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Dear Guests...

Welcome to the 9th ISTE C -2018.

International Science and Technology (ISTEC) is international academic conferences for academics, teachers and educators. They promote the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conferences activities, the conference proceedings books and TOJSAT Journal. Their focus is to create and disseminate knowledge about new developments in these academic fields.

ISTEC conference is now well-known international academic event and the number of paper submissions and attendees are increasing every year. This year our conferences have received more than 900 applications. The Conference Academic Advisory Board has accepted approximately 600 papers to be presented in Paris, France.

We would like to thank Prof. Dr. Mehmet Ali YALÇIN, Rector of Sakarya University and the President of the Association of Quality in Higher Education Prof. Dr. Muzaffer ELMAS, for their support of organizing this conference.

We also 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 ISTE C Paris, France.

Without their participation, ISTE C-2018 would, of course, have been impossible.

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 ISTE C conference papers, which will be also published in TOJSAT.

Finally, we would like to wish you all a successful conference, pleasant stay in Paris, France.

Thank you

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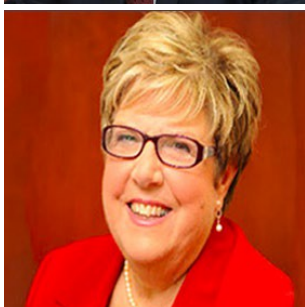
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A “SUPER FOOD” FOR ALTERNATIVE NUTRIENTS: *Spirulina Platensis*

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Abstract: Nutrition provides the growth and maintains function of organism. In recent years, there has been an increase in importance of alternative foods for feeding and health, especially *Spirulina platensis*. *S. platensis* is a microalgae called as “Super food” as endorsed by lifestyle personalities, and also has been approved as a health food by the World Health Organization. This study we aimed to evaluate the effects of different doses of *S. platensis* (500-1000 mg/kg bw) on physiological such as growth, haematological and biochemical parameters. During trial the rats were weighed weekly and the haemogram parameters (haematocrit, haemoglobin, red-white blood cell counts, leukocyte subtypes, MCV, MCHC, RDW and PLT) were analyzed. Serum total cholesterol, its fractions (LDL, HDL) and atherogenic indices (TC:HDL-C, LDL-C:HDL-C) were observed. Besides that, serum protein, albumin, globulin and albumin/globulin ratio were determined. Although there were no differences occurred among all groups statistically, all parameters were found in their reference values. However, effects of lower dose of *S. platensis* showed the best result for those physiological parameters. As a result that, *S. platensis* with its high concentration of functional nutrients is called as an important alternative therapeutic food and can be said that it can be used safely.

Key words: Alternative food, Spirulina, microalgae, health.

Introduction

Nutritious is important for physiological functions and also growth mechanism of organism. Belong this issue, a quality nutritious is needed for a healthy life for both animal and human. Recent years, researchers are interested in interesting food supplements for better health. The selection criterias of these products take into account the strengthening of the immune system, maintenance of growth performance and antioxidant properties, especially protein needs. Among these products, a strong antioxidant *Spirulina platensis*, which is a natural protein source, rich in vitamins and minerals, has become a focus of interest. Belong to the increase in interest of *S. platensis*, biotechnological studies about this microalgae have been researched in nowadays.

S. platensis is a microscopic filamentous alga which is rich in polyunsaturated fatty acids, phycocyanin and phenolic compounds (Richmond, 1992). It also does not contain cellulose on its cell wall. In this respect, *S. platensis* stimulates the bowel function and digestion rate by activate the useful microorganism such as *Bifidobacterium* and *Lactobacillus*, and inhibit the harmful bacteriae such as *E. coli* and *Candidas*. The improvement of absorption of foods and digestion were reported by some researchers (Pulz and Gross, 2004; Vural and Celen, 2005; Dogan, 2012). Besides that, phycocyanin content of *S. platensis* which has antioxidant and antienflamatuar properties, affects positively on erythropoiesis. Researchers also determined that phycocyanin and also polisaccarides in this microalgae improve values of the erythrocytes, granulocytes, monocytes and fibroblast cells in bone cell marrow (Hayashi et al. 1994; Cheng-Wu et al., 1994). Hayashi et al. (1994) observed the stimulation effects of *S. platensis* on activation of macrophage and leukocyte cells, phagocytosis, interleukin production and immune response in rats. At the same time, more toxicological analysis have been studied for usage this microalga as a natural food additive and reliability (Salazar et al., 1998; Yazıcı and Kaynak, 2001; Belay, 2002). On that point, in terms of preventive medicine or alternative food for health is supported by the macrophage activation and thereby effects on growth and immune system. *S. platensis* has an important role on blood protein and lipid. Researchers indicated that (Nakaya et al., 1988; Kanamaru et al., 2005) cholesterol is decreased by inhibition of the cholesterol absorption from jejunum and bile acid resorption from ileum with phycocyanin in *S. platensis*. Also, it was reported that polyunsaturated fatty acids and phycocyanin in *S. platensis* may help for this purpose. In addition, the plasma proteins (total protein, albumin, globulin) increased by *S. platensis* due to its high contents of essential amino acids and protein with values ranging from 55-65% (Bezerra et al., 2009; Mariey et al., 2012). However, it was only reported that long term of Spirulina intake may caused gout due to the high protein value (Becker et al., 1986; Araújo et al., 2003). In this study, it's aimed to evaluate the effects of different doses of *S. platensis* on hematological and biochemical parameters of rats that fed a long trial period.

Materials and Methods

Animals, Groups And Feeding

In trial, aged 7-8 weeks, 30 male Wistar Albino rat were randomly allocated on a weight basis to three groups: Control, (basal diet), SP-1 (added 500 mg/kgbw *S. platensis*, daily) and SP-2 (added 1000 mg/kgbw *S. platensis*, daily). The rats were housed in purpose-built metal cages. Feed and water were offered ad libitum throughout the 45 day trial. Basal diet was formulated to contain 2000-2500 kJ ME/kg metabolize energy, 23% crude protein, 3% crude fat, 7% crude fiber, 8% crude ash and, was projected to take on maintenance requirements according to the NRC (1995). The experimental groups fed by *S. platensis* (Egert, Izmir-Turkey) orally daily, and doses also were provided and modified according to literature (Nagaoka et al., 2005; Moreira et al., 2011).

The experimental protocols were approved by the Animal Care and Use Committee of Namik Kemal University and are in accordance with the National Institute of Health Guide for the Care and Use of Laboratory Animals. The study was carried out with the permission of Namik Kemal University Animal Experimentation Local Ethics Committee (Approval No: 2017/04-4).

Measurement

Body weights and weight gains of each rats were determined for growth performance in each week of the trial. Blood samples were collected for anticoagulant tubes by tail venipuncture on the 45th day from overnight-fasted rats. Haematocrit, haemoglobin, counts of white and red blood cell, platelet (PLT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and red cell distribution width (RDW) were obtained by Exigo Eox Vet hemogram apparatus that from the laboratory of Namik Kemal University Experimental Research Center. Serum total cholesterol, its fractions (LDL, HDL) and atherogenic indices (TC:HDL-C, LDL-C:HDL-C) were observed by spectrophotometrically. Besides that, serum protein, albumin, globulin and albumin/globulin ratio were determined.

