeleri sonucu oluşan mikroyapı görüntüleri verilmiştir. Bilyalı değirmende karıştırma ve etüvde kurutma sonrası üretilen tozların mikroyapısında perlit tozunun tipik yaprak formu karmaşık yapısı perlitin baskın olarak kullanıldığı CMAS-P1 kodlu numunede gözlenebilmiştir. Hazırlanan her iki bileşim EDS analizinde Si, Al, Ca, Mg ve Oksijen elementini içermekte olup; bu elementler bileşimle paralellik sergilemektedir. Sinterlenmiş mikroyapılarda sıcaklık ve süre arttıkça yapıda porozitenin azaldığı, daha yoğun mikroyapının oluştuğu ve camsı oluşumların varlığı gözlenmiştir.



Şekil 2. a. CMAS-P1 ve CMAS-P2 kodlu tozlara ait mikroyapılar ve genel EDS analizleri



Şekil 3. CMAS-P1 kodlu a. 1100ºC, b. 1150ºC, c. 1200ºC'de 1'er saat ve d. 1100ºC, e. 1150ºC, f. 1200ºC'de 5 saat sinterlenen numunelere ait mikroyapılar

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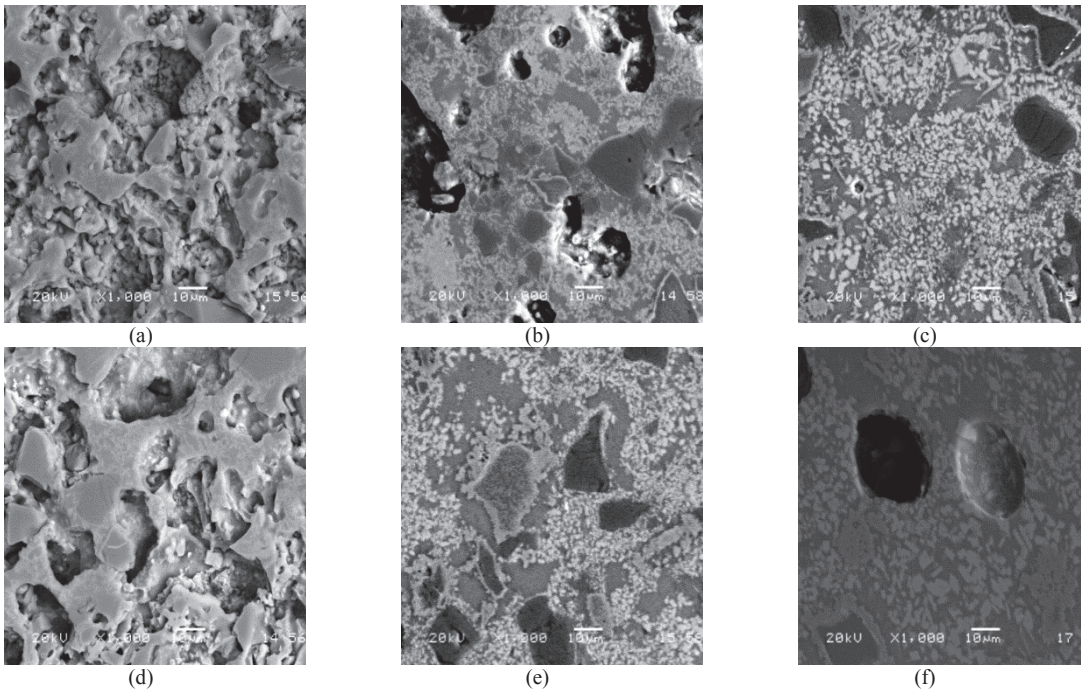
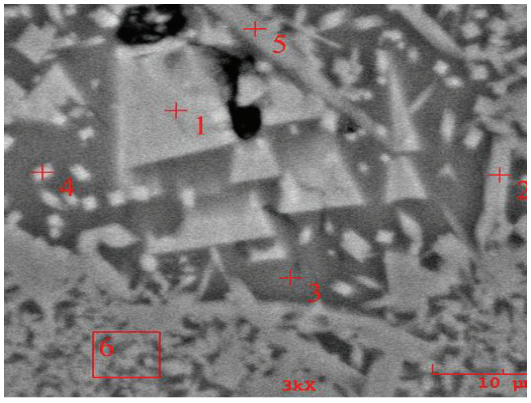
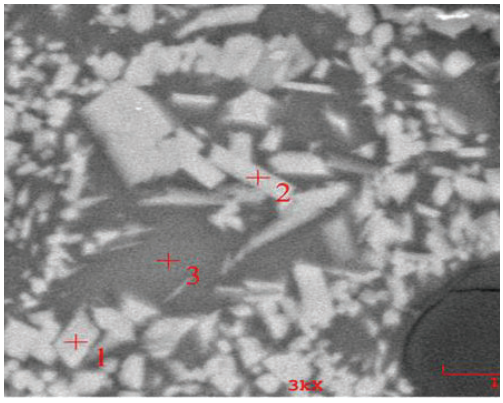


Şekil 4. CMAS-P2 kodlu a. 1100ºC, b. 1150ºC, c. 1200ºC 1'er saat ve d. 1100ºC, e. 1150ºC, f. 1200ºC'de 5'er saat sinterlenen numunelere ait mikroyapılar

Şekil 5'te 1200˚C 1 saat sinterlenen CMAS P1 ve CMAS P2 kodlu numunelerin SEM görüntüsü ve noktasal EDS analizleri görülmektedir. SEM-EDS analizleri değerlendirildiğinde CMAS-P1 kodlu numunenin 1 ve 2 nolu bölgelerindeki çubuksu formdaki oluşumların wollastonit ve diyopsit fazlarına ait olduğu, 3 nolu kısımda en düşük Mg değeri gözlenmiş ve faz analizleri dikkate alındığında bu bölgenin anortit fazına (camsı) ait olduğu belirtilebilir. CMAS-P2 kodlu numunenin 4 nolu bölgesinin magnezyum silikat esaslı olduğu, atom numarası yüksek olan Ca elementini yüksek oranda içeren bölgelerin ise daha açık renkli bir görüntü verdiği belirtilebilir.



(a)



(b)

Elementler		Miktar (%)				
	1	2	3	4	5	6
O	31.068	32.233	34.766	34.346	34.299	30.483
Na	1.961	1.595	4.274	3.023	0.866	1.327
Mg	6.683	6.541	1.121	4.805	8.580	8.786
Al	4.063	10.373	15.986	12.852	5.856	6.739
Si	25.571	32.122	30.452	29.716	31.586	32.708
K	-	3.613	9.514	5.602	2.380	2.935
Ca	30.654	13.523	3.888	9.657	16.433	17.023

(c)

Elementler		Miktar (%)		
	1	2	3	4
O	38.091	37.440	34.334	34.730
Na	-	-	0.960	0.260
Mg	0.892	1.053	1.255	34.882
Al	2,040	1.602	7.892	-
Si	34.588	32.828	41.644	28.517
K	-	-	2.196	-
Ca	24.388	27.075	11.718	0.613
Fe	-	-	-	0.998

(d)

Şekil 5. 1200˚C 1 saat sinterlenen a, c. CMAS P1 ve b, d CMAS P2 kodlu numunelerin SEM görüntüsü- noktasal EDS analizleri

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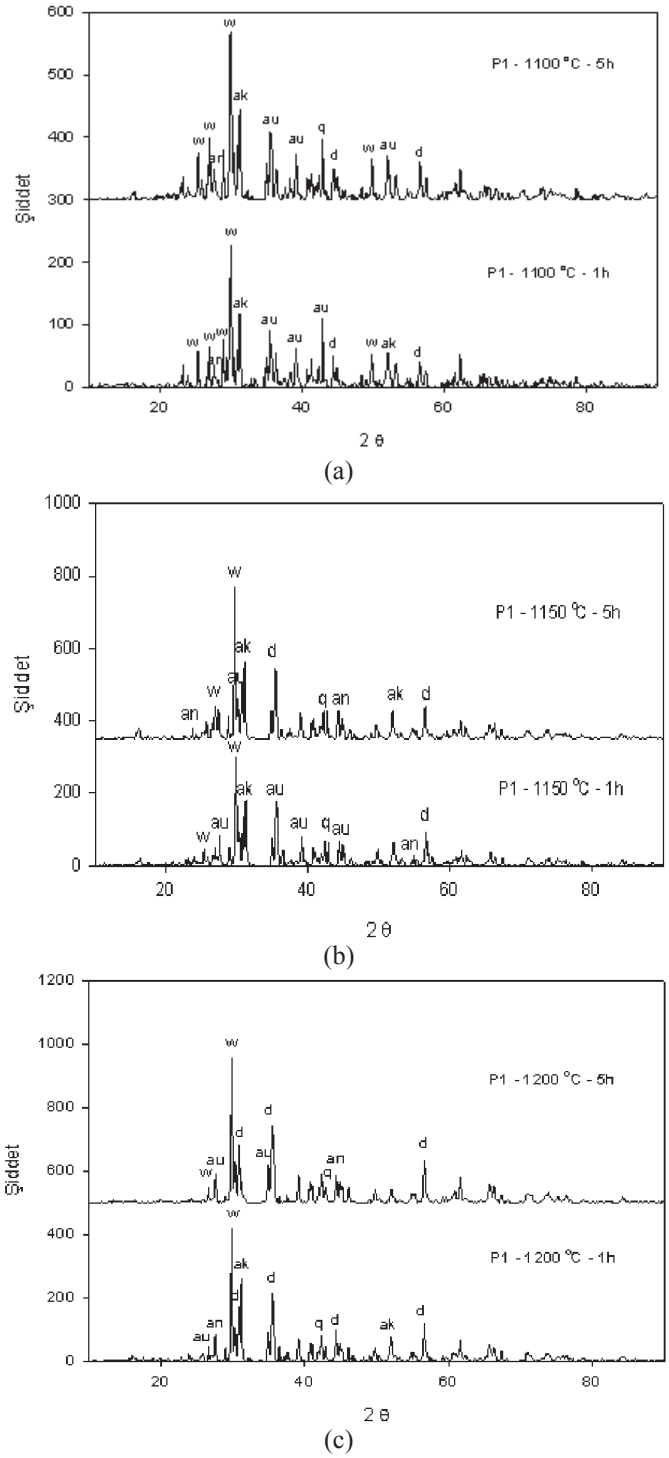
Faz Analizi

CMAS-P1 ve CMAS-P2 kodlu numunelerin 1100°C, 1150°C ve 1200°C'de 1 ve 5 saat sinterlenmesi sonucu oluşan XRD grafikleri Şekil 6 ve 7'de görülmektedir. Sonuçlar incelendiğinde CMAS-P1 cam seramikleri düşük sıcaklıklarda iken yapısında wollastonit ve augit fazlarını bulundururken sıcaklık artışı ile yapısında karakteristik iki fazı olan diyopsit ($CaMgSi_2O_6$) ve anortit ($CaAl_2Si_2O_8$) tespit edilmiştir. Sonuçlar incelendiğinde sıcaklık 1100°C'den 1200°C'ye çıkarıldığında hem wollastonit hem de augit faz şiddetinin azaldığı, süre 1 saatten 5 saate çıkarıldığında ise her iki sıcaklık değerinde anortit ve diyopsit faz şiddetinin arttığı gözlenmiştir. Sonuçlara göre CMAS-P2 cam seramikleri düşük sıcaklıklarda iken yapısında karakteristik iki fazı olan diyopsit ($CaMgSi_2O_6$) ve anortit ($CaAl_2Si_2O_8$) tespit edilmiştir. Sıcaklık ve sürenin artmasıyla birlikte yapıya genel olarak diyopsit fazının hakim olduğu gözlenmiştir.



Şekil 6. CMAS-P1 kodlu numunelere ait a. 1100°C b. 1150°C ve c. 1200°C'de 1 ve 5 saat sinterlenmesi sonrası XRD analizleri

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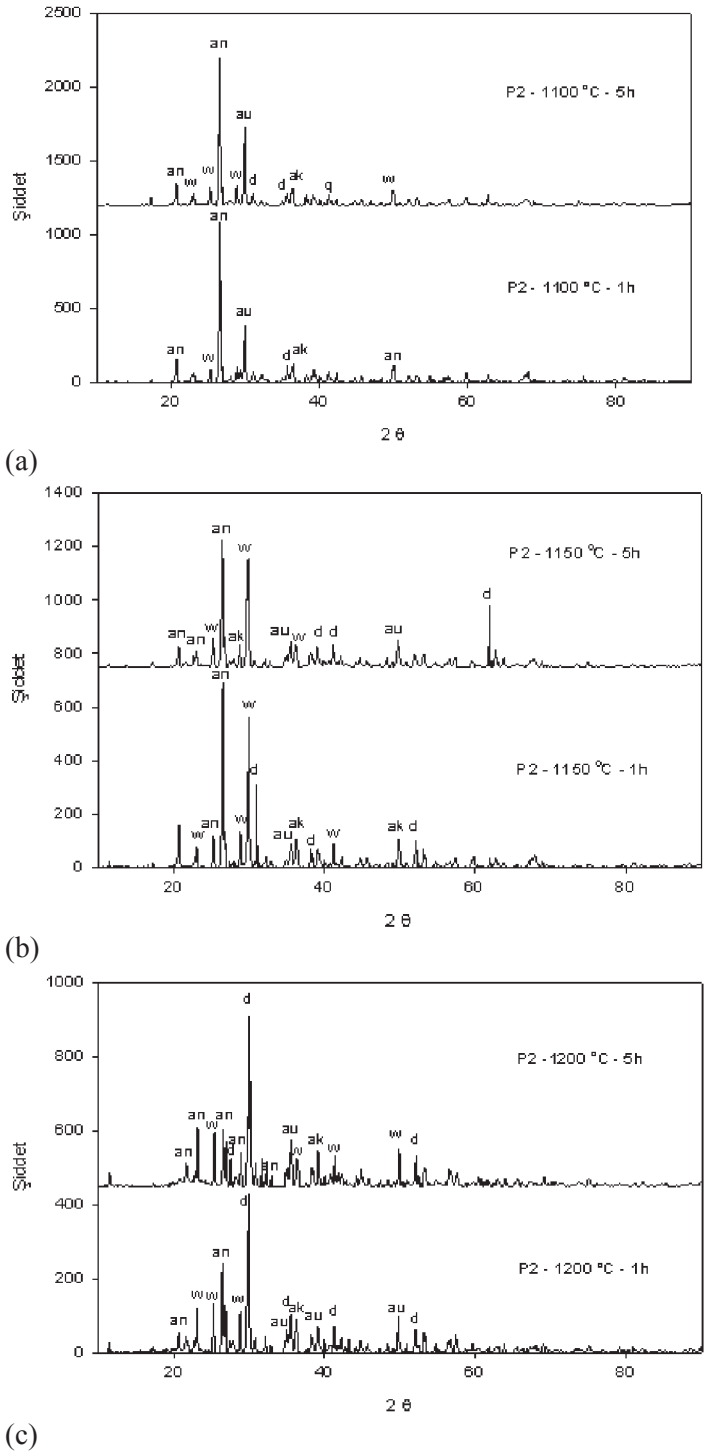

Şekil 7. CMAS-P2 kodlu numunelere ait a. 1100°C b. 1150°C ve c. 1200°C'de 1 ve 5 saat sinterlenmesi sonrası XRD analizleri

Çimento kil tozu, silika kumu, granit ve magnezit başlangıç hammaddelerini kullanarak hazırlanan CMAS esaslı seramik numunelerde 950°C sıcaklıklarda 3 saat süre ile gerçekleştirilen ısıl işlem şartlarında diyopsit, anortit ve wollastonit fazları tespit edilmiştir (Khater, 2010). 700 ve 910°C ısıl işlem koşullarındaki XRD faz analizinde Wollastonit ve anortit fazları tespit edilen bir diğer çalışma, mevcut çalışma ile benzerlik göstermektedir (Yu 2015). Eti Maden Kırka Bor İşletmesi konsantratör ve türev tesisi atıklarının ZrCMS ve CMAS seramik sistemlerinde değerlendirilerek yüksek aşınma dayanımlı firitlerin üretilmesi, sonrasında geliştirilecek firit esaslı sırlarla son dönemde Avrupa'da olduğu gibi ülkemizde de çok popüler hale gelen porselen karo bünyelerin kaplanmasının amaçlandığı diğer bir çalışmada; CMAS sistemi seramiklerin çok yüksek sertliğe ve aşınma direncine sahip olduğunu ve faz analizinde ana kristalin fazın anortit olduğu belirtilmiştir (Karasu 2007). Guo ve

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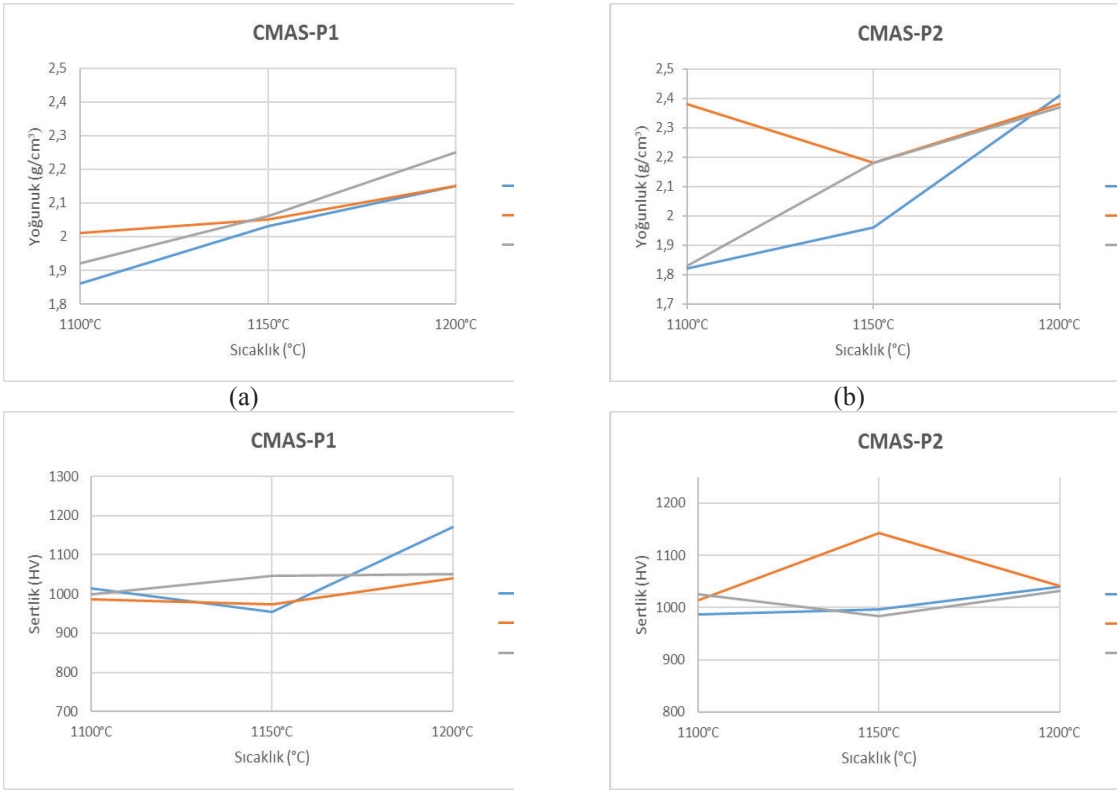
arkadaşları, yaklaşık 1000°C'de 4 saat sinterledikleri CMAS seramiklerinde anortit ve diyopsit fazlarını tespit etmişlerdir (Guo 2014).