Statistical Analysis

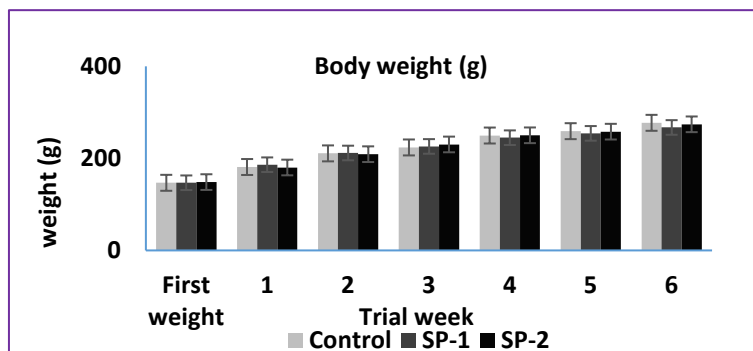
Statistical analyses were performed with SPSS (Version 17,0). Data were tested for normality distribution and variance homogeneity assumptions. All the values were grouped and the means and standard errors were calculated. One-way ANOVA was applied to the all parameters to examine the difference between groups. Differences were considered significant at $P < 0.05$. If the difference between groups was provided to be significant ($P < 0.05$), differences evaluated by Tukey's test (Dowdy and Wearden, 1981). On the other hand, in non-homogenous groups, differences between means were analyzed by Kruskal Wallis and following Mann Whitney U test between groups one by one (Dawson and Trapp, 2001).

Results and Discussion

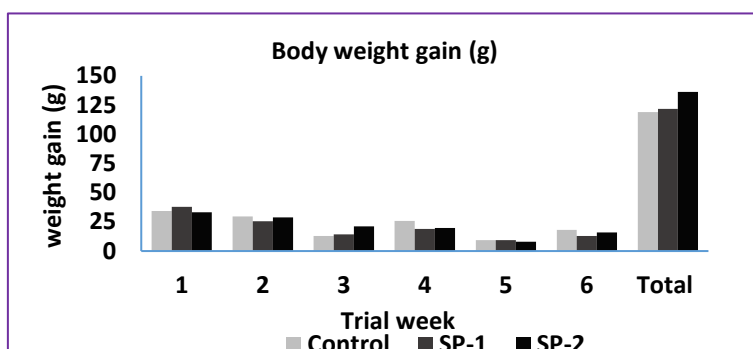
Although there were no statistically differences occurred among all groups, all parameters were found in their reference values. However, effects of lower dose of *S. platensis* showed the best result for those physiological parameters. The body weight and weight gain values obtained in the study groups were shown in Graphic 1 and 2, respectively. There were no significant differences among all groups according to the weekly periods ($p > 0.05$). At the end of the study, mean live weights of control and research groups were 277.25 ± 13.22 , 267.19 ± 8.13 and 274.033 ± 7.84 g. Also, there were no differences in terms of average weight gains among the groups (Graphic 2, $p > 0.05$). The weight gains of rats at the end of the experiment were 118.91 ± 13.60 , 121.82 ± 9.93 , and 136.23 ± 8.59 g respectively in group control, SP-1 and SP-2. The data about some physiological and biochemical parameters were given in Table 1 and 2. All parameters were found in normal reference values but interesting in increase of total cholesterol, LDL cholesterol and atherogenic indices.

S. platensis have been used for a natural food additive for animal feeding, recently. Most of researchers reported various results of the effects of *S. platensis* on growth performances. Araújo et al. (2003) studied rats fed by of 5% and 10% *S. platensis*. It was determined that although there were no statistical differences in growth and feed efficiency, there was an increase in live weight in group fed by 10% *S. platensis*. This results were similar to our results. Although there were no significant differences in growth parameters statistically in our study, it was observed that weight and weight gain of rats in experimental groups increased in last weeks (Graphic 1). Nevertheless, Heidarpour et al. (2011) had a study with additives of 0, 2, 6, 25 g *S. platensis* given to ruminants for 15 trial day. They found no differences in weight gain, feed efficiency and daily feed consumption among all groups. Besides that, an other study about growth parameters were detected in fishes which fed by 10%, 20%, 30% and 40% Spirulina, and no statistical differences were observed (Dernekbası et al., 2010). However, some researchers reported the positive impact of *S. platensis* on growth metabolism in animals (Grinstead et al., 2000; Peiretti and Meineri, 2008; Moreira et al., 2011). The mechanism of *S. platensis* on growth and feed efficiency was explained by its inhibiton effect on harmful microorganism in intestinal mucosa (Bhowmik et al., 2009).

Graphic 1. Body weight of rats in Control and Experimental Groups (g).



Graphic 2. Body weight gain of rats in Control and Experimental Groups (g).



In our study, there were no statistical differences in all hematological parameters among all groups, and also they were in their normal reference values (Table 1; $p > 0.05$). Similarly, Simsek et al (2007) determined that *S. platensis* had no differences in hematological parameters such as erythrocytes, haemoglobin, but a statistical decrease in haematocrit value in rats. A study about fish nutrition with *S. platensis*, researchers found that an increase in erythrocytes and leukocytes count statistically (Promya and Chimanat, 2011). They reported that *S. platensis* may stimulate the activities of bone marrow cells and thereby improve the immunity of organism. Also, it was reported that because of the macrophage activity of *S. platensis*, cellular and humoral immunity and survival rate were improved, especially broilers whose immune system was not sufficiently developed (Qureshi et al., 1996; Hamad et al., 2001). There was no mortality and any diseases were excited during this study as well as the results showed that *S. platensis* had no negative effect on hematological characteristics. The Lymphocytes were $69,34 \pm 1,96$ in control, $70,66 \pm 0,98$ in SP-1 and $76,05 \pm 3,17$ in SP-2 ($p: 0,185$). Eosinophils were $10,87 \pm 1,64$, $14,50 \pm 1,68$ and $13,70 \pm 1,63$ in groups control, SP-1 and SP-2 respectively ($p: 0,116$). However, leukocytes counts and ratios of monocytes, neutrophil and basophils were not identified exactly. So, they not rated for the research. This result may be due to an allergic reactions of rats or a mistake of analyzer. Besides that, a recent study, it was reported that using automotical methods (hematology analyzers) for count the leukocyte and leukocyte subtypes may not be suitable for rats (Messias et al., 2017). So, it was necessary to analyse these parameters by handled method for future researches.

Table 1. Haematological Indices (mean \pm SE, n=30).

Parameters	Groups		
	Control	Group SP-1 (<i>S. platensis</i> -500mg)	Group SP-2 (<i>S. platensis</i> -1000mg)
Haematocrit (%)	39,91±1,10	36,55±1,34	34,72±2,34
Haemoglobin (gr/100ml)	15,27±0,35	13,93±0,50	13,34±0,90
Erythrocyte (x106/mm3)	7,64±0,19	6,92±0,22	6,71±0,46
Leukocyte (x103/mm3)	8,32±0,90	4,73±1,33	10,18±3,97
MCV (fl)	52,22±0,80	52,74±0,62	51,82±0,74
MCH (pg)	20,02±0,24	20,11±0,18	21,99±2,05
MCHC (g/dl)	38,39±0,29	38,14±0,20	34,73±3,77
RDW (%)	15,11±0,34	14,13±0,29	14,34±0,24
PLT (x106 /mm3)	519,83±143,57	573,67±39,37	556,75±171,69

In addition, *S. platensis* may inhibit the harmful bacteria in intestine (Bhowmik et al., 2009) and thereby inflammatory agents that secreted by enteric bacteria may affect on globulin synthesis of liver. Some researchers reported different results about effects of Spirulina on protein values. (Bezerra et al., 2009; Moreira et al., 2011; Heidarpour et al., 2011). Although, Moreira et al. (2011) indicated no effect of *S. platensis* on serum protein levels, Mariey et al. (2012) stated that SP level at 0.2% had a significant increase in plasma total protein, albumin and globulin in laying hens. On the other hand, Bezerra et al. (2009) determined the high serum protein value in lambs fed 0, 5 and 10 g SP. All these researchers suggested that the protein quality and quantity of *S. platensis* may increase the serum protein level. In recent study, high Spirulina additive showed normal value with control however, in group of lower dose of Spirulina determined interesting results about cholesterol and its fraction values. All of them are in reference value but interesting in increase of Total cholesterol, LDL cholesterol and atherogenic indices. Total cholesterol (TC) and its fraction, low-density lipoprotein cholesterol (LDL-C), exhibited a rise coupled with a marginal decrease in the level of high-density lipoprotein cholesterol (HDL-C). As a result, increase in the atherogenic indices, TC:HDL-C and LDL-C: HDL-C, was observed. Due to all parameters resulted in their reference value, we can say that different experimental condition or animal may be change the results. However, various studies must be planned for next studies with different aims.