Yoğunluk ve Sertlik Testi

Perlit katkılı tabletlerin 1100, 1150 ve 1200°C'de 1, 3 ve 5 saat sinterlenmesi sonucu elde edilen ürünlerin sertlik ve yoğunluk değerleri Şekil 8'de görülmektedir. CMAS-P1 ve CMAS-P2 kodlu seramiklerde sinterleme sıcaklığının artması ile yoğunluk değerlerinde genel olarak artış görülmektedir. Bunun nedeni ise sıcaklık ve sürenin arttırılmasıyla yapıdaki porozitenin azalmasıdır. CMAS-P1 kodlu seramiklerde en yüksek yoğunluk değeri 2.25 gr/cm^3 olarak 1200°C 5 saat sürede, en düşük yoğunluk değeri 1.86 gr/cm^3 olarak 1100°C 1 saat sinterleme işlemi uygulanmış numunede elde edilmiştir. CMAS-P2 kodlu seramiklerde en yüksek yoğunluk değeri 2.41 gr/cm^3 olarak 1200°C 1 saatte, en düşük yoğunluk değeri ise 1.82 gr/cm^3 olarak 1100°C 1 saatlik sürede elde edilmiştir.

Sertlik değerleri incelendiğinde ise CMAS-P1 kodlu numunenin 1100˚C'deki 1 saat için sertlik değeri 1015 HV, 5 saat için sertlik değeri 999 HV iken CMAS-P2 kodlu numunenin 1100˚C'deki 1 saat için sertlik değeri 987 HV, 5 saat için sertlik değeri 1026 HV olarak ölçülmüştür. Aynı süre ve sıcaklıkta sinterlenmiş CMAS-P1 ve CMAS-P2 kodlu numuneler kıyaslandığında iki farklı bileşime ait numuneler için sertlik değerlerinin birbirine yakın olduğu belirtilebilir.



Şekil 8. CMAS-P1 ve CMAS-P2 kodlu numunelerin a,b. yoğunluk-sıcaklık ve c,d. sertlik-sıcaklık değişim grafikleri

Pomza, mermer tozu ve alümina tozları kullanılarak hazırlanan CAS esaslı numunelerde yoğunluk değeri 1200°C 1 saatlik sürede 2.7 g/cm^3, mikrosertlik değeri en yüksek sinterleme sıcaklığı olan 1200°C 1 saatte 647 HV olarak bulunmuştur (Merkit, 2016). Ren ve arkadaşları CMAS esaslı seramikleri CaO, MgO, Al_2O_3 ve SiO_2 başlangıç hammaddelerinden üretmişlerdir. CMAS esaslı bileşimler alümina pota içerisinde 1550°C'de 5 saat ergitildikten sonra ön ısıtılmış 500°C'deki paslanmaz çelik kalıba dökülmüş ardından ön ısıtılmış 650°C deki fırında tavlanmıştır. Isıl işlem şartları 700°C'de 2 saat çekirdeklenme ve 910°C'de 3 saat çekirdeklerin büyümesi için 5°C/dk ısıtma hızı olarak belirlemişlerdir. Hazırlamış oldukları CMAS esaslı numunelerde sertlik değeri 790 HV olarak bulunmuştur. Araştırmacılar CMAS bileşimine Fe_2O_3'ün ağ.%0-10 katkısını inceledikleri çalışmada Fe_2O_3 miktarı %6 oranına kadar sertlik değeri artarken; bu değerin üstüne çıkıldığında ise sertlik değerinin 700 HV'nin altına düştüğünü tespit etmişlerdir (Khater, 2010).

Genel Sonuçlar

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Bu çalışmada perlit, alumina tozu ve dolomit tozu kullanılarak CMAS-P1, perlit, kuvars, olivin ve mermer tozu kullanılarak CMAS-P2 kodlu bileşim tozları hazırlanmıştır. CMAS esaslı tozlar bilyalı değirmende 250 devir/dk hızla yaş olarak karıştırıldıktan sonra tozlar hidrolik presler yardımıyla çelik kalıplarda tabletler halinde şekillendirilmiş ve 1100-1150 ve 1200ºC'lerde 1-5 saat sürelerde sinterlenmiştir. Üretilen numunelerin faz analizleri ve mikroyapısal özellikleri, yoğunluk ve mikrosertlik incelemeleri gerçekleştirilmiştir.

1. Mikroyapılar incelendiğinde aynı sıcaklık ve sürelerde CMAS P1 ve CMAS P2 kodlu seramiklerin daha düşük sıcaklıklarda sinterlenebildiği, 1200°C'deki tüm sinterleme sürelerinde daha yoğun bir yapı dikkat çekmektedir.
2. XRD analizi doğrultusunda CMAS-P1 ve CMAS-P2 kodlu numunelerde wollastonit, anortit ($CaAl_2Si_2O_8$) ve diyopsit ($CaMgSi_2O_6$) fazları tespit edilirken, sıcaklık ve sürenin artışıyla anortit fazı diyopsit fazına dönüşmüştür.
3. CMAS P1 ve CMAS P2 kodlu seramiklerde sinterleme sıcaklığının artması ile yoğunluk değerlerinde genel olarak artış gözlenmiş; CMAS P1 kodlu seramiklerde en yüksek yoğunluk değeri 2.25 gr/cm^3 1200°C 5 saatlik sürede, en düşük yoğunluk değeri 1.86 gr/cm^3 1100°C 1 saatlik sürede elde edilmiştir.
4. Sertlik değerleri incelendiğinde, CMAS P1 kodlu numunenin 1100˚C'deki 1 saat için sertlik değeri 1015 HV, 5 saat için sertlik değeri 999 HV iken; CMAS P2 kodlu numunenin 1100˚C'deki 1 saat için sertlik değeri 987 HV, 5 saat için sertlik değeri 1026 HV olarak ölçülmüştür.
5. Üretim sırasında kullanılan hammaddelerden kaynaklı olarak sertlik değerleri bu hammaddelerle üretim yapılan önceki çalışmalardan daha yüksek sertlik değerleri gösterdiği tespit edilmiştir.
6. Bu çalışmada; üretimi yapılan numunelerde kullanılan perlit hammaddesi çok hafif ve poroziteli bir doğal kayaçtır. Perlit hammaddesi ile ilgili başta Amerika olmak üzere dünya üzerindeki birçok ülke çalışmaya ve perliti geliştirmeye başlamıştır. Türkiye için de perlit kullanımı önemli bir yere sahiptir ve rezerv sahasının 100 milyon ton olduğu düşünülmektedir. Perlitin gelecek için önemli bir hammadde kaynağı olması, kullanım alanlarının çok geniş ve doğal bir kayaç olması, bununla birlikte üretilebilirlik ve ekonomik olması ile de geleceğe yön verebilecek bir kaynak olduğu belirtilebilir.

TEŞEKKÜR

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PLANNING IN HIGHER EDUCATION
The Future of the Faculty of Statistics and Informatics, Universidad Veracruzana, Mexico

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Abstract: A planning exercise was carried out at the Veracruzana University, named after the state of Veracruz, where it is located. The Faculty of Statistics and Informatics of the University was, due to internal distancing among staff, on the verge of dissolution into two separate entities, where neither one would be able to retain faculty status. An intervention was programmed to explore the possibility that the members of the Faculty come up with a unified vision of the institution and thus prevent dissolution. The planning exercise selected was the Reflection and Design Conference (RDC), which is an adaptation of the Search Conference (SC) methodology to the Mexican organizational culture. After an initial period of uncertainty due to conflicting positions of some members of the faculty, a unified and consensual desired future was achieved, and projects were designed upon diverse lines of action with the full participation of faculty members, authorities and students. The intervention proved successful in that members were able to set a path for the Faculty that allowed it to maintain its status. The paper presents a brief summary of the RDC methodology, the process of implementation, and the results achieved by members of the Faculty, with the hope of contributing to the discussion on planning in educational institutional settings.

Keyords: Planning, participative, Reflection and Design Conference, Search Conference

Introduction

The present experience is inserted within processes of profound organizational change, where there is need to remove obstacles to the formulation of effective development plans.

It is natural that power groups form around diverse interests in organizations. They can be legitimate interests, like academic interests, political, social, including union interests if the objective is to improve conditions of its members. However, at some point these interests can come into conflict with the organization and provoke a certain paralysis. The point in time when this occurred in the case of the Faculty of Statistics and Informatics (FEI) of the Universidad Veracruzana (UV, Veracruzan University) was the institutional requirement on the Faculty to elaborate an Institutional Development Plan in order to be allocated funds from the university treasury.

At the Faculty[21] in question there were opposing interests that were retarding the formulation of their Development Plan. An influential academic in the Faculty, with strong leadership and following in the Statistics group, had a different agenda. He would agree to the Institutional Development Plan only if it provided for the separation of Statistics from Informatics, an institutional transformation that could not be accepted by University authorities.

Through a pre-intervention briefing, the attempt was made to convince the academic community of the need to air their differences in an environment of respect and equality, with the aid of outside consultants that would play the role of facilitators of the process. A way to mobilize the academic community around a plan and at the same time trigger an academic renovation that would provoke the creativity and boldness of the staff, the consultants proposed, was the conduction of a Reflection and Design Conference (RDC) (Jiménez, 1987; Jiménez *et al.,* 1997 a, b; Jiménez, 2001), an adaptation of the Search Conference (SC) methodology developed in Tavistock, England. The Conference is an excellent tool that allows groups to converge on common objectives. At the heart of the process lies the socialization among all stakeholders of a common problem, where conflicting interests are invariably exposed, and in the name of a common good, expunged. In fact, the influential academic leader at subsequent meetings, joined colleagues and fully participated in task group work.

The outcome of the Conference was the formulation of 11 specific projects that constitute the main part of the Development Plan. It was agreed that the Faculty's change process would be followed-up with subsequent

[21] The usage of "Faculty" in this paper refers to the disciplinary and administrative distribution that stems from the higher education system that originated in Europe, as opposed to faculty, meaning academic or professorial "staff", in the British and US departmental systems of higher education. Somewhat equivalents in the latter are the "college", or the "school".

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meetings. At the time, there have been two of such meetings that evidence that various projects have advanced in the attainment of their goals.

The paper will present a brief theoretical and methodological background of the RDC, describe the process of its implementation at the FEI, and the positive results obtained. It is worth noting that during the second follow-up meeting, the academic that had previously rejected the realization of the RDC joined the group, as his intention was to lead the group that would formulate the Development Plan. At the end of the second meeting, the community practically demanded that the head of the Faculty form a work team to elaborate the plan, and the discontented academic agreed to participate in the process.

The results obtained up to now in this intervention are very positive. It shows us the efficacy of the RDC insomuch as once it is realized, a follow-up takes place of the subsequent change process, that will allow the members of the community the opportunity to evaluate the progress of their own projects, of providing feedback amongst colleagues in the different work groups, of knowing the opinion of external observers, all in an environment of absolute respect and equality, encouraged by the facilitators.

Theoretical aspects of the intervention method: The Reflection and Design Conference

The method utilized in the event is named Reflection and Design Conference. This resource provides the conditions necessary for a fruitful convergence among organizational systems whose interactions are weak. The method is based on the *Search Conference (SC),* proposed by Fred Emery and Eric Trist in 1958-59 (Emery M., 1993, 1994).

Among types of interventions (Blake and Mouton, 1976), the Search Conference shares the essence of the *confrontational* approach described by these authors. It is an approach that challenges the *status quo,* and asserts that the future can be built by the members of a system. The Search Conference accepts that the individual is able to learn and experiment by himself the processes of participative, strategic planning that will lead the system toward a desired future, designed by the participants.

The Search Conference was conceived as an alternative to planning efforts that had had scarce impact. It is centered on a participative philosophy of planning. Its focus coincides with the assumption that centralized planning, promoted from "the top", inhibits the creativity of the people involved, that is, of those that are responsible for carrying out actions, and reduces their level of commitment and identification with drawn plans: "…the Search Conference works adequately in the generation of commitments and therefore improves the possibilities of implementation." (Crombie, 1984, p.2).

The Search Conference is a useful instrument especially in turbulent environments such as those in which organizations are currently immersed (Emery, F. and Trist, 1965; Schon, 1971; Ackoff, 1974; Emery, M., 1994), as when it is conducted, planning takes place in a viable and adaptive way "…it provides a "social" space where reflection and design can take place in an environment free of self-imposed restrictions" (Jiménez, 1987, p. 1).

In their effort to import the virtues of a method of this nature, the strategic planning research group at the Department of Mathematical Modeling of Social Systems of the Institute for Research in Applied Mathematics and Systems, after experimenting on a number of occasions, saw the need to effect some adaptations at an operating level to the original method of the SC, to be applied successfully in the Mexican organizational context. Out of this effort, emerges the Reflection and Design Conference, a modality of the SC that preserves the basic principles that make it a robust group method (Rodríguez, 1998), of which the following are the most important:

- Provide a platform so that the processes of reflection and design can take place with the most liberty possible, and in a spatial-temporal mosaic as broad as considered by participants.
- Guarantee a broad participation of the involved in a complex problematic situation, creating a democratic environment.
- Encourage an environment of trust and respect so that people, which attend as individuals and not as representatives of the groups they belong to, put forth their opinions even when these are antagonistic.
- Encourage both the design of desirable futures as well as the joint effort for their achievement.
- Promote the social learning that will increase the ability to self-organize, adapt and plan.

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The RDC emphasizes the importance of the two principal moments of the method: the **reflection** on the problematic and the **design** of courses of action to overcome it. It is a procedure that propitiates the adequate conditions to propose solutions to complex problems, where the participation of those involved constitutes a fundamental element. It is based on the premise that the future can be modified by the intervention of those interested. There is no single future, there are various possible. The name of the game consists of achieving one that is desired and agreed by all.

It takes advantage both of the experience and the knowledge of the participants to enrich with their creative ideas the formulation of action in the short, medium and long terms. In addition, it facilitates a coming together among members of different sectors, creating an environment of collaboration. It allows participants to complement their vision with that of others, achieving an understanding of the problematic in a different way, generating new options, and creating the possibility of greater cohesion among them.

The RDC structures group work, stimulates participation, organizes the generation of creative ideas, and facilitates the convergence toward the realization of concrete actions and the establishment of commitments oriented toward a common ideal. The method has the delicate but necessary purpose of opening new paths and stimulating creativity without usurping the role of the members' respective organizations. These types of events are designed to provoke substantial changes, thus their effects are appreciated in the mid and long term. They are not conceived as isolated events, but as the beginning of a continuous effort of periodic evaluation-modification of the course of action agreed upon.

In synthesis, the method implies the task of jointly designing the desired future and needed actions to reach it, instead of being passively "overrun" by a future that is to be avoided.

It is a horizontal event. All participants' opinions have the same value. As group work consists in the building of a desired future and the means to reach it, no one is able to consider himself "expert" in those tasks.

With the aim of having participants feel free to expand their field of alternatives, they attend the event as individuals interested in overcoming the problematique in question, not as representatives of the organizations where they work.

The facilitators of the Conference do not intervene in the generation of the "substance". Their role is to help propitiate an environment of trust, learning, mutual respect and collaboration, and ensure that the rules established in the work dynamic are observed.

Methodology

The RDC consists of five stages (See Figure 1). In the first, participants explore in depth the contextual conditions under which the system has functioned in the past, how it performs in the present, and how it will perform in the future if nothing is done to modify the current situation. In the second stage, attendants reflect upon the manner in which the system performs in the present, and how it has arrived at such a situation. The third stage consists of an exercise in creative design. Participants work, free of self-imposed restrictions, in the bold design of the system's ideal future, within a time frame of 5 to 10 years. The idea is to configurate a system that responds to the needs and desires of all involved. In the fourth stage, participants return to the present and reflect on current and future obstacles and opportunities that obstaculize or facilitate the attainment of the future defined in the previous stage. In the fifth stage, participants propose courses of action to approximate the desired future and, depending on their degree of involvement, in a final sixth stage, they commit to work on those courses identified as of high priority.

Participants are organized in groups of 10 to 12 persons each which will work in parallel during the first four stages, holding plenary sessions at the end of each stage, to share their points of view. In the fifth stage new groups are formed according to each participant's personal interest, to work on the design of a priority course of action. At the end of this stage, a plenary session is held where the specific designs developed by the new groups are presented. Each one of the initial groups is aided by a process facilitator, whose role is to ensure that the rules of the method are observed rigorously.

As only the attendants participate in the elaboration of the content of the topics, they experience full authorship of the ideas and assume total responsibility over them. Since the results belong to all, it is probable that they establish commitments toward them, and elaborate on activities that will lead to drawn objectives.

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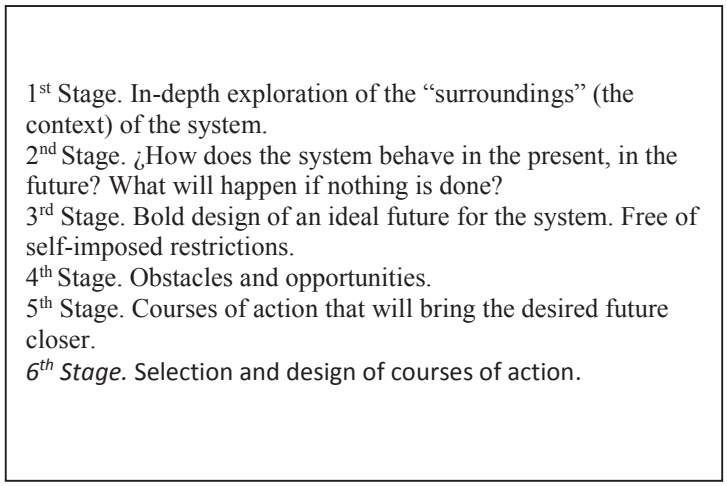
The RDC is a method immersed in a process of intervention; in consequence it requires careful pre-planning and post-implementation of the courses of action drawn. To omit this point is to provoke deceit and frustration among participants.

An RDC requires previous preparation and careful planning, since it is not an isolated event. Generally, it produces conditions for change that needs preparation, and sets the ground for the starting-off of processes of improvement in the long-term.

To take advantage of the impulse that this type of events provides to change processes, it is necessary to count on the participation and support of authorities from beginning to end. It is only so that the achievements obtained can be capitalized on to confront and channel change.



Figue 1. Stages of an RDC.

Need to follow-up on the RDC

The RDC is designed to provide members of a planning community the basic elements to liberate themselves from self-imposed restrictions, overcome current obstacles that seem insuperable and detect opportunities that had until then gone unnoticed. It is an exercise that, through a correct management, allows the community itself to plan its own future and establish procedures and mechanisms to reach it. The result of the RDC is not a plan designed by consultants, it is an exercise conducted by the community itself with the aid of a group of facilitators. As Merrilyn Emery (1994) asserts, its objective is not the plan in itself, but the creation of the ***planning community***. In the past, this maxim had been followed with rigor. No subsequent follow-up was implemented by the consultant. The consulting team acted exclusively as facilitator of a process of dialogue whose end was to plan the future, and retired once the community had designed its plan, which took place in a period of 2 to 3 days of intense collective work. If there was some "follow-up", this took place only informally, with no established commitment. The RDC, as the SC (Emery, 1994), is a process immersed in another that is broader that includes preparatory planning, the event itself, and the implementation of the resulting plans. The planning community must know from the start, that the presence of the facilitator ends with the RDC's conclusions. In the moment that this occurs, the planning community must continue the process on its own, following the assumption that the community learned to plan and implement formulated plans.

However, in the Mexican organizational environment, throughout the years the research group at IIMAS, as was said before, has felt the need to adapt the SC method, designed in the developed world and thought for its own idiosyncrasy, to certain aspects that are unique to local culture. Thus the change that took place even in the name of the method itself, which now reflects more truthfully local sentiments: a process of deep **reflection**, first, followed by a **design** stage. **Conference** denotes lecture, and **search** tends to be associated more to some esoteric activity that has scarce relation to the most immediate environment of "developing" countries. In addition, the

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Conference has undergone other changes that have to do with a more immediate reality of the local environment. The most recent innovating proposal, still in a testing stage, revolves around the need to monitor the evolution of the planning community that emerges with the completion of the RDC, through follow-up visits throughout a period of two years, and spaced between themselves by periods of three to four months.

The intervention: The "warming up" process

The formulation of the School's Development Plan was being confronted with obstacles to its elaboration. A group of the teaching staff was opposed to the fact that the Plan was led by the head of the Faculty, and wanted to have control over its implementation. On the other hand, it was imperative that such a Plan was carried out by virtue of the fact that the support by the University's presidency was granted based on such a plan in each academic unit.

The Faculty's administrative body made contact with the IIMAS, knowing that the group utilizes regularly the RDC to start-off participative strategic planning processes, with the aim of having the group disseminate the method throughout the university community via a meeting with professors and students. The attendance to the meeting was a bit scarce due to a degree of rejection to the administration's initiative. However, the procedure raised interest among those attending.

In order to familiarize a greater number of academics with the concept of the RDC, a new presentation was programmed. The intention was convince the academic body that the realization of a RDC would be beneficial as a prior step to the formulation of a Development Plan. On this occasion, the format of the presentation was changed, and it was turned into a dialogue among colleagues in search of alternatives for the advancement of the Faculty. The attendance was much more numerous than on the prior meeting, and at the end of the presentation it was agreed to carry out the RDC almost unanimously.

Part of the problem of the Faculty resides in the fact that two differing disciplinary careers are imparted in it, and the academic personnel is assigned to one career or the other, with some exceptions. However, as there is affinity between the disciplines, it is possible to propose joint projects that aid in the promotion of the Faculty as a whole.

On the other hand, as was mentioned earlier, the opposition of one of the professors, leader of one of the disciplines, to carry out the reflection and design exercise, was known beforehand. This opposition, however, gradually became diluted as it was observed that the personnel in general became associated to a concrete project, and that it advanced in the attainment of its goals.

Results of the RDC

To fulfill the objectives described in the five different stages of the work method, the participants were divided in three groups. At the end of each stage a plenary session was carried out where each group shared results achieved with the other groups.

In the last stage, in line with the methodology, new groups were organized around the courses of action that the participants considered priority. The final plenary session consisted in the presentation of the projects elaborated by the new groups.

In what follows, a synthesis of the projects formulated by the participants is presented, preceded by a shared vision of the desired future.

The desired future

It is in this stage where one of the most cherished results of the RDC is obtained. It is here where the attempt is made to plan a bold and ambitious future for the Faculty, free of restrictions. The most relevant points on the future of the Faculty were obtained, in which both students and professors made a commitment toward an improvement of the activities that are established within the Faculty. The vision of that shared future is the following:

> We are a Faculty leader in the formation of professionals in both disciplines, with a staff of professors immersed and committed in the process of teaching-learning and in the research and personal development that complements the formation of students with leadership and with a high demand in the labor market. Our students have an adequate formation, are motivated and have vocation in the careers that are imparted. They are students that are more linked to society, have more real practice and there are lower indices of desertion and failure. They are of high academic level. The professors, on their part, encourage innovating projects that are actually

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projected into practice, where students and professors converge. They also have a high academic level, with adequate profiles, are integrated, committed, with capacity and vocation and apply innovating methods of teaching.

The design of the projects

In the following, the courses of action or projects designed by the new work teams aiming to approximate the collectively drawn desired future are shown:

Group 1. *To implement a program that stimulates, foments and regulates the work of the academic bodies (remedial courses, departmental exams).*

Group 2. *Establish a program to link the Faculty with productive sectors that allows the realization of professional practices, social and employment service (client and supplier registries, training of consultants).*

Group 3. *To develop a permanent labor, lecturing and disciplinary training program in compliance with the MEIF (Integral and Flexible Educational Model) and the new technologies.*

Group 4. *To implement a program that promotes, stimulates and regulates the work of academic bodies, disciplinary groups and existing lines of generation and application of knowledge.*

Group 5. *To elaborate a plan that tends to the needs of academic personnel..*

Group 6. *Creation of a program for the promotion of knowledge (identification and dissemination of current competences and interests).*

Group 7. *Establish an integral program for the improvement of infrastructure (Mixed Committee for Improvements).*

Group 8. *Establish graduate programs, Ms and PhDs, as well as technically-oriented Bachelor's, in accordance with the requirements of the labor market.*

Grupo 9. *Academically link Statistics with Informatics and with other Faculties.*

Grupo 10. *To develop a student's admissions program that is coherent with the MEIF and with the entrance profile of the Informatics and Statistics study programs.*

Grupo 11. *Development of a program for the (soft) incorporation of Statistics to the MEIF.*

Follow-up interventions

There were two follow-up meetings at 4 and 8 months since the RDC. The format that was followed in both consisted of allowing all of the groups to present their advances and provide comments concerning support or obstacles that they had encountered during the development of thier tasks, the changes that they had had to implement in their original goals, and in come cases, the need to rename their course of action in order to better express its nature.

Through this process, it was possible to enroll the participation of the totality of the attendants, who were able to clarify doubts concerning some points, but above all, it was possible to witness the will of all the groups to support each other, contributing with ideas and information to bring projects to good terms.

First follow-up meeting

After the presentations on advances, which took place in the morning, an intense feedback session followed in which many ideas and recommendations emerged. It was suggested that the projects should consider the role of Faculty and university authorities, which should go beyond the sole creation of the colleges, and verify that they conduct activities for which they were created, observing their normative and operational frameworks. The need to establish guidelines that guarantee congruence and convergence in the work of these collegiate bodies was also recommended. The elaboration of a Teacher's Development Program that would explain the need for training based on the Faculty's Development Project was suggested to one group, and that it should be considered as a

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fundamental part of the change effort. It was also suggested that they incorporate all the training needs of the other projects, offer open courses with recovery fees, and the resources obtained be used to implement new courses.

Another group was asked to incorporate Statistics professors in the analysis. New staff implies new activities, evolution of the curricula, new projects, new profiles, etc. In addition, they were asked to elaborate the Staff Growth Program that explains the need to hire new personnel with a profile that is congruent with the educational model, related to the Faculty's development program. The work group on infrastructure was asked to define clearly an integral program for the improvement of the infrastructure that sees to academic needs. The group was also asked to elaborate an integral diagnostics of the library: technical services, collection, furniture, normative framework, security instruments, satisfaction levels of library users, etc. Finally, they were asked that policies on waste, acquisitions, substitutions, etc., be made public. In other words, they were asked to socialize the library project.

Of foremost importance, participants agreed:

- that all formal applications to the different university units should be conducted by the corresponding authority figure, and

- to present the projects to the university president, as part of a Faculty development strategy.

Second follow-up meeting

The same format was followed for this meeting, although the order of presentation was inverted with the aim providing a more adequate space to the academic which was being incorporated for the first time. This individual, which had exercised a certain pressure to nullify the RDC, intended now to collaborate with the rest of the group. In light of the results that had been achieved so far, he reverted on his decision to maintain himself away from the exercise and joined the rest of his colleagues.

The individual was included in group 11, which was the first to make its presentation, under the title *Development of a program for the (soft) incorporation of Statistics to the MEIF,* which is a government-mandated model with which all the career programs must comply. The reason he was invited to this Project is because the incorporation of Statistics to the MEIF was very delayed, partly because of this professor's opposition. Additionally, being a professor of Statistics and a leader of that group, it was very stimulating that he would now assume responsibility to advance the project.

The general recommendations that came out of this second meeting were:

- To strengthen the activity of the projects incorporating more students, either as an integral part of their course matter, through elaboration of theses or fulfillment of the social service requirement.

- To invite those professors which were not in any of the groups to participate in the projects.

- Identify meeting hours that are compatible with the majority. For example, early in the mornings before classes, or at break times ("active" lunch).

- The formal *Development Plan* is being implemented through the projects that are being conducted and begin to fructify. We believe that it is time to elaborate the document that formalizes the *PLADEA* (Development Plan) in accordance with the corresponding instructions.

Of these, the last is the most important: ***comply with the requirement to formulate the Institutional Development Plan without further delay.*** It was the appropriate time to formalize the existence of a development plan through its formulation, following the guidelines indicated by the university presidency, now that resistance to its materialization had been diminished. The Plan would be constituted by the projects in process, in addition to other elements that could be considered for inclusion.

Conclusions

This experience showed the capability of the Reflection and Design Conference to bring about a rapid convergence of points of view in face of a complex problem, like the one here presented. The difference in results obtained in an RDC with respect to those that could be obtained with different methods is notable. Normally in a traditional event, a series of papers are presented that are previously elaborated with no consensus behind them. In an RDC,

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the results are the product of the active participation of all attendants, which go through a gradual process of convergence and collective learning.

The RDC method is effective as a catalyzer of continual planning efforts. Subsequent actions, which are analyzed during the follow-up events, are irrefutable proof of results achieved in an intervention of this nature. Even though, as was expected, the Institutional Development Plan did not emerge during the exercise, the need for its existence and the will to give it a concrete form did. A good part of the Plan was in effect formulated during the RDC and its subsequent meetings.

With respect to the results achieved in the event, a clear vision of the important changes that the Faculty must face to improve the quality of its academic and administrative performance was reached, and with emphasis on the national demand for greater scientific and technological development. Above all, the need to implement such changes toward the inside of the institution were made evident, with the finality of preventing excisions or fractures that damage the capability of the Faculty to confront not only the challenge of academic excellence, but the challenge of survival in an environment that is extremely competitive and demanding such as the one that higher education presents in the country.

Even though the efficacy of the RDC to initiate processes of far-reaching change is recognized, it is necessary, and this does not always occur, to conduct a longitudinal follow-up of the implementation of the plans. This was done in the case that is being reported here and the results were very positive. Based on this experience, from this point on the RDC will be conducted only if the agreement with client organizations includes the follow-up of the process. That is, if it included several follow-up meetings, conducted in the course of at least one year.

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POTENTIAL USAGE OF SOME OF THE GROUND-COVER VEGETATION FOR ECOSYSTEM RESTORATION IN CENTRAL ANATOLIAN REGION OF TURKEY

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Abstract: Long-term animal grazing and agricultural practices have disturbed the vegetation cover and rendered the sites prone to erosion in Central Anatolia Region of Turkey. Plantation practices have been carried out for about six decades in the region. However, tree-oriented plantation practices have not shown promising results. Thus, experimental data gathered in the region using new approaches with different plant species are urgently needed by the practitioners. The aim of the current study is to evaluate potential usage of some of the ground-cover species for ecosystem restoration in the region.

Seeds of fifteen local species were collected during extensive field surveys during summer and early fall of 2012 and 2013. Five sites scattered on the basin were chosen as experimental blocks. The area covers the driest part of the region with less than 300 mm annual precipitation and $11C^0$ average temperature. Soil texture for the first-20-cm soil depth in the experimental units ranges from clay to sandy clay loam with a high lime content. In October 2012, April 2013, October 2013 and April 2014 seeds of these fifteen species were sown on three 40 cm x 600-cm beds and covered manually.

In the spring and summer of 2013 and 2014, sites were visited, and field emergence rates and seedling growth were recorded for each species. *Atriplex hortensis (*L.), *Peganum harmala (*L.), *Glaucium corniculatum* (L.), *Marrubium parviflorum (*Fisch.&C.A.Mey.), *Onobrychis tournefortii* ((Willd.) Desv.), *Reseda lutea (*L.), *Stachys cretica (*L.), *Teucrium polium (*L.) and *Vicia cappodicica (*Boiss. & Bal.) appear to be the most promising ground-cover species for ecosystem restoration in the region.

Keywords: Aridland, restoration, Turkey, ground-cover

Acknowledgements

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PREFABRİKE YAPILAR: TEK KATLI MAFSALLI BİRLEŞİMLERİN YARI MAFSAL HALE GETİRİLMESİ

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ÖZET
Alttan ankastre üstten mafsallı betonarme prefabrike yapılarda kolonların konsol davranışı etkisi nedeniyle çok büyük öteleme problemleriyle karşılaşılmaktadır. 2007 Deprem yönetmeliği öncesinde Taşıyıcı sistem davranış katsayısı R=5 iken, 2007 Deprem yönetmeliğinde alttan ankastre üstten mafsallı betonarme prefabrike yapıların taşıyıcı sistem davranış katsayısı R=3 olarak verilmiştir. Bu değişiklik deprem yükünde 5/3 oranında artış demektir. Bu çalışmada tek katlı farklı yüksekliklere sahip 1 ve 4 açıklıklı çerçeveler incelenmiştir. Bu çerçevelerin mafsallı bağlantıları çelik profillerle farklı ölçülerde güçlendirilmiştir. Burada kullanılan profil bağlantıları mafsallı düşünülerek, profil elemanlar çekme ve basınç kuvveti etkisindedirler. Mevcut durum ile güçlendirme sonrası durumlardaki rijitlik değişimleri çıkarılmıştır. Bu tarz güçlendirme sistemi mevcut prefabrik yapıların güçlendirilmesine bir alternatif olmasının yanı sıra yeni yapılacak prefabrike yapılarda da benzeri uygulamalarla daha ekonomik çözümler sunabilir.
Anahtar Kelimeler: taşıyıcı sistem davranış katsayısı, konsol, mafsal

GİRİŞ

Alttan ankastre üstten mafsallı tek katlı betonarme prefabrike yapılar ülkemizde birçok alanda kullanılmaktadır (Arslan ve diğ., 2008; Bayülke, 19899). Bu yapıların tercih edilmesinde maliyet ve hız avantajları oldukça önemlidir. Çelik yapılara göre %20-30 civarında maliyet avantajı, yerinde dökme betonarme yapılara göre hız avantajları vardır. Bu yapıların bu avantajlarının yanı sıra deprem performansı açısından çeşitli dezavantajları vardır. Sistemin hiper statiklik derecesinin düşük olması, kolon diplerinin plastikleşmesiyle mekanizma durumuna gelmesine sebep olmaktadır. Ters sarkaç tipi bu yapılar deprem kuvvetlerini maksimum seviyede deplasmana çeviren ve yeterli önlem alınmadığında hasara sebebiyet veren davranışa sahiptirler (Ersoy ve diğ., 1993; Paulay & Priestley, 1992; Karadoğan, Yüksel & İlki, 1997).

PREFABRİKE BETONARME BİNALAR İÇİN DEĞİŞEN TDY2007 KOŞULLARI

Afet Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik (2007), prefabrike yapılarla ilgili aşağıdaki değişiklikler yapılmıştır.