Table 2. Biochemical Parameters (mean ± SE, n=30).

Parameters	Groups		
	Control	Group SP-1 (<i>S. platensis</i> -500mg)	Group SP-2 (<i>S. platensis</i> -1000mg)
Cholesterol (mg/dl)	41,18±3,25	51,76±3,4	42,78±2,04
Tryglicerid (mg/dl)	107,53±10,87	83,08±12,49	107,41±8,97
Total lipid (mg/dl)	252,19±8,37	257,32±16,07	259,44±5,82
HDL-Cholesterol (mg/dl)	30,89±0,86	25,13±3,16	30,91±2,52
LDLD-Cholesterol (mg/dl)	31,80±3,56	43,25±7,81	33,36±2,52
VLDL-Cholesterol (mg/dl)	21,51±2,17	17,46±2,35	21,48±1,79
LDL/HDL ratio	1,04±0,13	1,46±0,43	1,17±0,17
TC/HDL ratio	1,25±0,07	1,52±0,14	1,43±0,11
Total protein (g/dl)	5,63±0,18	6,06±0,20	5,54±0,08
Albumin (g/dl)	2,36±0,07	2,20±0,07	2,28±0,05
Globulin (g/dl)	3,27±0,21	3,86±0,24	3,27±0,10
Albumin/globulin	0,75±0,07	0,62±0,06	0,70±0,03

Conclusion

Good and high quality protein intake from alternative supplements has become important in nowadays. Belong to this issue, researchers attract to attention on the various and natural alternative foods or plants. *S. platensis* which is an interesting plant among these natural additives has a rich biological content. Nevertheless, all studies about plant additives and the results were indicated the controversial nature effects of *S. platensis* on weight, weight gain, blood and biochemical parameters.

It's believed that these differences may due to the sexuality of animals, environmental conditions, trial long and also effective doses of *S. platensis* which have not yet been used. In this study, results showed that long term and high dose of using this microalgae is appropriate for health, but more studies are needed to pointed out the importance of this natural supplement.

Acknowledgements

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A CASE STUDY OF A GRAVITY WALL LOCATED IN THE FISHING PORT AREA

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Abstract: In a technical sense, a gravity wall is defined as any structure that resists soil pressure. The gravity wall is typically a permanent structure constructed in the form of a retaining element for the slope. The advantages of this wall type are that the excavation materials can be used in the walls of these walls, the evaluation of the waste materials and the integrity of nature by adapting to the ground conditions of the weight wall. The gravity wall, which is built between the service road of fishing port and the highway, is about 340 meters in length and varies in height and has a maximum height $H = 10.50$ meters. During the construction of the road, some parts of the gravity wall which had been built, were collapsed in the form of breakage in the wall as a result of the surcharge load effect caused by mass transfer from the road embankment. Damaged parts of the wall were repaired. In this study, bearing capacity and stability analysis were carried out on the failure cross section (Section-A) which has the height of 5.16 meter along the wall route. GEO5 package program are used in the analyses. The parameters used in analyses were obtained from the laboratory studies and literature. The port area is located in the second degree earthquake zone and the seismic effect was considered in the analysis.

Keywords: Gravity Wall, Retaining Structure, Bearing Capacity

Introduction

Gravity walls are widely used as earth retaining systems supporting fill slopes adjacent to roads and residential areas built on reclaimed land (Trandafir, Kamai & Sidle, 2009).

Gravity walls are the most common type of construction for docks because of their durability, ease of construction and capacity to reach deep seabed levels. The design of gravity walls requires sufficient capacity for three design criteria; sliding, overturning and allowable bearing stress under the base of the wall. Although the design of gravity quay walls is reasonably well understood for static loads, analysis under seismic loads is still in being developed (Alyami et. al., 2007)

One of the advantages of gravity walls is that the waste material can be used during the construction process and this ensures that the gravity wall is fully integrated into the nature.

In this study, bearing capacity and stability analysis were carried out on the failure cross section (Section-A) which has the height of 5.16 meter along the wall route.

GEO5 package program is used in the analyses. The parameters used in the analysis were obtained from the laboratory studies and literature.

Gravity Walls

Gravity walls are the earliest known retaining structures. These walls construct from solid concrete or rock rubble

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mortared together. The lateral forces from backfill is resisted by the weight of wall itself and due to their massive nature, they develop little or no tension.

The difficulty with retaining walls is that they are often concrete or a similar material which, compared to soil, are extremely strong. It is not advisable to include the actual strength of the retaining wall in the analysis, due to potential convergence difficulties. Consider also that failure of retaining walls is usually a result of undercutting of the retaining wall, not shearing of the concrete itself. For this mode of failure, the strength of the retaining wall itself becomes inconsequential, but the weight of the wall acting as a stabilizing force is critical.

Site Conditions

The gravity wall, which is built between the service road of the fishing port and the highway, is about 340 meters in length and varies in height and has a maximum height $H = 10.50$ meters. The gravity wall has been shown in Figure 1 and Figure 2.



Figure 1. Right Side of Gravity Wall



Figure 2. Left Side of Gravity Wall

The soil parameters to be used in numerical analysis are given in Table 1.

Table 1. Soil Parameters Used in Analysis

Soil	γ (kN/m ³)	ϕ (°)	c (kPa)
Soil-I (Behind the Wall)	20.0	37	10
Lime Stone	22.0	35	25

Analysis were carried out under effective stress conditions, assuming that groundwater was not encountered and necessary drainage precautions are taken.

Highway traffic load is considered as a surcharge pressure of 15 kPa (15 kN/m²) which is effective on embankment. In analysis of bearing capacity, the bearing capacity value for limestone was taken as 500 kPa.