Deprem yüklerinin tamamının üstteki bağlantılarının mafsallı olduğu tek katlı binalarda taşıyıcı sistem davranış katsayısı 1998 yönetmeliğinde 5 iken 2007 yönetmeliğinde 3 olarak alınması gerektiği bildirilmiştir. 2007

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yönetmeliğine göre bu tür tek katlı binaların içinde, planda binanın oturma alanının %25'inden fazla olmamak kaydı ile, kısmi tek bir ara kat yapılabilir. 1998 yönetmeliğinde ise kısmi arak at ile ilgili bir koşul verilmemiştir.

Göreli kat ötelemelerinin sınırlandırılmasında 1998 yönetmeliğinde $(\Delta_i)_{max}/h_i \leq 0.0035$ şartı varken, 2007 yönetmeliğinde sadece $(\Delta_i)_{max}/h_i \leq 0.02 / R$ şartı söz konusudur. Bu durumda söz konusu üstten mafsallı tek katlı binalar için 2007 yönetmeliği yatay deplasman sınırını %90 arttırmıştır. Betonarme taşıyıcı sistem elemanlarında S420'den daha yüksek dayanımlı olmayan donate çeliği için deneysel olarak bulunan ortalama kopama dayanımı, yine deneysel olarak bulunan ortalama akma dayanımının 1.15 katından daha az olmayacaktır. 1998 yönetmeliğinde bu katsayı 1,25 olarak alınmaktaydı.

Kaynaklı olarak yapılan mafsallı bağlantılar, depremden oluşacak bağlantı kuvvetlerinin en az 2 katını, diğer mafsallı bağlantılar ise en az 1.5 katını taşıyacak dayanıma sahip olacaklardır. 1998 deprem yönetmeliğinde bu katsayılar sırasıyla 1.5 ve 1.2 olarak verilmişti. Ayrıca birleşim hesaplarında emniyet gerilmeleri en fazla %15 arttırılabilir.

GEÇMİŞ DEPREMLERDE PREFABRİKE YAPILARDA RASTLANAN YIKIM TÜRLERİ

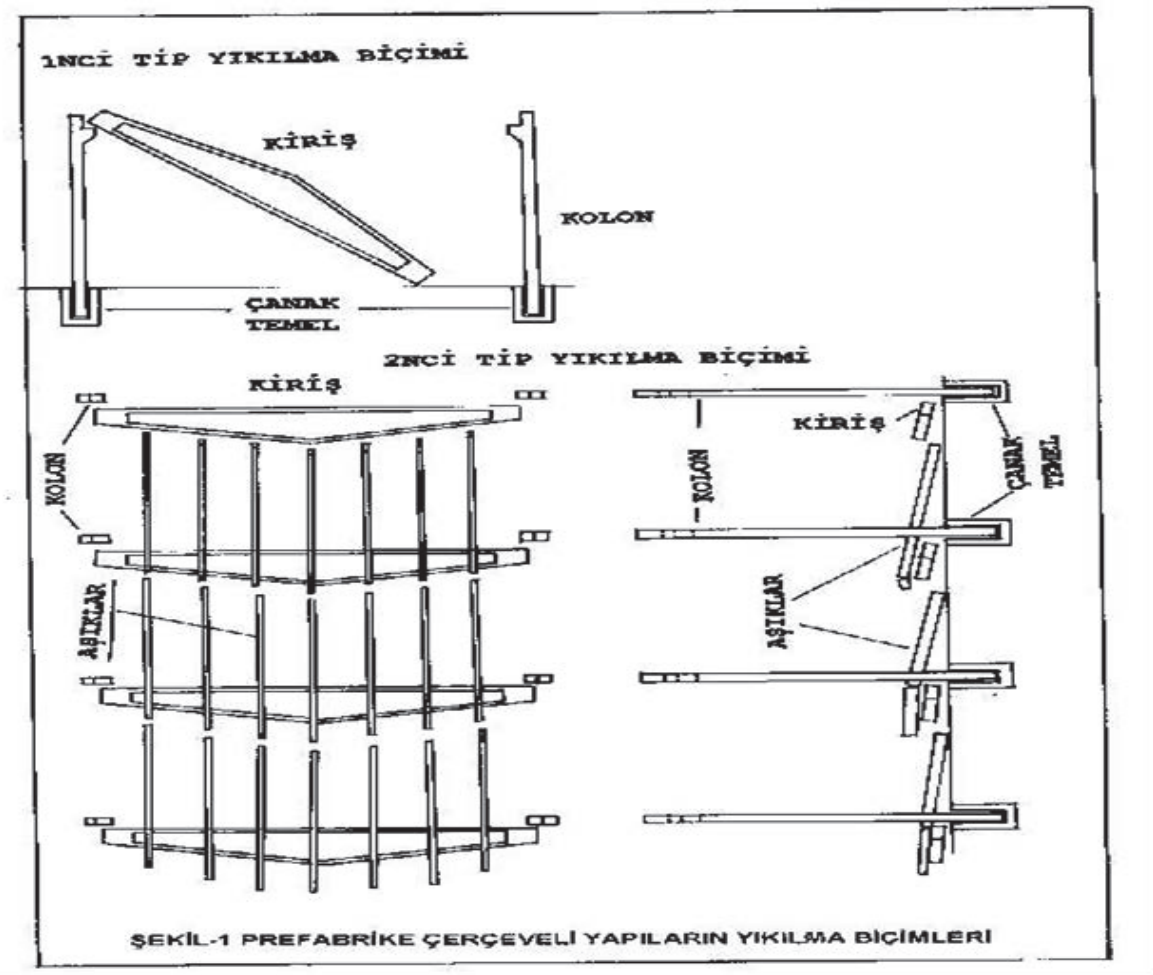
Geçmiş depremlerde alttan ankastre üstten mafsallı betonarme prefabrike yapılarda iki tür yıkıma rastlandı

1-Kirişler mesnetlerinden yanlamasına devrilerek yere düşmeleriyle oluşan yıkımlar

2-Kirişler uçlarından kırılarak uzunlamasına yönde bir uçlarındaki mesnetten düşmesiyle oluşan yıkımlar (Şekil-1).

Depremde gözlenen bir diğer önemli hasar çerçeve kolonlarının alt uçlarına yakın yerlerde betonda eğilme çatlaklarıdır. Bu hasar kolonların alt uçlarında elastik moment taşıma gücünün aşıldığının göstergesidir.

Şekil 1. GÜÇLENDİRME ÖNERİSİ



ŞEKİL-1 PREFABRİKE ÇERÇEVELİ YAPILARIN YIKILMA BİÇİMLERİ

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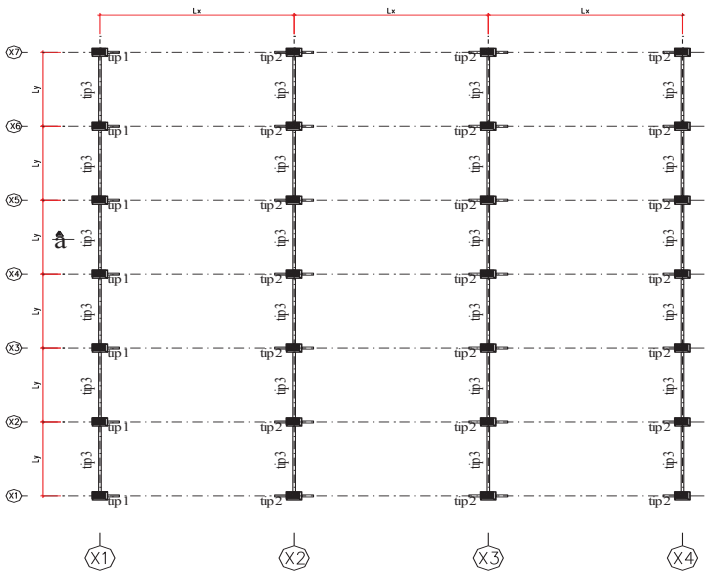
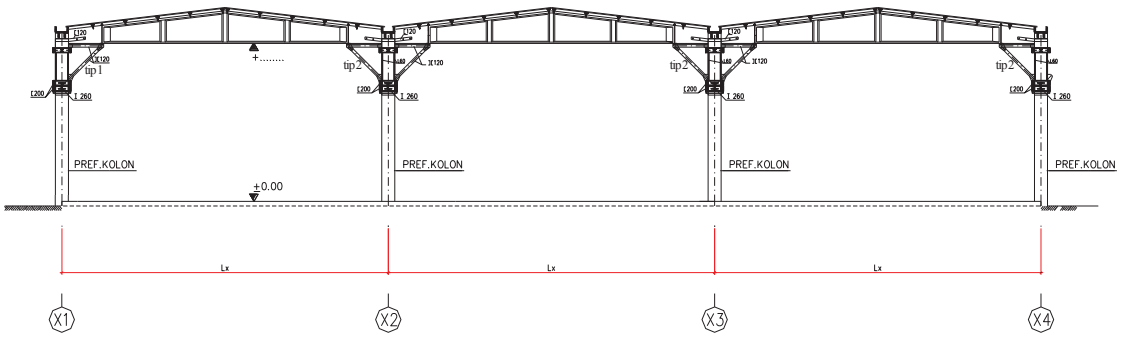
Şekil 2, Şekil 3, Şekil 4 de önerilen güçlendirme önerisinde sistemin üstteki bağlantılarında kullanılan çelik profiller, sistemi üstten mafsallı halden yarı mafsallı hale getirmektedir. Burada kullanılacak çelik profillerden makaslara aktarılacak yükler dolayısıyla oluşacak kesme kuvveti ve eğilme momentleri kiriş kapasitelerini aşmamıştır. SAP2000 sonlu elemanlar programı kullanılarak yapılan çözümlerde sistemde yanal ötelemelerin önlenebileceği görülmüştür.



PLAN

Şekil 2



X-X YONU

Şekil 3

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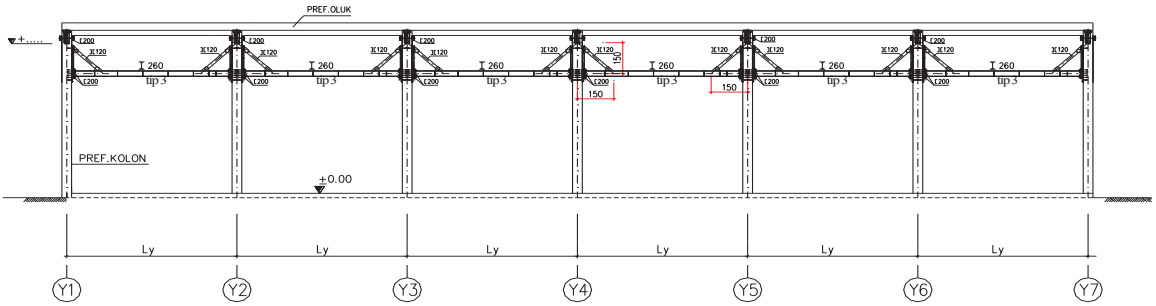
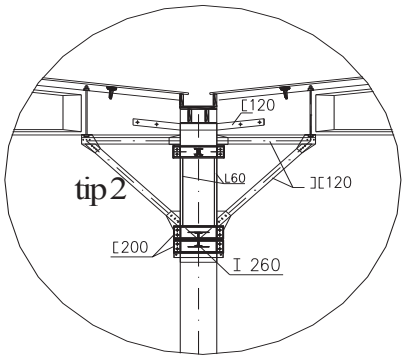


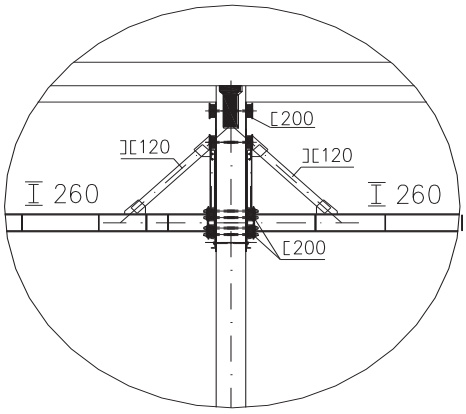
Y-Y YONU

Şekil 4



CERCEVE YONUNDE GUCLENDIRME

Şekil 5



Y–Y YONUNDE GUCLENDIRME

Şekil 6

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SONUÇ VE ÖNERİLER

Joint	OutputCase	CaseType	U1	U2	U3	R1
Text	Text	Text	m	m	m	Radians
34	DEPREMEX	LinStatic	0.014305	0.000036	1.018E-17	
34	DEPREMEY	LinStatic	-0.000003072	0.014744	1.579E-17	

Güçlendirilmemiş Durum için Ötelemeler

Joint	OutputCase	CaseType	U1	U2	U3	R1
Text	Text	Text	m	m	m	Radians
34	DEPREMEX	LinStatic	0.003653	0.000007126	-0.000001245	
34	DEPREMEY	LinStatic	-0.000000565	0.003815	1.579E-17	

Güçlendirilmiş Durum için Ötelemeler: Yukardaki SAP2000 programından elde edilen sonuçlardan, yapılan güçlendirmenin aynı yatay yükler için ötelemeleri azaltarak yatay rijitlik artışını sağladığı görülmüştür. Bu sistem mevcut sistemlerin iyileştirilmesinin dışında yeni yapılacak prefabrike yapılarda da kullanılarak daha ekonomik çözümler sağlanabilir.

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PRODUCTION OF FLAME RETARDANT WOOD COMPOSITES BY USING HUNTITE AND HYDROMAGNESITE

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Abstract: In this study, it is aimed to provide resistance to fire as seen the biggest obstacle to the wood that until 60-70 years of our lives in the almost forgotten today, even though it is frequently used in every aspect both as building material requirements of wood with furniture that we use in all areas of daily life, decorative items, in front of which is related to the use of the kitchen tools or for decoration. In this study, inorganic Turkish huntite and hydromagnesite mineral was used as an additive flame retardant material during the production of wood composite. Primarily for the production of composite material, the mineral was crushed and ground. Mineralogical structure was determined by XRF, XRD and SEM-EDS devices. Thermal behavior was observed by DTA-TG apparatus. UL-94 test apparatus was used to determine flame retardant properties of the wood composites. In the preparation of the composites, changing of the mineral additive rate was considered. In this way the additive amount dependence of fireproof composite was observed to evaluate the optimum amount of mineral.

Keywords: Wood, Composites, Flame retardant, UL-94.

Introduction

A porous, fibrous, and anisotropic material, wood is a versatile composite material containing cellulose, hemicellulose and lignin. Although it is one of the most important structural materials, it is almost forgotten in all kind of industries nowadays because of mainly its flammable property. In fact wood is an environmentally-friendly natural material and has many good properties such as good damping characteristics, thermal insulation, relatively low price and low specific gravity. In addition, wood can gain higher hardness, better weather resistance, abrasion resistance and higher strength by modification (Shah et al., 2017).

Porosity is another serious drawback of wood. The pores can interact with water due to the presence of hydrophilic groups present on its surface. Moreover the porous geometry provides channels for the flow of liquids and this which causes increased activity of microorganism in the presence of high moisture content and affects the dimensional stability of wood structures. Nevertheless, this may be converted to an advantage as the pores can be filled with the different functional materials (Shah et al, 2017; Leslaw, 2016).

The modification of wood is a topic that needs further investigations. Mostly modifications have been applied to the surface of the natural wood. This modified wood is effectively protected against degradation, has a higher life span and better mechanical properties compared to natural wood. Such as, a protective coating made of carnauba wax particles and zinc oxide was developed for the protection from both water and ultraviolet radiation (Lozhechnikova et al, 2017). In another investigation, hierarchical titania structures were constructed on wood followed by modification with perfluorodecyltriethoxysilane to produce a hydrophobic surface. Furthermore, a composite coating of titania/silica was also produced by hydrothermal process for the protection of wood (Liu et al, 2015). Shah et al. presented another method to render superhydrophobic properties to the wood (Shah et al., 2017).

In this study instead of modification of a natural wood, a wood composite was produced. This can be called engineered wood and includes a range of derivative wood products which are manufactured by binding or fixing the strands, particles, fibers, or boards of wood, together with adhesives, or other methods of fixation to form composite materials. Those products are used in a variety of applications, from home construction to commercial buildings to industrial products. They are engineered to precise design specifications which are tested to meet national or international standards (Oliveira, A.K.F. & d'Almeida, J.R.M., 2014).

Particle board is one of the engineering wood. It is manufactured from wood chips, sawmill shavings, or even sawdust, and a synthetic resin or other suitable binder, which is pressed and extruded. (Figure 1). Oriented strand board, also known as flakeboard, waferboard, or chipboard, is similar but uses machined wood flakes offering

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more strength. Particle board is cheaper, denser and more uniform than conventional wood and plywood and is substituted for them when cost is more important than strength and appearance (Taramian et al, 2007).

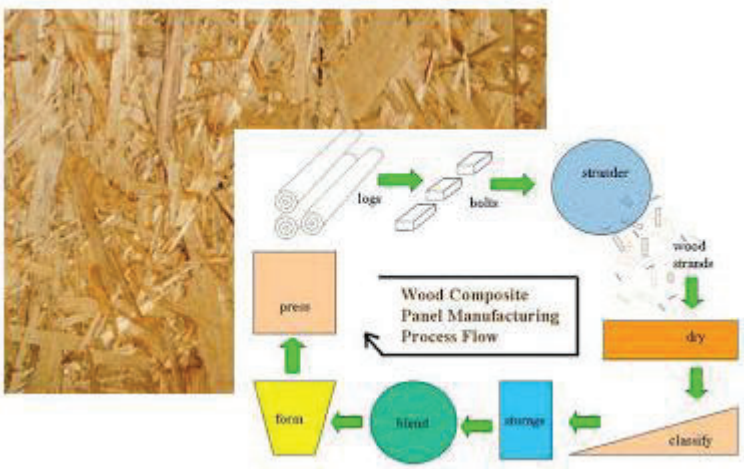

Figure 1. Particle board and munufacturing steps

As mentioned above that particle board are produced by using wood chips, sawmill shavings, or even sawdust. This is in fact an extremely important recycling process. The waste recycling covers several areas of interest such as environmental, engineering, economic and social and this is an important way to ensure sustainability in the world (Moreno, & Saron, 2017; Ng et al, 2014). The wood still is a material of expressive consumption for structural utilization for confection of furnishings, homes, buildings, among others. Packaging and pallets are also important products generated from timber industry. In Europe, around 20% of all sawnwood consumption is used for wooden pallets and packaging, while in Catalonia, northwest of Spain, 85% of the sawnwood is used to manufacture pallets. Conifers species such as pine are the main raw material for manufacture of the pallets (García-Durañona et al, 2016). The use of the pine presents an import environmental advantage due to their source from reforestation. The pine pallets are continuously submitted to high mechanical stress during use that of course lead to the usual break of the structural parts, disabling the entire pallet and generating pine waste wood (Moreno, & Saron, 2017).

A recycled wood composite was manufactured in this study by using huntite and hydromagnesite mineral additives to gain flame retardant property. The term flame retardant subsumes a diverse group of materials which are added to the materials, such as plastics and textiles, and surface finishes and coatings. Flame retardants inhibit or delay the spread of fire by suppressing the chemical or physical reactions in the flame or by the formation of a protective layer on the surface of a material. They may be mixed with the base material (additive flame retardants) or chemically bonded to it (reactive flame retardants) (Haurie et al, 2006; Le Bras et al, 2005). Both Reactive and Additive Flame retardant types can be further separated into several different classes, however two main categories can be seen as following; halogenated and halogen-free flame retardants. Halogen containing flame retardants act in the gas phase and contribute to incompletely burned substances like black smoke and toxic CO which is a highly toxic and nonirritating gas. As CO blocks the oxygen transport of the blood, it can disturb the respiration process immediately. Even though traditional solutions based on halogens have some advantages like low loadings and good retention of mechanical properties, they have also disadvantages compared to mineral flame retardants. Halogen free flame retardants are mostly inorganic fillers used to impart flame retardancy. Most used ones are alum, antimony trioxide, borax, chalk, magnesium oxide or silica. These fillers are usually cheap and in many cases help to improve the mechanical properties and surface appearance of the fabricated article (Kulshreshtha, 2002; Yılmaz Atay & Çelik, 2010).

Huntite and hydromagnesite mineral, one of the flame retardant mineral, has been used as an additive in the production of polymer composites to achieve incombustible property due to its inflammability property. The deposit normally consists of physical blends of two minerals huntite and hydromagnesite with varying ratios in between 40 and 30% huntite and 60 and 70% hydromagnesite The level of impurities is very low, the most important ones are other white carbonate minerals such as aragonite, calcite, and dolomite. Physical densities of huntite ($Mg3Ca(CO3)4$) and hydromagnesite ($Mg4(OH)2(CO3)3.3H2O$) minerals are 2.70 g/cm3 and 2.24 g/cm3, respectively (Yılmaz Atay & Çelik, 2010) . Although this mineral is said to be relatively new as it has entered into the market in 1980s, there are numbers of studies can be seen regarding huntite and hydromagnesite mineral used

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in polymer composites. However, there are no such studies related with the usage in wood composites.

This study investigated flame retardant behaviors of inorganic mineral huntite and hydromagnesite in wood composites. Primarily for the production of composite material, the mineral was crushed and ground. Mineralogical structure was determined by XRF, XRD and SEM-EDS devices. Thermal behavior was observed by DTA-TG apparatus. Flame retardant property of the wood composites was evaluated by UL-94 test. In the preparation of wood composites, the mineral was added to be used as additives during the production of wood materials. The samples were obtained by changing the mineral additive rate.

Materials and Methods

Fabrication of Composite Materials

The material is received from Isparta region in Turkey. Crushing and grinding steps were performed in Muğla Sıtkı Koçman University Department of Mining Engineering. Grinding was repeated in İzmir Katip Çelebi University Materials Science and Engineering Department with a ball mill to get finer particle size. Mixed and a well representative sample was drawn in each case for detail characterization and beneficiation studies.

Flame retardant wood composites were prepared by reinforcing mineral powders at different ratios into the sawdust. After well-mixing the determined amount of powders and sawdust, each mixtures were moulded under 3 tons of pressure using by a molding machine for preparation of the specimens. Each specimen has 10 mm diameter. Obtained samples and their descriptions are shown in Table 1.

Table 1. Sample codes and descriptions

Sample code	Huntite and Hydromagnesite amount in the mixture (%)
W00H	0
W20H	20
W25H	25
W30H	30
W35H	35
W40H	40
W45H	45
W50H	50
W55H	55
W60H	60

Characterization

A laser diffraction machine from Malvern Instruments, Mastersizer 2000 was used to obtain the particle size distribution of huntite hydromagnesite mineral powders. The thermal behaviors of hydromagnesite and huntite mineral and obtained composite materials were evaluated to observe decomposition and phase formation at a heating rate of 10 ^{0}C/min in the temperature range of 25–700 ^{0}C under air atmosphere by using DTA/TG machine Perkin Elmer. XRF studies were carried out for the identification of mineral phases present with an X-Ray Diffractometer (Amatek Spectro IQII) X-ray diffractometer in İzmir İnstitute of Technology. XRD analysis was performed on a Bruker D2 Phaser system with Ni-filtered Cu-K alpha radiation (k = 1.54 Å). SEM micrographs and EDS analysis were taken with Qanta Feg 250 SEM device with 3 kV accelerating voltage. Flame retardancy tests of the composites were performed by UL 94 technique with the machine of ZLT-ZYS Needle-Flame Tester. The material is conducted to the flame in a specific angle and distance. Extinguishing time of the flame and dripping ability are measured. Set-up of the experiment is shown in Figure 2.

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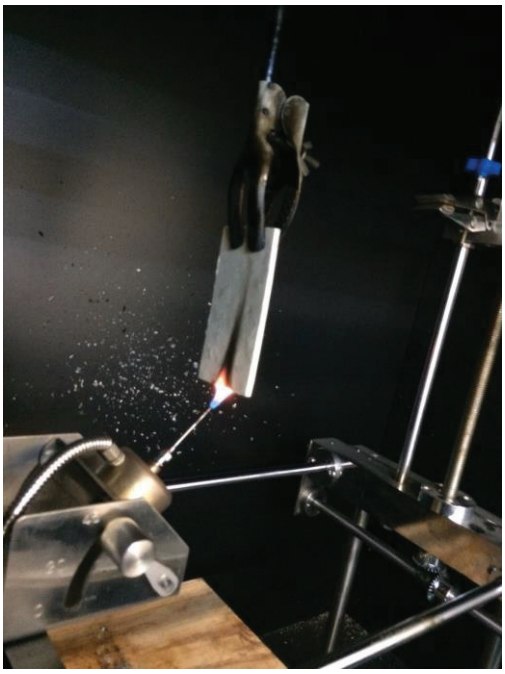

Figure 2. UL-94 flame retardant test experiment.

Results and Discussion

According to X-ray Fluorescence Spectrometry the chemical analysis of the mineral powder is as following; 53.32% Mg, 7.43% Ca, 0.53 Mn, 0.2 Al, 0.2 Ba, 0.1 Fe and 88.42% MgO, 10.4% CaO, 0.4 Al2O3, 0.07 MnO, 0.15 Fe2O3, 0.2 Ba. This results support XRD analysis and also literature information regarding chemical formula of huntite and hydromagnesite and impurities (Kirschbaum, 2001).

To determine the particle size Mastersizer 2000 the size distribution analysis is performed. The size distribution of the three particle sizes is shown in Figure 3. According to this analysis it can be said that mineral particle size is apprx. 10 µ.

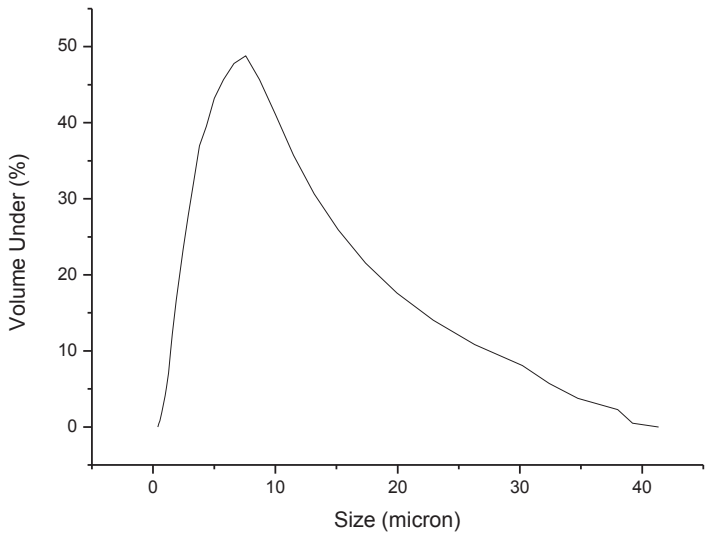

Figure 3. Size distribution of the mineral.

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XRD analysis of the received material is shown in Figure 4. It is found from this result that the basic minerals are hydromagnesite (Mg(CO3)3.3H2O) and huntite (Mg3Ca(CO3)). Magnesite exists as the main impurity in the ore. And the other impurities can be counted dolomite and calcite. The main phases with high intensity are huntite and hydromagnesite. XRD analysis result promotes literature information which stated that the impurities magnesite, aragonite, and calcite phases are accompanying with huntite and hydromagnesite (Kirschbaum, 2001).

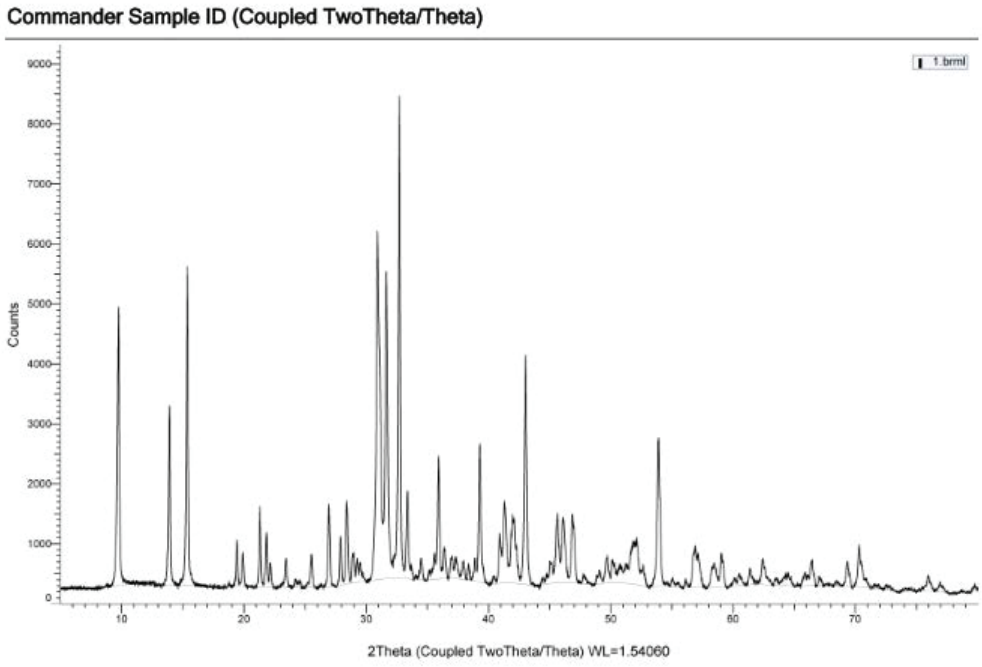

Figure 4. XRD analysis of the as-received material

Figure 5 demonstrates SEM micrographs and EDS analysis of huntite hydromagnesite mineral particles are shown in Figure 6. It is clearly seen from that the mineral particles are not circular but they are lateral with irregular shapes. EDS analysis supports XRD result as in the elemental analysis the elements of Mg, Ca, C, and O were indicated. There seem no any other elements as impurities.

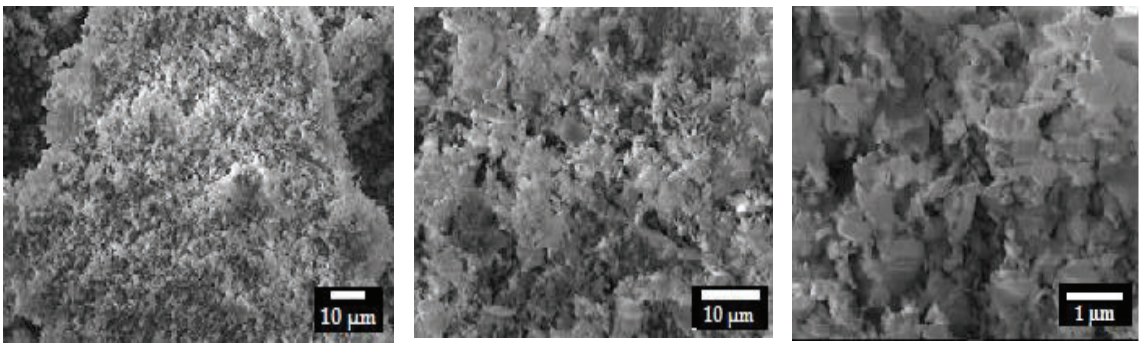

Figure 5. SEM micrographs of huntite and hydromagnesite

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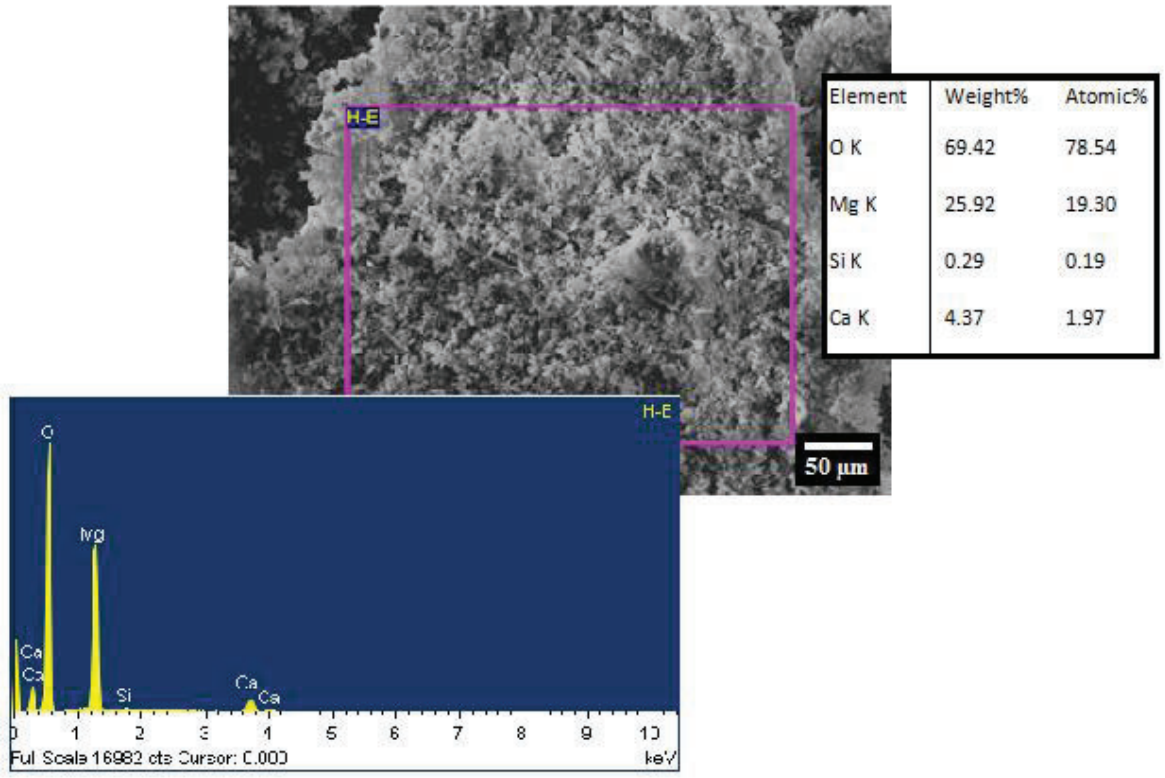

Figure 6. EDS analysis of huntite and hydromagnesite

For the flame retardant property exothermic and endothermic reactions are important, thus DTA-TG analysis are carried out to huntite hydromagnesite mineral (Figure 7). This analysis was performed by heating up at the rate of 10 ºC/min at temperatures between 25ºC and 600ºC under air. Huntite and hydromagnesite have $Mg_3Ca(CO_3)_4$ and $Mg_4(OH)_2(CO_3)_3.3H_2O$ chemical formulas, respectively. Decomposition occurred in these minerals at temperatures between 25ºC and 600ºC. The first thermal phenomenon starts at 219.86ºC and ends at 331.89ºC and then heat absorption is -3,61 J, corresponding to removal of water and OH groups. After removal of water from hydromagnesite, $Mg_4(CO_3)_3$ decomposes to MgO and CO_2. It is estimated that the decomposition of $Mg_4(CO_3)_3$ occurs at temperatures between 376.29ºC and 490,76ºC This is the second thermal behaviour and heat absorbed at -5,49 J. It is difficult to separately state decomposition phenomena of the individual components of huntite hydromagnesite because it is a mixture of $Mg_4(OH)_2(CO_3)_3.3H_2O$ and $Mg_3Ca(CO_3)_4$. Finally the third thermal effect starts at 503.94ºC and ends at 598.29ºC. In this case, heat absorption is -1,43 J. MgO and CaO are formed by the end of this process. According to Equations 1 and 2, $Mg_4(OH)_2(CO_3)_3.3H_2O$ and $Mg_3Ca(CO_3)_4$ starts to decompose at high temperatures.

$$Mg_4(CO_3)_3(OH)_2.3H_2O \rightarrow 4MgO + 3CO_2+4H_2O \quad (1)$$

$$Mg_3Ca(CO_3)_4 \rightarrow 3MgO + CaO + 4CO_2 \quad (2)$$

By comparing TGA analysis was to evaluate thermal stabilities of huntite/hydromagnesite mineral. It can be seen from Figure 4b that the decomposition of huntite hydromagnesite mineral occurs at temperatures between 400 ºC and 500 ºC. The weight losses were resulted at those intervals, it is indicated that weight losses of huntite hydromagnesite mineral was estimated 56 wt.%.