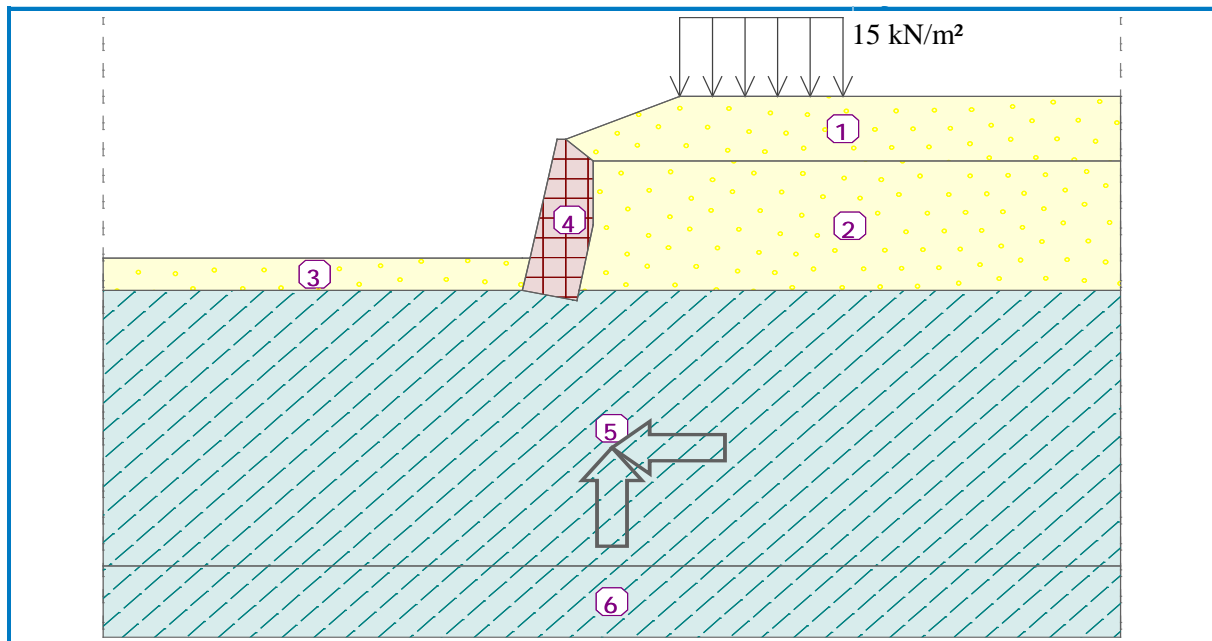


Figure 3. Section A Used Geo5 Program

Some points (1 to 6) shown in Figure 3.

- Point 1-2 : Soils behind the wall
- Point 3 : Fishing port area service road
- Point 4 : Gravity wall
- Point 5-6 : Limestone

Model Analysis

The simplified Bishop method neglects the interslices shear forces (Bishop, 1955). The factor of safety equations is derived by taking moments about the center of rotation. In the other words, the simplified Bishop method corresponds to the moment equilibrium factor of safety equation. In general, the difference between the simplified

Bishop factor of safety satisfying both force and moment equilibrium, decreases as a particular slip surface has an increasing planar portion (Fredlund, Krahn & Pufahl, 1981).

As a result of numerical analysis studies made, the factor of safety obtained for overturning and sliding, bearing capacity and stability are given in Table 2.

When the result of the analysis is evaluated, the factor of safety for section A is greater than the value of 1.50 according to Bishop method. ($FS > 1.50$)

Table 2. Factor of Safety in Numerical Analysis

Analysis Type		Factor of Safety
Wall Analysis	<i>Overturning Analysis</i>	1.88 > 1.50
	<i>Sliding Analysis</i>	1000 > 1.50
Bearing Capacity		1.57 > 1.50
Stability (<i>Bishop-Optimization</i>)		2.19 > 1.50

The most critical slip circle obtained with the optimization on the section and according to the Bishop method is also shown in Figure 4.

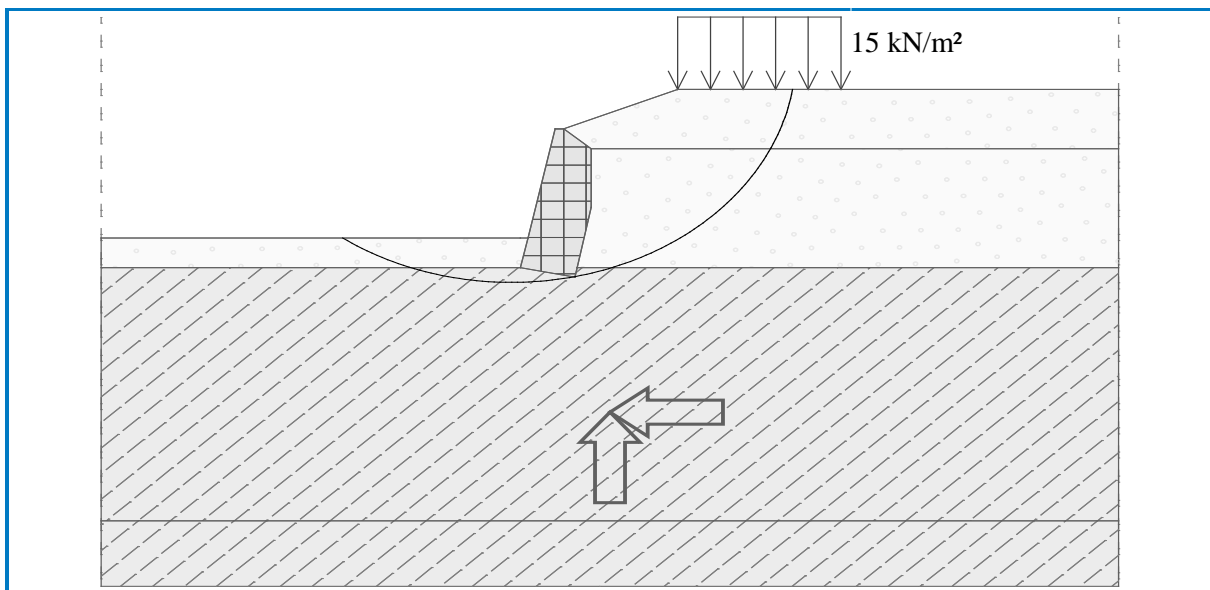


Figure 4. Most Critical Slip Circle

Conclusion

In this study, the factor of safety of the gravity wall were evaluated according to the Bishop method and the critical slip circle was determined according to numerical analysis. Site conditions and soil profiles were considered in this study based on literature and site studies.

It has been understood that there are no bearing capacity and settlement problems in the calculations made on the gravity wall located in the fishing port area. As a result of the numerical analysis, the factor of safety of sufficient magnitude were obtained in the wall investigations (overturning and sliding), bearing capacity and stability related to the gravity wall and no problems were observed.

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A COMPARATIVE STUDY OF VARIOUS POROUS ADSORBENTS FOR CO₂ ADSORPTION

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Abstract: Zeolites, metal organic frameworks (MOFs), carbon nanotubes, polymers, and activated carbons have been commonly used as porous adsorbents for CO₂ adsorption. The objective of the study was to prepare low-cost activated carbon from carob stones and compare its adsorption capacities for CO₂ with that of commercial mesoporous silica and four zeolites (zeolite, 4A zeolite, ammonium Y and sodium Y zeolites). CO₂ adsorption on these porous adsorbents was investigated by using volumetric adsorption apparatus, TriStar II 3020 at room temperature and at pressures up to 900 mmHg. The CO₂ adsorption capacities (wt%) were determined using the values of the quantity adsorbed at 900 mmHg. It could be confirmed that chemical activation plays an important role in determining the porous structure and amount of CO₂ adsorbed.

Keywords: Carob stones, zeolite, 4A zeolite, ammonium Y zeolite, sodium Y zeolite, mesoporous silica, activated carbon.