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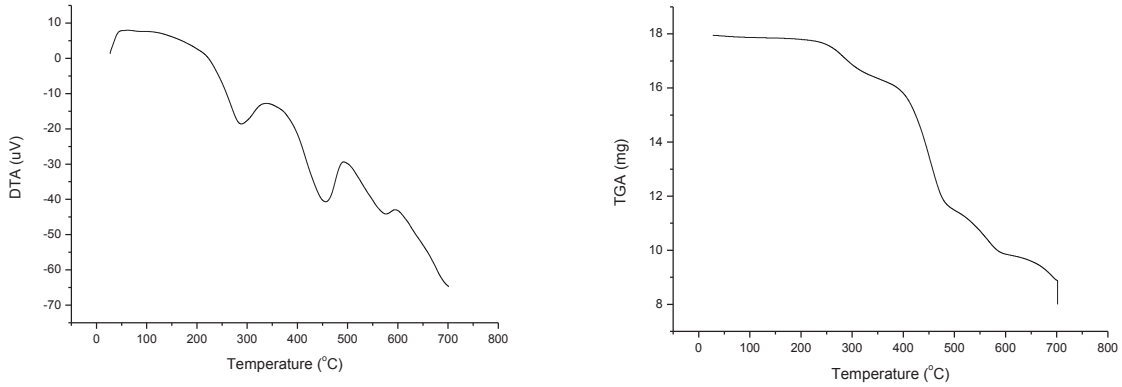

Figure 7. DTA and TGA curves of huntite hydromagnesite mineral.

Figure 8 and Figure 9 demonstrate SEM and EDS analysis of huntite hydromagnesite reinforced wood composites. In SEM micrographs cellulose fiber structures can be seen easly. They possess irregular shapes. Huntite hydromagnesite mineral particles of 10 micron size were seen in W60H sample. EDS analysis proved XRD and XRF result because C, O Mg, Al, Si and Ca elements were observed and there is any other element as impurities. It was found that by adding mineral particles denser composite structure was obtained.

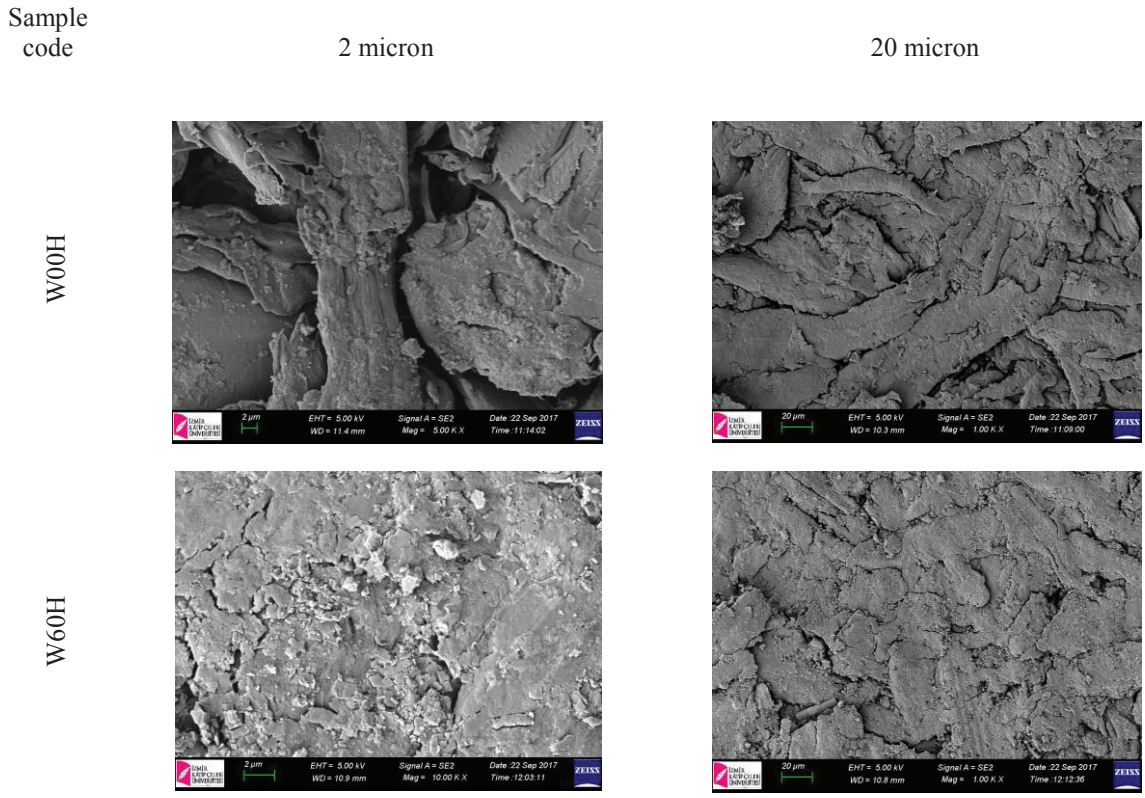

Figure 8. SEM analysis of samples of W00H and W60H

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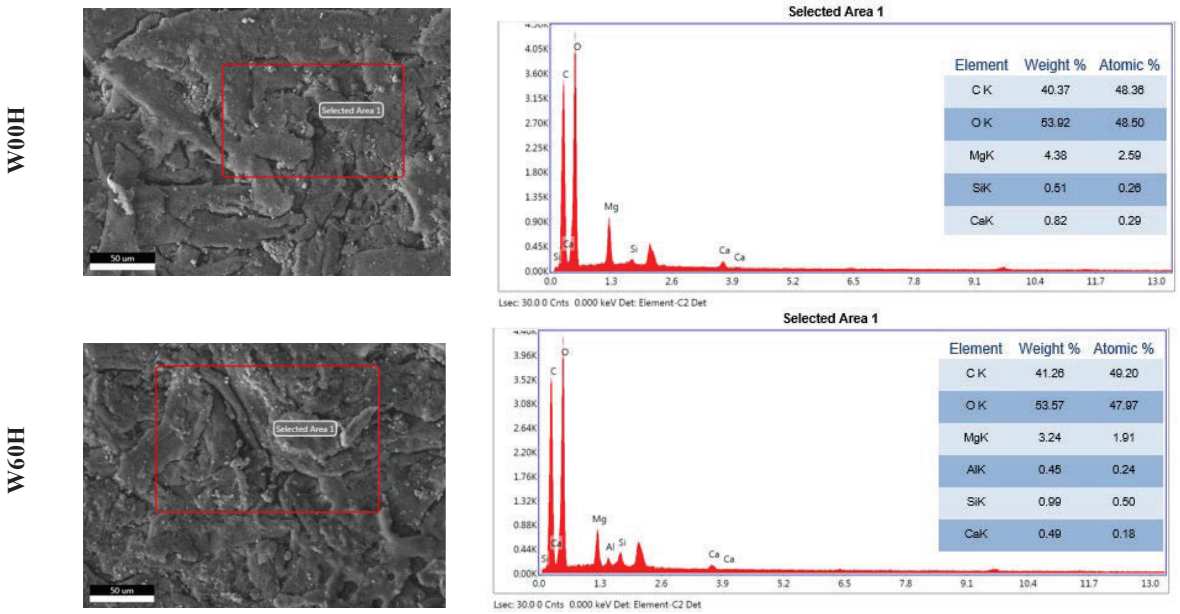

Figure 9. EDS analysis of samples of W00H and W60H

Table 2 depicts flame retardant test results. According to UL94 test, the results demonstrate the degree of flame retardant property of huntite hydromagnesite reinforced wood composite materials as a function of particle content. In between 0-45% content there was not indicated any flame retardant property, thus those samples can be defined as flammable. However, starting with 50% of mineral additive (W50H), the material became flame retardant as the flame was extinguished before 30 s according to the UL-94 standard. It can be easily seen that increasing the mineral filler amount improves the flame retardant property of the composite.

In our previous studies huntite and hydromagnesite minerals were investigated for the flame retardant property especially in polymeric composites; such as electrical cable applications, cable trays, window panels, polymeric flame retardant coatings etc (Yılmaz Atay & Çelik, 2013). In this study it is tested in wood composites and not surprisingly it was observed that the mineral was worked as flame retardant filler, too. The mechanism was similar as huntite hydromagnesite mineral undergoes an endothermic decomposition with water and carbon dioxide. By using this mineral in the wood materials, it will help to increase safety in virtually every wooden area of human existence. Therefore, this forgotten material in all kind of industries can get back its importance which it lost due to its flammable property.

Table 2. UL-94 test results of wood composite samples.

Sample Code	Flame applying time	Burning time	Result
W00H	10	30	Out of spec.
W20H	10	0	
	10	30	Out of spec.
W25H	10	30	Out of spec.
W30H	10	0	
	10	30	Out of spec.
W35H	10	30	Out of spec.
W40H	10	0	
	10	30	Out of spec.
W45H	10	30	Out of spec.

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W50H	10sn	0sn	
	10sn	0sn	
	30sn	25sn	O.K.
W55H	10sn	0sn	
	10sn	0sn	
	30sn	24sn	O.K.
W60H	10sn	0sn	
	10sn	0sn	
	30sn	7sn	O.K.

Conclusion

Fighting fires depends on directly fire precautions and is directly related to the use of non-combustible material. Even if the fire started, flame retardants help to extinguish in the early stages of fire and prevent the dispersion of the flame. The flame retardant behavior of Turkish huntite hydromagnesite mineral in wood composite was investigated in this study. Wood composite was formed by using auxiliary mineral flame retardant additive introduced into the combustible product. It was found somewhat more effective by UL-94 flame retardant test. Thereby, it was depicted that by using the mineral reinforced wood composite, wood can get back its importance which it lost due to its flammable property. It was observed that increasing the loading amount of the additive increases the flame retardant property of the composite. For the further investigations mechanical behavior needs to be tested. Moreover, if different particle size of the minerals is used, it would be possible to obtain improved flame retardant properties. Therefore, to obtain the best performance, it is required to consider optimum mineral amount and the particle size. On the other hand, additive amount can be evaluated according to use conditions of wood composite; such as, where the composite will be used, what kind of load it will be applied, to what kind of environment it will be in, and so forth.

Acknowledgements

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PRODUCTION OF HEMICELLULOSE BASED BIODEGRADABLE GEL FILM FROM TEA PULP (I)

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In this study, hemicelluloses (HC) based natural gel film were synthesized with free radical polymerization using tea pulp. The effects of HC/crosslinker ratio, HC/chitosan ratio and HC/redox initiator ratio on the characteristic properties of the synthesized gel films were determined. Prior to using the tea pulp was dried and sieved to obtain the -100 mesh fraction. The fraction of the tea pulp characterized with conventional analytical methods (chemical and proximate analysis) and instrumental analysis methods such as FTIR, TGA, BET. The HC was obtained applying the alkaline extraction method to tea pulp [1-3]. HC samples were dissolved in 2.5 M NaOH solution at a concentration of 1/10 (w/v) at 363 K during the 3 hours. After the dissolution, certain amounts of the crosslinker (methylene bis acrylamide), antimicrobial agent (mint essential oil), chitosan solution and redox initiator (ammonium persulfate) were added to the hemicellulose solution. The chitosan solution was prepared certain amount of chitosan solved acetic acid solution (50 %) at a concentration of 1/80 (w/v). After the 5 minute, the solution was poured into a petri dish and petri dish was placed in an oven at 333 K for polimerization. At the end of the polymerization, gel film samples were held in deionized water for 48 h and the deionized water was refreshed every 4 h to remove the impurities. The synthesized gel film samples were dried at 333 K until reached a constant weight. The synthesized hemicellulose based gel films were characterized by FTIR, TGA, SEM, moisture analysis and dissociation, swelling, biodegradation and thickness test.

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Keywords: Gel film, hemicellulose, alkaline extraction, tea pulp.

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RADON GAS CONCENTRATION IN ORENCIK VILLAGE IN GEYVE DISTRICT OF SAKARYA CITY

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Abstract: Radon is a cancer-causing radioactive gas. It's invisible, odorless tasteless. It may be a problem, because people spend most of their time indoors.
In this study, the radon concentration in air, drinking water and soil randomly selected 30 residences within all types building and schools in a pilot study in and around Geyve; Örencik of Sakarya. Turkey which these places have granite rocks, was determined for the first time, using LR-115 etch detectors during the period from 09.11.2012 to 14.09.2013.
The indoor radon concentrations measurement were performed using Lr-115 track etch detectors. The measured activity concentrations ranged from 105 Bq/m3 to 447 Bq/m3 with an average value of 194 Bq/m3 for Summer and for Winter from 297 Bq/m3 to 1319 Bq/m3 with an average value of795 Bq/m3. These results indicated relatively low in Summer but they relatively high 222Rn concentrations and they are below the WHO recommended level of 400 Bq/m3 for indoor radon concentration.

Keywords: radon concentration, radiation, granite, cancer causing, indoor, radon

Introduction

Naturally occurring Radon is a colorless, odorless, radioactive noble gas. Its concentration changes according to geographic properties of areas. It's a product of Radium. Radon also products polonium and during producing it radiates alpha (Kapdan, 2009: URL – 1: Güler, 1997). It emanates from soil to the air according to the properties of the geographical region. Radon enters a house from building materials (concrete, bricks, etc), cracks on the wall, water pipes, windows, drains etc. Radon migrates from soil to the air but some of the level of radon doesn't migrate to the air. It migrates to the underground water and also migrates drinking water pipes. Radon products are not gas form as radon. They are solid and they sticts to the dust in the air and water drops in the air. And they become aerosols. When we breath they can reach to our lungs (Ahmed, 1994) And they pose health problems. Radon gas is the second reason of the lung cancer after smoking (Güler, 1997). It doesn't mean that everbody who exposes to radon gas get cancer but, both exposure to radon gas and smoke increase the risk of cancer (Yücel, 2006). Soil and rocks in the earth include uranium and radium. Thus, radon and its products emanate from soil to the air. Main source of indoor radon concentration is soil and rocks properties of the building's location. To accept those rocks as a source of radon, their uranium density should be higher than 50ppm (Kapdan, 2009: Kürkçüoğlu and others, 2009: Durani, 1997a). And also the gas that we use at home for cooking and heating etc is an important radon source. However, air the house will decrease the indoor radon concentration level (Çelebi, 1995). Radon concentration of water doesn't effected only by radium it also effects by soil properties of the way of water pipes. But radon in water can come through the house only when it used (UNSCEAR, 1888). To decrease of indoor radon concentration building should be isolated, cracks of the buildings should be covered and as a most effected solution buildings should be aired and also shouldn't smoked indoor (URL-2). The main source of radon is Uranium. Thus, radon concentration has differences according to geographical properties of earth. So there are differences between countries because of this reason. The countries have limit levels acoording to this. These leves specified for England 200 Bq/m^3 , for Europe 400 Bq/m^3 , for new buildings 200 Bq/m^3 and for Canada 800 Bq/m^3 (Ayotte, 1998). According to this knowledge, is this study we specified the regions which has granit rocks in Sakarya and measured the level of radon gas concentration.

Materials and Methods

As we know radiation concentration level is high on soil which includes granite alloy rocks. First we checked all around Sakarya soil properties. And we found out Orencik village has very rich granite alloy soil. Indoor radon concentration level has measured for this area. During measurement we have considered some questions. Does granite alloy soil really effect indoor radon concentrations level? Is that region's level higher than limit level for Turkey? How much effective is the age of building? Does smoke create huge difference indoor radon concentration level? Are double glasses windows effective for protection? Even soil has granite alloy, can we reduce indoor

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radon concentration level airing the house?

There are two ways to measure the radon concentration; active and passive measurements. Active measurement method requires electronic devices and passive measurement methods requires thermoluminesances and solid state nuclear track detectors like Cr-39 and LR-115 as we used. Radon concentration can be measured short term and long term. Long term measurement provides results of seasonally and yearly concentration varieties (Kapdan, 2009: Çelebi, 1995). Detectors were prepared by using LR-115 thin films. Those films were cutted 1cm^2 for each and placed in plastic cups. Each cup were located on the regular person nose level in the houses which are in the village. By changing the detectors in every three mounts, concentration levels were measured yearly both for summer and winter. After every three mounts detectors were collected and new ones were located. Collected detectors were measured at Sakarya University Nuclear physic Laboratory. First 10% NaOH solution were prepared to scratch the films. Solution were prepared according to following amounts, for each film 25ml water and 2,5 gr NaOH. Films were scratched in this solution at 60° temperature for 2 hours. After scratching, traces on films were more visible. Scratched films were rinsed in pure water for 20 minutes and then dried. After those steps films were ready for measuring on microscope. Each traces on the films were counted and calculated their activity levels.

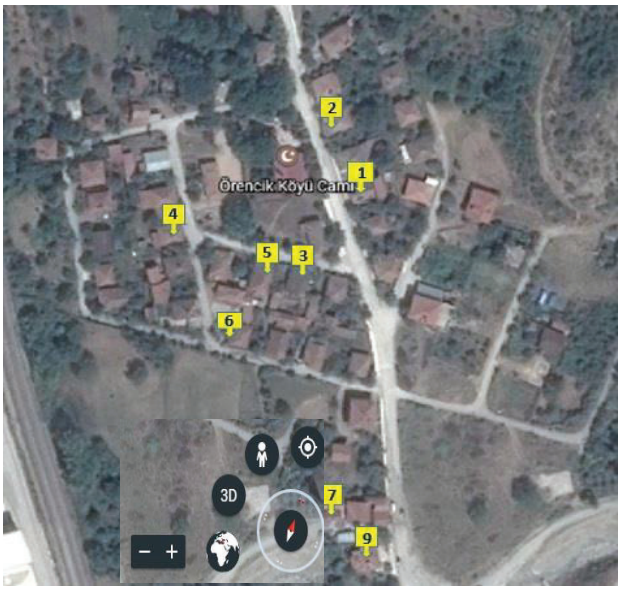

Figure 1. Detectors' locations in Orencik village.