Introduction

Climate change is the result of increasing CO₂ and other greenhouse gases (such as CH₄, HFCs and F₆) emissions. Various techniques (cryogenic separation, absorption and adsorption) for removing CO₂ from gas and thus reducing its impact on climate change have been investigated. Adsorption is most commonly used method for the capture and separation of CO₂ because of low energy requirements and high adsorption capacity (Liu et al. 2011; Liu et al. 2015; Goel et al. 2016). Activated carbon, carbon nanotubes, zeolites, mesoporous silica, metal organic frameworks (MOFs), polymers have been commonly used as adsorbents for CO₂ adsorption. Activated carbon is produced from variety of raw materials such as cherry stones, apricot stones, cornelian cherry stones, olive stones, wood and coal. Activated carbons can be produced by chemical activation. Chemical activation is a single step method for the preparation of raw material in the presence of chemical agent such as KOH, NaOH, LiOH, ZnCl₂ and H₃PO₄ (Erdogan 2016; Erdogan and Erdogan 2016). There are several study for CO₂ adsorption in the literature. Boyjoo et al. (2017) produced activated carbon from Coca Cola® for CO₂ adsorption. They found the adsorption capacity of the KOH activated carbon as 5.22 mmol/g. Ramli et al. (2014) investigated the effect of pressure and temperature on the adsorption of CO₂ on MCM-41. Sayari et al. (2011) exhibited a high CO₂ adsorption capacity 1.55 mmol/g at 55 C. Zeolite like metal organic frameworks with sod and rho topologies have been investigated for CO₂ adsorption by Chen et al. (2011). They found the adsorption capacities of sod-zeolite like metal organic framework and rho-zeolite like metal organic framework as 53 and 51 mg/g, respectively. Osler et al. (2017) reported that impregnating chitosan onto multiwalled carbon nanotubes increased their CO₂ adsorption capacity by 650%. The main objects of this study are: (i) to study the feasibility of using the activated carbon produced from carob stones as a low-cost adsorbent for CO₂ adsorption, (ii) to compare its CO₂ adsorption capacity with that of six commercially available typical adsorbents with different porosity and texture, i.e. activated carbon, mesoporous silica and four types zeolites (zeolite, 4A zeolite, ammonium Y and sodium Y zeolites).

Materials and Methods

In this study, carob stones were obtained from Antalya in Turkey. The precursor, carob stones were first air dried, then crushed. Then, carob stones were contacted with dilute a 15 vol.% sulfuric acid solution for 12 hours and washed with hot distilled water. Zeolite (Z), 4A zeolite (4AZ), ammonium Y (AYZ) and sodium Y zeolites (SYZ) and mesoporous silica (MCM-41) were purchased from Sigma-Aldrich.

Preparation of the activated carbon: 20 g of dried carob stones (<2 mm) was mixed in a beaker with 200 mL of KOH solution which corresponded to an impregnation ratio of 4:1 (weight of impregnation reagent/weight of carob stones) for 10 hours at 65°C. The mixtures were immersed in the ultrasonic bath for 120 minutes at 65°C and then the impregnated sample was then dried over a night in a moisture oven at 120°C. Then, the impregnated sample was carbonized in a tube furnace (Protherm STF) under N₂ flow at a heating rate of 10°C/min up to 700°C for 1 hour. After the activation, the sample was allowed to cool down to the room temperature under N₂ flow before its removal from the furnace. The activated sample was washed several times with HCl and hot distilled water to

remove residual chemicals until it did not give chloride reaction with AgNO_3 . The activated sample was dried for 6 hours at 120°C . Activated sample was stored in a sealed flask and labelled. The pores of activated carbon were characterized by analysis of N_2 adsorption-desorption isotherms at 77 K using Micromeritics ASAP 2020 (Erdogan 2018c).

Characterization of porous adsorbents and CO_2 adsorption measurement: The surface physical properties of adsorbents were characterized with an automated gas sorption apparatus (Micromeritics TriStar II 3020 and ASAP 2020) using N_2 as adsorbate at -196°C . Prior to measurements, the porous adsorbents were degassed for 4 hours under vacuum at 300°C . The BET surface area was calculated using nitrogen adsorption data in the relative pressure (P/P_0) range of 0.04 to 0.2. The total pore volume was calculated from the amount of adsorbed nitrogen at $P/P_0=0.99$. The micropore volume of the porous adsorbents was calculated by using the t-method analysis (Erdogan 2017a; 2018a). CO_2 adsorption-desorption isotherms of the produced activated carbon and commercially porous adsorbent samples were measured using a Micromeritics TriStar II 3020 instrument, which is a static volumetric apparatus. The equilibrium experiments were conducted at 25°C and at pressures up to 900 mmHg. The CO_2 adsorption capacities were determined using the values of the quantity adsorbed at 900 mmHg.

Results and Discussion

The N_2 adsorption-desorption isotherms of the activated carbon (AC) is shown in Fig. 1. It can be seen that, activated carbon possessed a combination of type I and type IV isotherms according to IUPAC classification. Appearance of hysteresis loop indicates the presence of mesopores. The isotherm reveals mesoporosity but also strong signs of microporosity

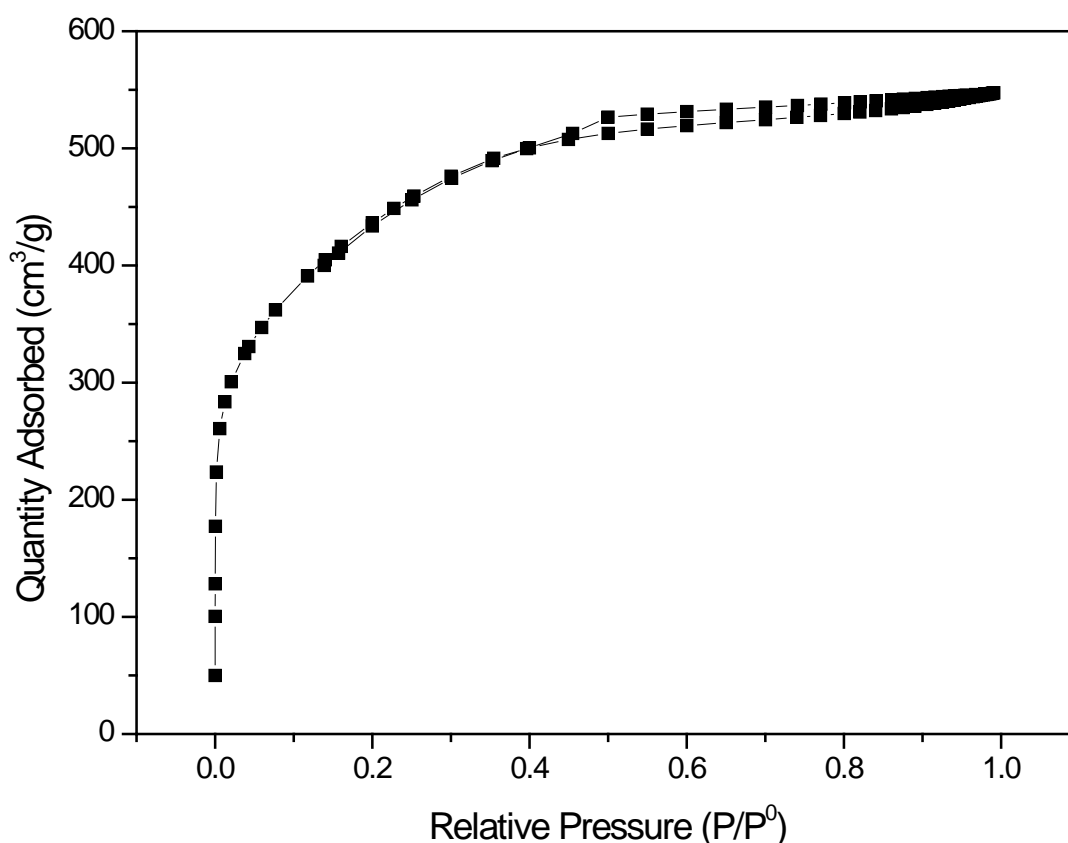


Figure 1. The adsorption-desorption isotherms of activated carbon sample (AC).

Average pore widths and pore volumes were calculated from the nitrogen adsorption isotherm data by t-method analysis. Table 1 gives the values of the BET surface areas, Langmuir surface areas, total pore volumes, micropore volumes and average pore widths which were calculated by using the nitrogen adsorption-desorption data obtained at 77 K. The BET and Langmuir surface areas were found for the AC produced with KOH activation, as 1480.96

and 2288.31 m²/g, respectively. In our previous studies we have reported that the BET surface areas and pore volumes and average pore widths of MCM-41 (Oguz Erdogan and Erdogan 2018), AYZ and SYZ (Erdogan 2018a), Z, 4AZ (Erdogan 2018b). BET surface areas of MCM-41, AYZ, SYZ, Z and 4AZ adsorbents were found as 689.32, 736.92, 766.61, 6.874 and 18.09 m²/g, respectively. Average pore widths for MCM-41 and 4AZ were found as 4.32 ve 19.391 nm, respectively and it was reported that these adsorbents have mesoporous structure. Average pore widths for AYZ, SYZ and Z were found as 1.945, 1.918 ve 1.255 nm, respectively and it was reported that these adsorbents have microporous structure.

Table 1: Physical characteristics of the activated carbon sample (AC).

BET surface area (m ² /g)	1480.96
Langmuir surface area (m ² /g)	2288.31
Total pore volume (cm ³ /g)	0.845
Micropore volume (cm ³ /g)	0.140
Average Pore Width (nm)	2.283

CO₂ Adsorption: Figure 2 represents the carbon dioxide adsorption-desorption isotherms of these six porous adsorbents at 25 °C. The adsorption isotherms indicate that the CO₂ adsorption capacity at 900 mmHg for SYZ is higher than the other porous adsorbents. The chemically activated carbon sample (AC) showed better CO₂ adsorption capacity as compared to the commercial Z, AYZ, 4AZ and MCM-41.

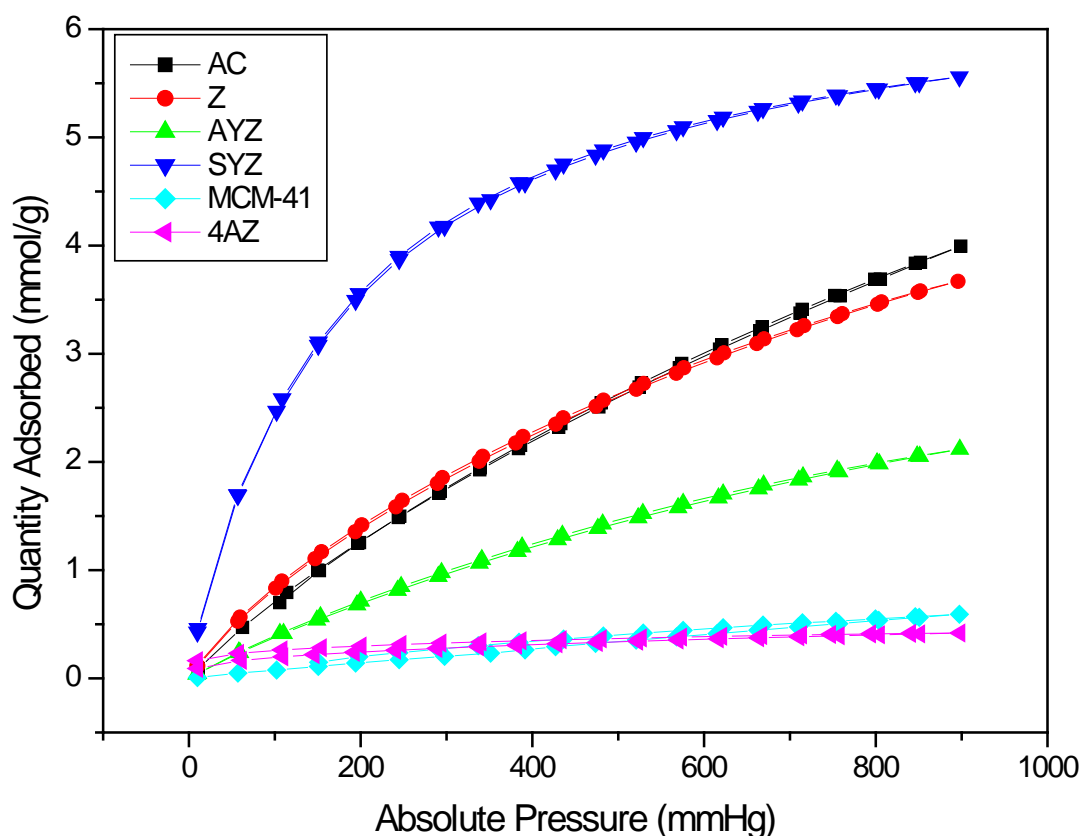


Figure 2. The adsorption-desorption isotherms of CO₂ on the porous samples.

The CO₂ adsorption capacities of these porous adsorbents are shown in Figure 3 and Table 2. The CO₂ adsorption capacities of the SYZ, AC, Z and AYZ were found as 19.657, 14.951, 13.905 and 8.524 wt %, respectively.

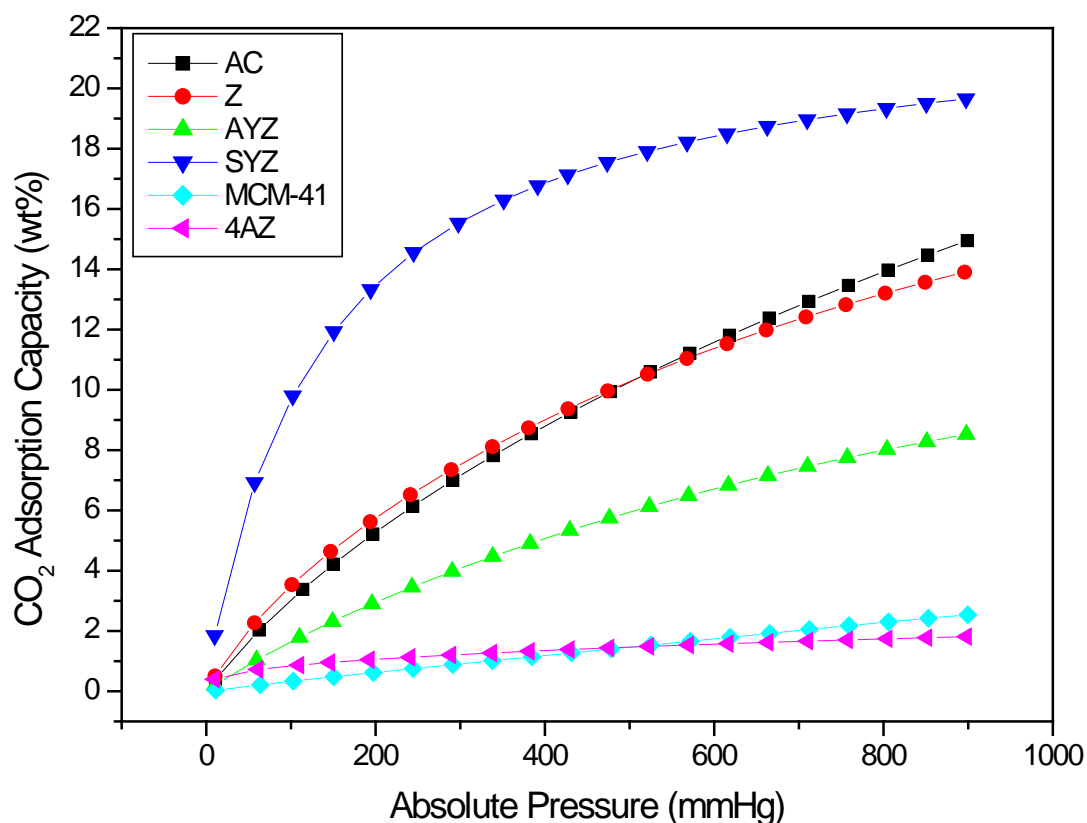


Figure 3. The CO₂ adsorption capacity (wt%) collected at 298 K for the AC, Z, AYZ, SYZ, MCM-41 and 4AZ.