Figure 2. Scratching of films.

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Figure 3. Counting of tracks.

Results and Discussion

During this research I had difficulties of course. I placed more detectors, but most of them were ruined by some of the village people. It was hard to explain them this research. So they didn't feel comfortable with the detectors in their houses or some of their children broke them while they were playing. But generally they were helpful and open. All year we were in contact because of the detectors. I replaced damaged ones with the new ones. But after first 3 months for second measurement I couldn't replace. Because I started measurement, it would affect the research. So I continued measurement with the left ones. I had a short interview with the village people before placed the detectors. I asked their houses building materials, smoke or non-smoke, age of buildings, isolations, windows isolations, heating system, health problems (cancer) etc. All of them were builded bricks and wood they weren't using gas to heat the houses, and there were no isolations for houses. Only differences were smoking, age of buildings and windows isolations. So I compared the results according to these differences. And also geographic locations in the village area.

Table 1: Orencik village radon concentrations number of tracks

No	State	Coordinats		Number of Tracks		Activity	
				05.12.2012 05.03.2013	20.05.2013 20.08.2013	05.12.2012 05.03.2013	20.05.2013 20.08.2013
1	Sabri Demir	40º 34´ 54, 26´´	N	6100	1420	1319	307
		30º 20´ 12, 54´´	E				
2	Cevdet Işık	40º 34´ 55, 16´´	N	5505	2070	1190	447
		30º 20´ 11, 60´´	E				
3	Fadime Demir	40º 34´ 53, 21´´	N	4400	530	951	114
		30º 20´ 12, 61´´	E				
4	Fatma Işık	40º 34´ 52, 77´´	N	2150	770	465	166
		30º 20´ 10, 04´´	E				
5	Aydın Işık	40º 34´ 53, 24´´	N	4710	600	1018	130
		30º 20´ 11, 43´´	E				
6	Emine Turhan	40º 34´ 51, 59´´	N	4000	570	865	123
		30º 20´ 11, 34´´	E				
7	Özlem Çakmak	40º 34´ 49, 79´´	N	1600	490	346	105
		30º 20´ 13, 59´´	E				
8	Fatma Çakmak	40º 34´ 49, 60´´	N	1375	870	297	188
		30º 20´ 13, 59´´	E				
9	Zekiye Kanbur	40º 34´ 49, 33´´	N	3200	770	692	166
		30º 20´ 16, 21´´	E				

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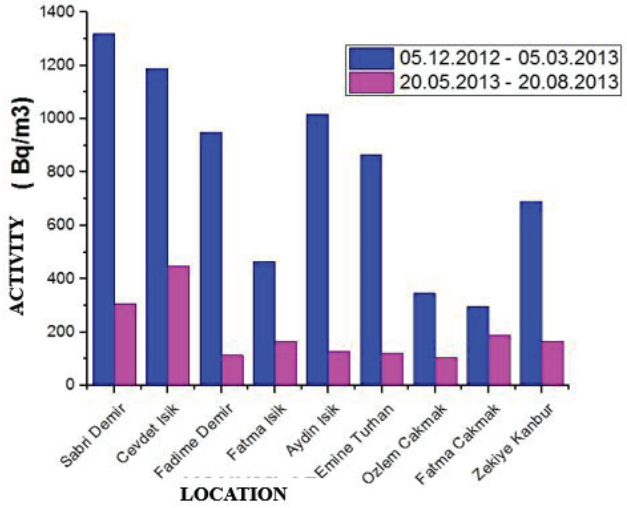

Figure 4. Indoor radon concentration activity level.

This graph shows the locations's activity levels and differences between summer and winter. It is obviously seen summer concentration levels are lower than winter. But still they are not too low. And also when we check winter results we can see there are differences between the locations. Some of them are too much. To find the reason and consider the interviews locations were compared with each other.

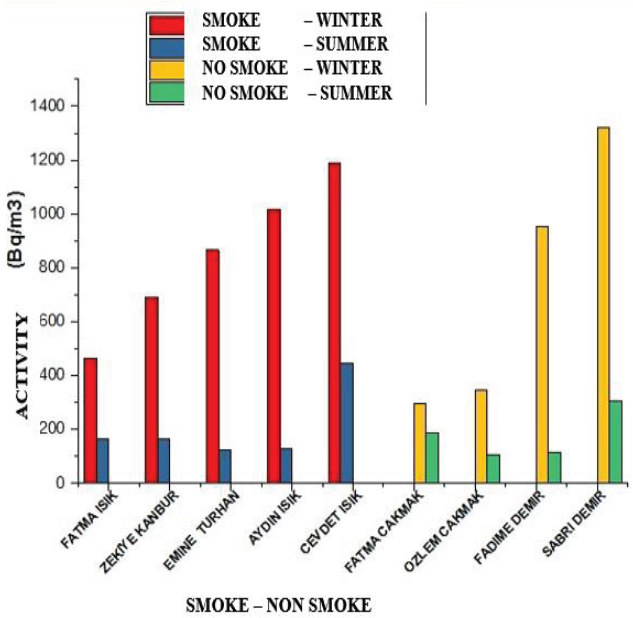

Figure 5. Smoke – non smoke differences

First five locations show the places which people smoke in. And others are non-smoking places. Expectation; non-smoking places should have lower concentration level. But especially last location – even it's a non-smoking house- shows highest rates at all. So that is not the only difference. Then other differences of buildings were considered.

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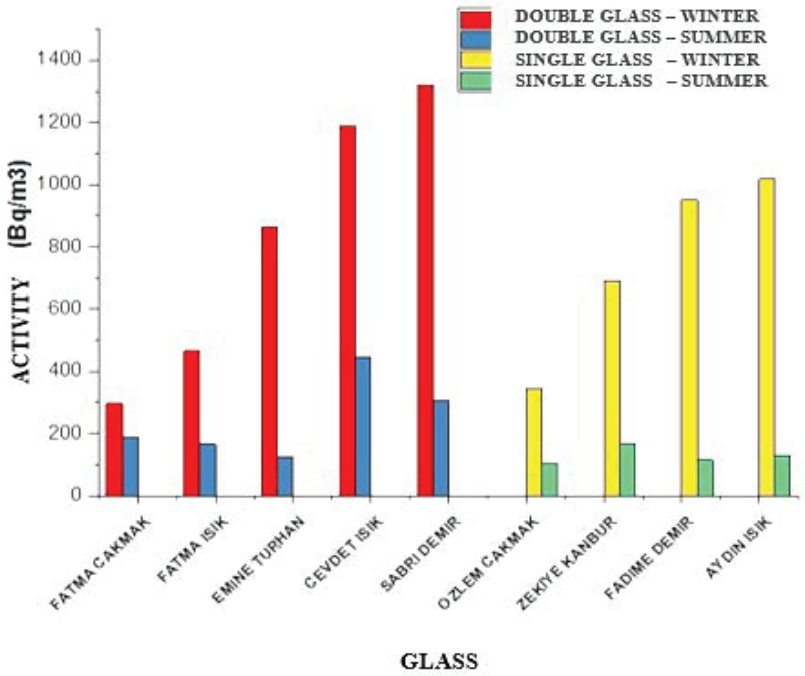

Figure 6. Windows isolations. Double glass or single glass

Glass isolations should protection indoor. When graph was checked, unexpected result is seen. Because one of the double glass house shows still the highest rates.

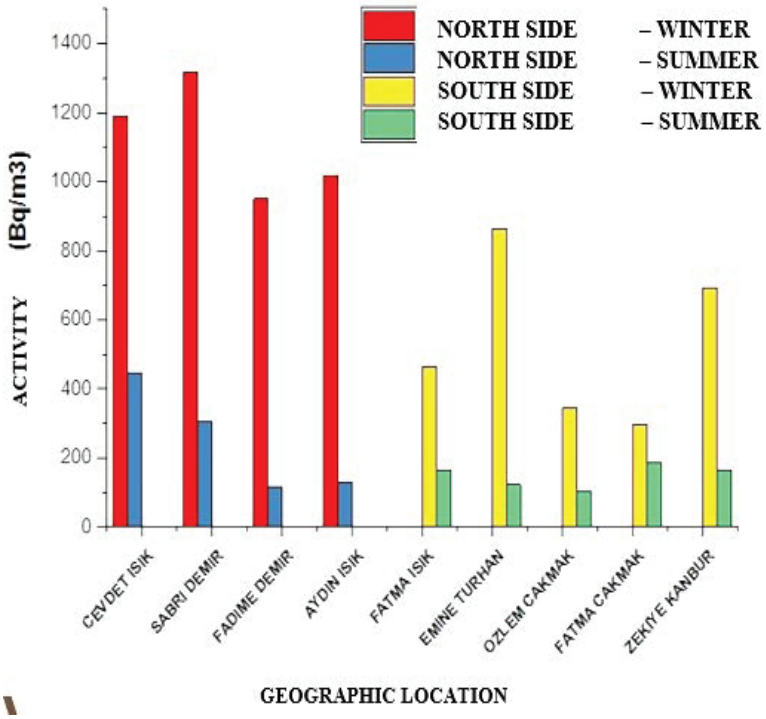

Figure 7. Geographic locations of the buildings.

When the houses were compared according to their geographical locations in village, a reasonable result has found. North side of the village was showed the highest rates than south side. All over the village soil includes granite alloy rocks, but north side might be more effective.

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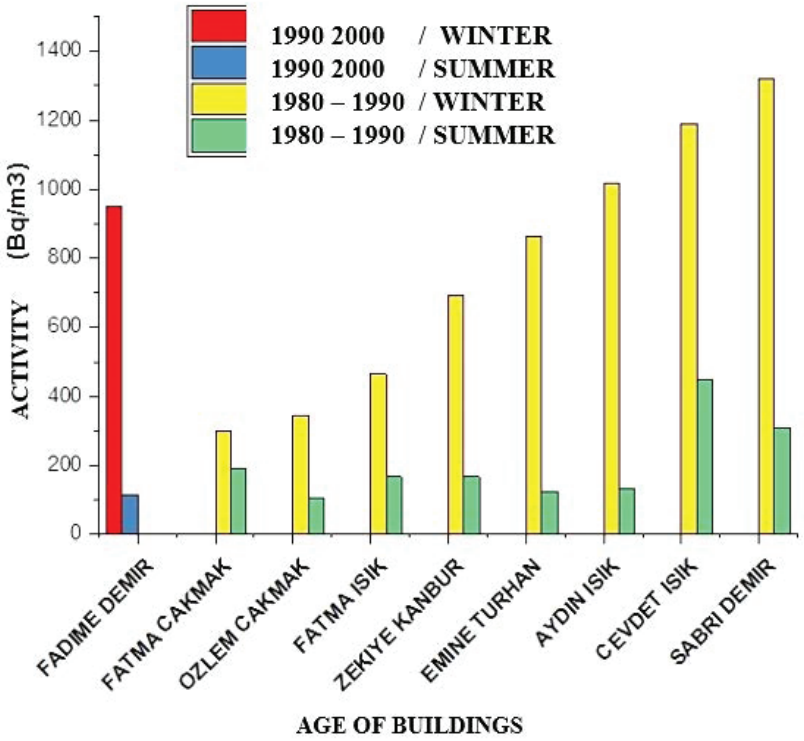

Figure 8. Age of the buildings.

Another difference, which the buildings's ages was gave another expected result. When that graph was checked the result can be seen that the old building has given highest rates. But still some of the old buildings were showed lower rate than the new one.

Conclusion

All around Orencik village soil has granite alloy rocks. But when the houses were checked there were still differences. That is why, all area was checked with all differences.

When all graphs were considered, especially winter results are quite high according to limit level for Turkey. And also as we know smoke might affect concentration rates of the house. But first graph shows that some of the non-smoke houses have higher rates than the others. How could smoked houses have lower rates than the non-smoke houses? Is it not that much effective? Before getting a conclusion the other graphs should be considered. As we know isolation is one of the solution protect from radon. But, when graph, which shows glass isolations differences, shows unexpected results. According to this graph single glass houses have lower rates than the other. We still can't get a conclusion just up to that. All differences must be considered. When other differences which are geographical locations and age of buildings were considered we can get a conclusion. Geographical location and age of buildings differences show us some reasonable results.

When the results were considered all together. We can get a conclusion. Smoking houses should have higher results. But according to graph they don't. And double glass windows should protect the house. All of the village houses haven't got isolation. Some of them only have window isolation and according to results we can say that is not enough. And also when we compare them according to their age, we can say most of them are old buildings and that is another reason that only window isolation is not enough. And also we know that all area has granite alloy rock soil but according to graph results north side's concentration must be more. And also when we focus of differences between winter and summer, we can say airy the house is really effective. Because summer rates are quite lower than winter rates. But still this region's rates are too high, even in Summer they are not low enough. And during this research some of the people who live here got cancer. But as general knowledge about radon not only lung cancer, colon cancer as well. People who live here doing gardening. They have animals too. They grow fruits and vegetables. Radon in the soil might affect those fruits and vegetables and also animals. That's why people got different type of cancers. Radon concentration level is didn't notice until now. It's rates might be affected because of the earthquake which happened in 1999. That earthquake might create a foult line under or around this region.

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SELECTIVE CO-PRECIPITATION OF CU^{2+} METAL IONS USING ULTRASONIC NEBULIZER-INDUCTIVELY COUPLED PLASMA OPTIC EMISSION SPECTROMETRY

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Abstract: Heavy metal ions are contained at trace levels in enviromental samples and can not be measured directly with enstrumental methods. For this case, a preconcentration method must be applied in order to separate and measure the levels of trace elements. Coprecipitation with carrier element is a well known method for separation of the metal ions from their different media. Copper is an essential element for human beings and lack of copper may lead to anemia and osteoporosis.

In this work, a selective co-precipitation method was suggested in order to separate and preconcentrate copper ions from environmental samples. Measurements were done by ultrasonic nebulizer - inductively coupled plasma optic emission spectrometer (USN-ICP-OES).

A different dithiocarbamate derivative was used as complexing agent and Bismuth was used as carrier element. Firstly, copper was complexed with ligand in the presence of Bismuth at pH=4. After waiting 10 mins of the complexation process, solution was centrifuged for 20 mins at 4000 rpm. At the end of centrifugation, the liquid was decanted from the centrifuge tube and the solid was remained at the bottom of the tube. After that the solute was dissolved with 1 mL of concentrated nitric acid (suprapur) and diluted to 5 mL with ultrapure water. In all measurements a known concentration of indium was added as internal standard. Finally preconcentrated liquid phase was measured by using USN-ICP-OES. The method was successfully applied to the analysis of environmental samples. Although dithiocarbamate ligands can complexed with many metal ions, in acidic media only copper ions were complexed, preconcentrated and separated from samples.

Keywords: Coprecipitation, Dithiocarbamate, Ultrasonic nebulizer, ICP-OES, Copper, Bismuth

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TAX INCENTIVES FOR INNOVATION IN THE LIGHT OF IT GOVERNANCE BEST PRACTICES (EVIDENCE FROM THE FINANCIAL SERVICES INDUSTRY AND IMPLICATIONS FOR EXECUTIVES)

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Abstract: IT governance frameworks and in particular COBIT, are today accepted internationally. Particularly in the emerging market of Turkey, there have been efforts to encourage the use of IT governance but practitioners have had varying perspectives. IT governance allows businesses, for example, those in the financial service markets, to align themselves with strategies in the information technology sector. Many companies adopt IT governance to increase efficiency, increase IT infrastructure control, reduce costs, make better decisions and motivate employees (Lahti and Peterson, 2007). Companies with integrated IT governance are in a stronger position to increase their organizational accountability, offering better returns on investment.

Innovation serves the same purpose as IT governance, (managing innovation is a part of COBIT) fostering competition, productivity and job creation – essential factors for sustainable growth. Innovation extends beyond mere technological advancement, encompassing new business models and organizational change. Innovation is frequently a product of R&D efforts, driven by vectors like IP and software, alongside organizational and human capital. R&D carries risks both in uncertainty of investment outcomes and spillover effects to third parties; this risk typically results in below-socially-optimal R&D investment. Governments frequently intervene to increase R&D investment, either through direct sponsorship of research or through policy measures, e.g. tax breaks to correct the market failure (OECD, 2013).

Keywords: Tax Incentives, Innovation, Research&Development, IT Governance, COBIT 5.

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Using In Vitro Digestion model, measurement of bioaccessibility of heavy metals in Turkish Hazelnuts (*Corylus Avellana L.*) by ICP-OES

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Abstract: Hazelnuts are nutrient dense foods and very high in energy with numerous health-benefiting nutrients that are essential for optimum health. Bioaccessibility has been defined as the fraction of a compound that is released from its matrix in the gastro-intestinal tract [1] it includes all physical, chemical, and microbiological processes between chewing in the mouth and precipitation in the intestines in the human body [2].

In this study, the Unified Bioaccessibility Research Group of Europe in vitro method was used to assess the bioaccessibility of copper, iron, manganese, nickel and zink in eight Turkish Hazelnuts (*Corylus avellana L.)* samples and three certified reference materials. The accuracy of the method was corrected by standard reference material. The total digest (microwave-assisted digestion (3HNO3:1HCl)), gastric phase and gastro-intestinal phase concentrations of Cu, Fe, Mn, Nickel and Zn were determined by ICP-OES. The results showed that the concentrations of the trace elements were found to be under the limit of Turkish Food Standards.

Keyword: Bioaccessibility; In vitro extraction; Heavy metal; Hazelnut; Copper; Iron; Manganese; Nickel; Zink; ICP-OES.

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Wet and microwave digestion methods for Cu and Zn determination in food samples using ICP-OES

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Abstract: Elements such as Cu and Zn are basic elements and have roles in several biological processes, whereas lead and cadmium are non-essential elements as they are toxic, even in traces. The essential elements can also produce toxic effects when the element intake is excessively elevated. In recent years it has become clear that transition metals such as Cu and Zn are essential for normal development and function of human cells [1].