The CO₂ adsorption capacities of the MCM-41 and 4A zeolite were found as 2.540 and 1.811 wt %, respectively. The highest CO₂ adsorption capacities of 19.657 and 14.951 wt % were achieved with SYZ and AC, respectively. It could be confirmed that KOH activation plays an important role in determining the porous structure and amount of CO₂ adsorbed. A similar phenomenon was reported in previous studies (De Andres 2013; Boyjoo et al. 2017).

Table 2: CO₂ adsorption capacities (wt%) of porous adsorbents.

Adsorbents	CO ₂ adsorption capacities (wt%)
AC	14.951
Z	13.905
AYZ	8.524
SYZ	19.657
MCM-41	2.540
4AZ	1.811

Conclusion

We have investigated the adsorption process for CO₂ on six typical adsorbent with different texture, surface area and porosity. The CO₂ adsorption capacities of the SYZ, AC, Z, AYZ, MCM-41 and 4AZ were found as 19.657, 14.951, 13.905, 8.524, 2.540 and 1.811 wt %, respectively. Microporous zeolites and AC showed higher CO₂ adsorption capacities than the mesoporous MCM-41 and 4A zeolite. The CO₂ adsorption capacity of commercial 4A zeolite was found to be 1.811 wt%, while CO₂ adsorption capacity of the KOH activated carbon (AC) was found to be 14.951 wt%. This correspond to 8.26 times increase in the CO₂ adsorption capacity. The adsorption capacity of activated carbon sample obtained from carob stones for carbon dioxide was higher than the investigated

four commercial porous adsorbents. It can be said that chemical activation plays an important role in determining the porous structure and amount of CO₂ adsorbed. This study revealed that carob stones based activated carbon can be used as a highly efficient and economically viable adsorbent for carbon dioxide adsorption.

Acknowledgements

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A Conceptual Approach to Chemistry

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Abstract. Conceptual Chemistry is to introduce chemistry to the conceptual understanding of chemical principles. It is a well-known and famous statement for chemistry that real life practices facilitate the understanding and appreciation of chemistry concepts. Philosophy is worried with total views of the world, and generalizations focus on the risk of producing individual generalizations. Some theorists of science are interested in strange situations in which their reactions to science involve all the actions of the past and present scientific public. The productivity of study areas allocated to chemistry is very diverse. In this paper, we try to give possessions parts of chemistry that can be theoretically diversity from subfields of chemistry.

Keywords: conceptual chemistry, substances, chemical classification

Introduction

When someone talks about chemistry, it keeps him different from the other sciences. And when chemistry teaches chemistry, they accept the concept of chemistry, which includes a complete list of research activities assigned to chemistry (Schummer, 1997; Nye, 1989). Although Nye does not require certain decisiveness, he assumes some general ideas about what is more important for chemistry. He also pointed out that the viewpoint of chemistry should benefit simplify such a concept with theoretical tools by considering these risks. According to him, based on extreme generalizations, blind avoid redeemed attitudes should help. And it should draw consideration to the theoretical problems in chemistry, outside the reduction problems, and how much sciences investigation is probable.

Schummer (1997) underlines that chemists working in quantum chemistry will accept most of their work as conceptual chemistry. For him, it is simply a matter of quantum chemistry to be placed in an area that is not directly concerned with chemistry and physics and other interdisciplinary fields.

Systematic Chemical Knowledge

Chemistry is first concerned with empirical substances and objects (Schummer, 1997). But the focusing is on *material aspects* of the substances and objects. He stated that it has a fixed exchange value within an economical society, which analyse the empirical substances for being a coin. According to him, if the coin is antique, we need to on the history of this tiny substance, and we should learn about its long antiquity from a traditional kingdom. Chemistry is the greatest overall discipline of resources, in the intelligence that it offers the greatest overall system of ideas (Duncan, 1981). He stated that the impressions of general chemistry are appropriate to the discerning about all empirical substances. According to Duncan, the landscape of scientific quantifiable properties be clean only if we expand our every time considerate.

Schummer (1997) characterized material properties by focusing on a certain contextual factor:

- mechanical effects: *mechanical property*
- thermodynamic conditions (temperature, hydrostatic pressure): thermodynamic properties
- electromagnetic fields: electromagnetic properties
- other chemical substances: chemical properties

According to the above characterization, it is easy to determine the standard conditions for each substance since each assay context can be defined by each factor. If two or extra interest factors are collective, new "mixed" material properties "types can be generated.

Cognizable Chemical Species

The usual explaining of 'chemical substances' or 'pure substances' gives the scientific view, that also the matter of 'pure material' has a simple and good-distinct sense (Van Brakel, 1986). He noted that get an undefined homogeneous things and control to find out which one is clean, and which one is diverse by researching observed assets first. Of course, in this step, simple physical solid assets do not permit us to make a true decision. Brakel presented a simple approach in this situation that whatever the resulting values of physical properties are determined (Schummer, 1997). Today's key technique to *distinguish* cleanliness of *known* materials is spectroscopy that does not present a diacritic result.

Chemical Classification Systems

Van Berkel made a classification of substances that if pure substances are determinate as the basic chemical species, chemical classification divide pure substance into substance classes according to chemical similarities. Here, great differences in physical properties is not important. We know that substance classification is not hierarchical in chemistry. But, Van Berkel says, “it is always chemical similarity or dissimilarity, what the classification is about. It is a simple reduction that we do not use sameness classes of the physical solid assets as the principle of matter sorting. Finally we note that, chemically similar behavior makes them closer position (Schummer, 1997).

In his famous book, *Chemistry, Quantum Mechanics and Reductionism*, Primas (1981) stayed that “One might thing that today’s chemists notice a material as belonging to a positive material class, say to alcohols, by spectroscopic incomes, *i.e.* by cultured electromagnetic possessions. A positive typical part of the IR- or NMR-spectrum unmistakably discloses an alcohol, so that chemical possessions seem to be no longer significant”. Of course, this detection is true which chemical assets are low important in chemical properties exercise. We remember that a good strong relationship among certain chemical features of alcohols and certain characteristics of spectra give us a good idea to select the later for checking (Schummer, 1997).

It is continuous developing scientific ring that the logical relations are a special undersized portion of philosophical logic. In this section, chemistry has found its different and meaning ways to settle the classifier states (Schummer, 1997; Beretta, 1993). He also gives that chemical substance classifier gives us a certain kind of circularity, because of the ideas of ‘chemical likeness’ and ‘material class’ determine each other that from the logical point of view. Beretta made the following definitions for the classificatory situations (Schummer, 1997 and 2002):

- If chemically similar, the two substances belong to the same class of substances.
- If each reacts under the same conditions to form product substances in a common substance class, the two substances are chemically similar.