The aim of this study was used to investigate the level of heavy metals (Cu and Zn) in some food samples from Sakarya, Turkey. Trace elements were determined by ICP-OES after wet and microwave digestion methods in same food samples. Validation of the proposed method was carried out by using a NIST-SRM 1515-Apple Leaves and Tea leaves (INCYTL-1) certified reference material. The analytical parameters show that the microwave oven digestion procedure provided best results as compared to the wet digestion procedure. The results were compared with the literature values.

Keywords: Food; Wet ashing; Microwave digestion; Heavy metal; ICP-OES

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Eğitim Bağlamında Kur'an İsminin Düşündürdükleri*

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Özet: Yüce Allah, indirdiği kitabın birden fazla isim taşımasının, doğal olarak indirilen bu vahyin insanlara bu çeşitli isimler ile aktarılmasının eğitim açısından istifade edilecek birçok yönünün olduğu ihmal edilmemelidir. Bu isimlerin iyi şekilde bütün yönleriyle kavranması, eğitimin ana hatları olan okumaya ve yazmaya ne kadar önem verdiğini ortaya koyacaktır. Kendisine verilen isimlerden birisi olan Kur'an ismi ile her şeyden önce Müslüman tarafından okunması gerektiğine vurgu yapılmaktadır. Bu isim sayesinde, önce Kur'an okumaya daha sonra da okunması gerekenleri okumaya yönelen Müslüman, bilgi sayesinde dünya ve ahiret mutluluğunu elde eder, doğru ile yanlışın ayırt edilmesinin ancak okuma sayesinde olabileceğini bilir. İşte bu makale eğitime katkı bağlamında "Kur'an" ismini ele almaktadır.

Kur'an İsmi ve Türediği Kök

Allah Teâlâ vahyine, gerek bir bütün ve gerek parça parça olarak, Arapların sözlerine verdikleri isimlerden farklı isimler seçmiş ve bu isimlerde, kelimelerin ihtiva ettiği sırlarla kök manalarını gözetmiştir. Bunlar arasında ise Kur'an ve Kitap isimleri şöhret bulmuştur. Vahyin Kitab ile isimlendirilmesinde, onun yazılarak bir araya getirileceğine işaret vardır. Ama özet kısmında da işaret ettiğimiz gibi sadece Kur'an ismi üzerinde duracağız.

Kur'an ile isimlendirilmesinde, göğüslerde muhafaza edileceğine dair işaret vardır. Çünkü Kur'an lafzı "Kıraenin/okumanın" mastarıdır ve Kıraatta bir şeyi hatırlama manası bulunmaktadır. Arapça olarak gelen bu apaçık vahiye öyle bir önem takdir edilmiştir ki, sapasağlam korunması ve sapıkların tahrifatından uzak tutulması garanti altına alınmıştır. Çünkü diğer kitaplarda olduğu gibi ne sadece yazı ile ve ne de sadece ezber yoluyla nakledilmiştir. Aksine onun yazılı olarak gelişi tevatür yoluyla nakline, tevatür yoluyla bize gelmesi de, sağlam ve hassas belgelere dayalı yazı ile tespit edilmişliğine tam uygun düşmektedir[1].

Eğitim Bağlamında Kur'an'ı Okumanın Anlamı ve Kazandırdıkları

Kur'ân-ı Kerîm, insanlara hem lafız hem de mânasıyla, hidâyet ve rahmet olarak gelmiştir. Hz. Peygamber (sallallahu aleyhi ve selem), bu yüce Kitabı en iyi şekilde okumuş ve okutmuş olup ümmetine de eksiksiz olarak tebliğ etmiştir.

---

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[1] Suphî Salih, Mebâhis Fî Ulûmi'l-Kur'an, Daru'l-İlm Li'l-Melâyîn, 2000, s. 17.

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Şüphe yok ki Kur'ân-ı Kerîm, tüm iyilik ve hayırların menbaı, bereketlerin kaynağı ve rahmet duygularının karargâhıdır. Kur'ân'ı okumak, Allah'a yaklaştıran en değerli ibadetlerden olup cennette yüksek derecelere ulaştıracak olan en kıymetli amellerden sayılır.

Kur'an'daki "oku" emri[2] sadece vahiyden indirilen ilk kelime değildir. Aynı zamanda Allah Teala'nın son peygamberi ve onun şahsında ümmetinden yapılmasını istediği ilk iştir. Hiç fıkhı tartışmalara girmeden "oku" emri Hz. Peygamber (sallallahu aleyhi ve selem)'e kılınan ilk farzdır. İslam'ın beş temel esaslarından olan namazdan, oruçtan, zekattan ve hacdan önce farz kılındı. Hatta "oku" emri, diğer farzlar için temel oluşturdu. Ancak bu kelime çok yaygın bir şekilde sadece yazmaya, okumaya ve ilme bir çağrı olarak değerlendirildi. Çoğu kimse İslam'ın ilk emrinin oku olmasını ilme verdiği öneme hasretmekte asıl hedefin Kur'an okuma olduğu üzerinde gereği gibi durulmadığı dikkatlerden kaçmayan bir gerçek olarak karşımızda durmaktadır.

"Yaratan Rabbinin adıyla oku" [3] ayetinde ne okunacağını gösteren nesne/mef'ul gelmemiştir. Kur'an'ın icaz yönü ile bağlantılı olarak burada îcâz (kısa ifade) üslûbunu sergilediğinden anlam sahasının geniş tutulabileceğini söyleyebiliriz. Bu bağlamda bazıları tarafından "oku" emrinden sonra mef'ul gelmediğinden ayete "kendini oku" ve "kainatı oku" gibi anlamlar yüklendi. Ancak vahyin ilk muhatabı olan Hz. Peygamber (sallallahu aleyhi ve sellem)'den ilk istenilenin Kur'an'ı okuması olduğu üzerinde bildiğim kadarı ile gerektiği şekilde durulmadı, belki de bilindiği düşüncesiyle temas edilmedi.

Hz. Peygamber'e okumak ile emredilenin ne olduğu noktasında aklımıza ilk gelmesi gelenin Kur'an'ı okumasının kendisinden istenmiş olmasıdır. Cebrail geldiğinde Onun, okuma ile hiç tanışmamış bir pozisyonu vardı. Zira oku dediğinde Hz. Peygamber kendisinin hiç okuma bilmediğini ortaya koymak için "Ma Ene Bi Kariin/Ben hiç okuma bilmiyorum" ifadesini kullanmıştı. Aynı zamanda yüce kitabın en yaygın isimlerinden olan "Kur'an" ismi, Hz. Peygamber (sallallahu aleyhi ve selem)'e ilk gelen (oku) emri ile aynı kökten türerler. Zira "Kur'an" kelimesi "şükran" vezninde bir mastar olup, okumak anlamına geldiği gibi, ism-i meful manasında "okunan kitap" anlamına da gelir ki, terim manası budur. O halde "Oku" ile yüce kitabın isimleri arasından en meşhur olan "Kur'an" ile muazzam bir ilişki vardır. Dolayısıyla "Yaratan Rabbinin adıyla oku." ayetinin ilk anlamı Kur'an'ı okumaya tahsis edilmelidir[4]. Bu nokta göz önünde tutulursa ayetin manası şöyle olur: Her şeyi yaratan Rabbinin ismi ile Kur'an okumaya başla, veya O'ndan yardım dileyerek Kur'an okumaya başla.

Kur'an-ı Kerim'le ilk defa Hz. Peygamber (sallallahu aleyhi ve sellem) muhatap olduğu gibi, ilk defa da o okudu. Allah Teala Kur'an'ı nasıl okuması hususunda onu serbest bırakmamış, "tertîl" üzere okumasını ona emretmiştir[5].

Arapçada tertîl kelimesinin sözcük anlamı, "kelimeyi kolayca bir şekilde ağızdan çıkarmak" demektir. Kur'ân kıraatında tertîl, tecvîd kaidelerine uymak ve harflerin hakkını vererek, tane tane okumaktır. Kur'ân'ı tertîl üzerine okumaktan en büyük amaç, okunanı düşünmek ve mânaları tedebbür süzgecinden geçirmektir. Nitekim Yüce Allah (celle celâluhu) mübarek kitabını Peygamber'ine indiriş gayesine işareten "(Resûlüm!) Sana bu mübarek Kitab'ı, âyetlerini düşünsünler ve aklı olanlar öğüt alsınlar diye indirdik" buyurmuştur[6].

Tertîl üzere okumanın doğru ve eksiksiz olan şekli, kelimelerin hakkını vermek, harflerini ayırt edilebilecek şekilde tane tane okumak, nefes nefese kalındığında, nefes normale dönünceye kadar susmak ve harfleri birbirine katmamaktır. Bu mânada tertîl kelimesi tecvîd mânasını da içermektedir. Hatta tecvîd, bütün bu meseleleri konu edinen ilim haline dönüşmüştür. Kur'ân'ı tam tertîl üzere okumak isteyen kimse, tertîl'in mertebelerine riâyet ederek okur; tehdit içeren bir kelimeyi okursa, verilen

[2] Alak Suresi, 1.
[3] Alak Suresi, 1.
[4] Alûsî, Rûhu'l-Meânî, 30/178.
[5] Müzemmil, 4.
[6] Sad Suresi, 29.

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gözdağını veya tehditi okuyuşundaki ses tonunda hissettirir. Tazîm ile ilgili bir lafzı okursa o lafzın da telaffuzunda tazîmi hissettirecek bir tarzda okur[7].

Eğitim açısından Kur'ân'ı tertîl üzere az okumak mı, yoksa süratle okuyup çok okumak mı daha efdâldir?

Efdâllik yönünden bir değerlendirme yapacak olursak, az da olsa Kur'ân'ı, mânalarını düşünerek, bilinçli bir şekilde okumak, elbette ki hızlı olan çok okumaktan daha efdâldir. Zira Abdullah b. Mesud (radiyallahu anhu) ve İbn Abbas (radiyallahu anhu), az da olsa Kur'ân'ı mânalarını düşünerek tertîl üzerine okumanın, çabuk ve süratli okumaktan daha faziletli olduğunu söylemişlerdir. Acurrî (ö.360/970) konuyla ilgili şu noktaya dikkat çekmiştir: "Düşünerek ve mânalarını kavramaya çalışarak, az bir miktarda Kur'ân okumak, düşünmeyerek ve mânalarını araştırmayarak, çok miktarda Kur'ân okumaktan, benim için daha hoş ve daha sevimlidir[8]. Hatta Acurrî gibi bu görüşü benimseyen âlimler Kur'ân'ı okumaktan asıl maksadın onu düşünmek, anlamak ve inceliklerine vukûfiyet olduğunu, söylemişler, Kur'ân'ın okunmasını ve ezberlenmesini, mânalarına ulaştıracak birer vesile olarak değerlendirmişlerdir.

Bu hususta seleften bazıları Kur'ân'ın, kendisiyle amel edilmesi için indirilen bir kitap olduğunu ve okunmasının sadece onunla ilgili amellerden biri olabileceğini söylemişlerdir. Bunun içindir ki; Kur'ân'ı ezberlememiş olsalar bile, Kur'ân'ı bilen ve onunla amel eden kimselere "Ehlu'l-Kur'ân/Kur'ân ehli" denmiştir. Kur'ân'ı anlamayan ve onunla amel etmeyen kimse, onu ezberlemiş ve bütün kaidelere uygun bir şekilde okumuş olsa bile Kur'ân ehli sayılmamaktadır. Bunlara göre iman, amellerin en faziletlisidir. İman'ı da, Kur'ân'ı anlamak ve mânalarını düşünmek gerçekleştirir. Zira, kuru kuruya, anlamadan, düşünmeden okumayı, mümin, münafık, her türlü vasfı taşıyan insan yapabilir.

İsminden esinlenerek Kur'ân'ın okunması ve tilâvet edilmesi, en güzel bir şekilde okunması, okunurken Kur'ân'ın en üst düzeyde anlaşılabilmesi için bazı verilere ihtiyaç vardır. İnsanlara ilâhî mesaj olarak gönderilen Kur'ân'dan arzulanan bir şekilde istifade etme oranının yüksek olabilmesi, en güzel bir şekilde okunmasına bağlıdır. Huşu' olmadan Kur'ân hakkıyla tedebbür edilemeyeceği, hakkıyla mânalarının inceliklerine vakıf olunamayacağı açıktır.

Kur'an Bağlamında "Okumanın" Eğitimdeki Yeri

Okuma kökünden ismini alan "Kur'an", öğrenmenin en önemli etkin tarafının okumaktan geçtiğine işaret etmektedir. Günümüzde de kitap eğitim açısından en kolay öğrenme yolunu oluşturur. Belki de okumak, insan için en kolay ve en etkili öğrenme yoludur. Hatta bilgilerinin çoğunluğunu kitap okuyarak elde eder. Kur'an'ı manalarını öğrenerek okudukça insan, dünya ve ahiret ile ilgili daha kültürlü bir yapıya geçtiğini fark edecektir.

Hz. Peygamberin geldiği dönemde Araplar geri kalmış toplum statüsünde idi. Dili en iyi konuşmalarına rağmen okuma yok sayılacak kadar azdı. Bundan dolayıdır ki, Hz. Peygamber ile vücut bulan ilahi sistem temellerini "Oku" emriyle ilim üzerine oturtmuş oldu.

Okuma ve yazma işlemi eğitim bağlamında kişiye büyük kolaylıklar sağlar. Tabii ki Kur'an'ın ilk "oku" emriyle beraber okunması istenmiştir. Zira insan başkalarından bölük pörçük, kulak dolgunluğu ile öğrenmek zorunda kaldığı bilgileri tek başına çeşitli kitapları okuyarak elde edebilir.

Kur'an okumak, kanaatimce insana başka faydalı şeyleri de okuma alışkanlığı kazandıracaktır. Zira okudukça kendine olan güveni artacaktır. Böylece zamanla düşünce ufku gelişecek, geniş bir görüş açısı elde edecek ve netice itibarıyla da olayları inceleme ve iyi değerlendirme yeteneği kazanacaktır.

[7] Zerkeşî, el-Burhan fî ulûmi'l-Kur'ân, I, 449.
[8] Acurrî, Ahlâku hameleti'l-Kur'ân, s. 98.

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Okuyan kişinin kelime hazinesi zenginleşecek ve hitap ettiği kişilerde etki alanı geniş olacaktır. Bu etki ise kişiye daha sosyal bir yapı kazandıracaktır. Okumak ile elde ettiği geniş kelime sayesinde daha rahat ve daha iyi düşünecektir. Çevresindeki ortaya çıkan olaylara hakim olacak ve olayları değerlendirmede isabetli kararlar almış olacaktır.m

Sonuç

Baştan itibaren Kur'an'ın birçok isimleri arasından "Kuran" ismini eğitim açısından incelemeye çalıştık. Kur'an, isim olarak insana hoş gelen ve olumlu çağrışımlar yapan bir özellik taşımaktadır. "Kur'an" ismi, türev bağlamında önce kendisinin okunması gerektiğini, bunun yanında Kur'an'ın "oku" emrinin her Müslüman için kendisine fayda vereceği ilme teşvik olduğunu da tespit etmiş olduk. Kur'an'ı okuma sayesinde insan, doğru ile yanlışı, zararlı ile zararsızı tespitte zorluk çekmez.

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AZ GELİŞMİŞ ÜLKELERDE EKONOMİK BÜYÜMENİN BİR BELİRLEYİCİSİ OLARAK DEMOKRASİNİN ÖNEMİ

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Özet: Son yıllarda ekonomistler ekonomik büyümenin en önemli göstergelerinden birisi demokrasi olduğu üzerine tartışmaktadırlar. Buna göre ülkelerin gelişmişlik düzeyleri ile demokrasi düzeyleri arasında bir ilişkinin varlığı genel kabul gören bir görüş olarak öne çıkmaktadır. Bu çalışmada az gelişmiş ülkelerin demokrasi düzeyleri ilgili bilgi verilerek söz konusu ülkelerde demokrasi ve ekonomik büyüme arasındaki ilişki incelenmiştir. Analiz sonucuna göre az gelişmiş ülkelerde demokrasi ile ekonomik büyüme arasında bir ilişkiyi rastlanılmamıştır. Söz konusu ülkelerde kurumların verimsizliği, yolsuzluk, bilgiye erişim zorluğu ve yargıya olan düşük güven gibi faktörlerin demokrasi bilincinin yerleşmesine engel olduğu düşünülmektedir. Çalışmanın sonuç bölümünde az gelişmiş ülkelerin demokrasi seviyesini arttıracak bir kısım politika önermelerinde bulunulmuştur.

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Will Unfair Distribution of Income Affect Economic Course of Events in terms of Balance of Payments in Turkey ?

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Abstract: A vast majority of studies concentrate on the unfair distribution of income in terms of several factors notably including socioeconomic destruction and poverty. This study investigates macroeconomic consequences of that problem rather than focusing on micro dimensions such us behavior of public in order to solve and provide some recommendations by implementing econometrical models such us panel data analysis, cointegration test and multivariate regression. In addition, data derived from TUIK which is official website of Republic of Turkey and World Bank. Gini coefficients determined as independent variable and components of BOP determined as dependent variables. The empirical results demonstrate that unfair distribution of income affects BOP parameter negatively in Turkey.

Keywords: Balance of payments, Unfair distribution of income, Panel data analysis, co-integration test.

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Testing the transportation-induced EKC hypothesis The case of Turkey

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Abstract: This paper focuses on the relationship between transportation and carbon emissions in Turkey via testing Environmental Kuznets Curve hypothesis, which is one of the main transportation hubs in the Middle East and Europe and whose economy is connected with rapid industrialization, high-level urbanization and variety of energy sources. Nevertheless, this paper demonstrates that the inverted U-shape EKC hypothesis is applicable to Turkey. According to Granger causality test, the bi-directional causality between economic growth and CO2 emissions is determined in Turkey. This paper finds bi-directional causality between transport energy consumption, GDP and CO2 emissions in Turkey as well.

Keywords: Environmental Kuznets Curve hypothesis, GDP, Granger causality test, CO2

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