We add that the “substance class concepts” follow each other staying active.

Result

Subsequently, when discussed on the substances, they are considered to be the basic chemical species defining them in empirical and theoretical ways. It is presented some views of the authors on the conceptual chemistry: It was determined that basic chemical species are also pure substances with categories as the main way of chemical classification. It was stated that the definitive concepts of the classes of the classes are carried out only in terms of chemical similarity.

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A New Programming Language

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Abstract: Everyone knows that hardware does not mean anything without software. Software is developed by programming languages. One of the most important factors determining the reach of software is the characteristics of the programming language. Many rich applications can be developed with a language that is fast, easy to learn, and has a large library.

The aim of this work is to provide information about the Go programming language that a powerful, fast, easy to learn programming language. Go programming language, developed by Google. Many of the deficiencies of traditional programming languages have been eliminated. It appeared in 2009 and 1.0 version was released in 2012. With the Go programming language, fast and sophisticated projects that can work on the web or in a different environment can be produced. It is an open-source programming language that is evident by the notion of rule, flexibility and speed. In a short time, he was among the fastest growing programming languages.

Keywords: Programming Languages, Go Programming Language, Software Development, Google, Open Source Software, Web Programming

Introduction

The Go language was originally a programming language developed by Google in 2007 by Robert Griesemer, Rob Pike and Ken Thompson. It is a static written language and has a syntax similar to that of C programming language. It provides many advanced built-in types such as garbage collection, type security, dynamic typing, variable-length arrays, and key-value maps. It also provides a rich standard library. The Go programming language was launched in November 2009 and is used in some of Google's systems.

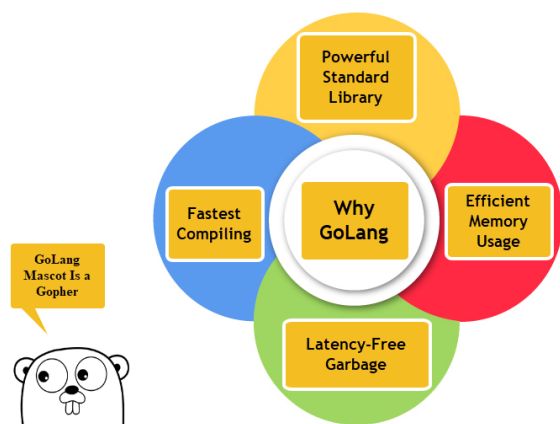


Figure 1: Why Go Programming Language?

Google, a large technology and company, for years C, C ++, Java, Python and so on. It uses many different programming languages. These technologies have advantages and disadvantages. You may not notice them in small or under-load projects, but they appear in large projects. These are performance, compilation (in large projects may take hours to compile the source code) security, compliance, time management, resources (hardware, money, energy, etc.) can be listed in many headings such as management. For many years, Google has developed both an operating system for internal systems and many technologies and algorithms to solve many problems like these. Go programming language is one of them. The Go programming language has been initiated by Google to solve its problems. Therefore, all features added to or not added to the Go are completely determined by the software experiences of the years. If you look at the Go programming language a little bit, you might see a question like yok “Why not generics?”. The answer of this question from the developer team to summarize; Generics are not fast. The point of view of Go is so clear. The goal is to create a flexible, fast and powerful language with little language capability and rule. In this article, basic features of Go programming language will be explained. The ease of bringing to the software world will be discussed. Sample codes will be explained. GoLang, which is a fast language, will be examined with its basic lines. Go programming language has many similarities to the C programming language.

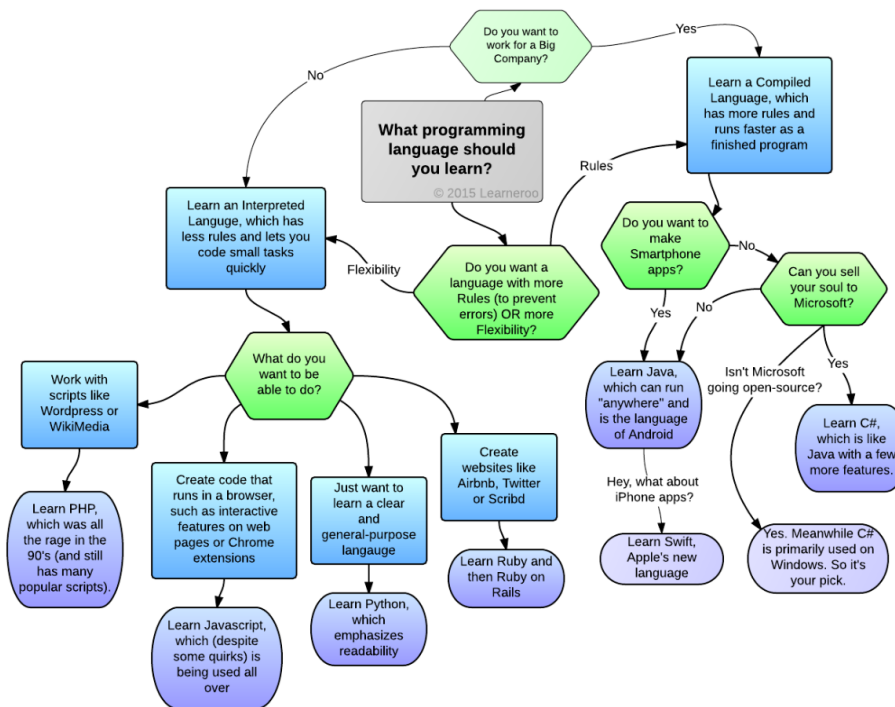


Figure 2: What Programming Language Should You Learn ? (Learneroo, 2015)

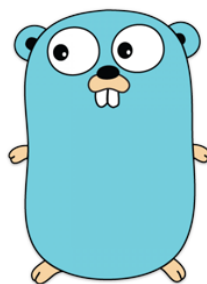
1. Features Of Go Programming Language

Most important features of Go programming language are listed;

- Compile time is fast.
- Support for environment adopting patterns similar to dynamic languages. For example, type inference (`b := 10` is valid declaration of a variable `b` of type `int`)
- GoLang programs are simple and safe.
- Support for Interfaces and Type embedding.
- GoLang is object oriented

To keep the GoLang simple, the following features commonly available in other similar languages are omitted in GoLang;

- Type inheritance
- Method or operator overloading
- Circular dependencies among packages
- Pointer arithmetic
- Generic programming



GoLang

Concurrency

Scalability

Error Checks

Compiled Language

Garbage Collection

Cross Platforms

Figure 3: GoLang Top Advantages

Python	Go
<pre>def adding(a,b): return a + b</pre> <p><i>Lambda using;</i></p> <pre>adding = lambda a,b: a + b</pre>	<pre>func adding(a, b int) int { return a + b }</pre> <p><i>Lambda using;</i></p> <pre>adding := func(a, b int) int { return a + b }</pre>

Figure 4: Python and GoLang Class Functions Using

2. Create, Compile Go Programs

```
package main

import "fmt"

func main() {
    fmt.Println("Hello, World !\nGo is fast")
}

Hello, World !
Go is fast
```




Figure 5: First Go Program

A Go program lines length can vary from 4 lines to millions of lines. It should be written into one or more text files with the extension ".go". For example, firstapp.go. You can create a Go program use Notepad or Notepad++ in Windows, Nano in Linux, TextEdit in macOS etc. Other, you have to download Go compiler software. You can download golang.org for your operating systems.

A compiler is computer software that transforms computer code written in one programming language (the source language) into another programming language (the target language). Compilers are a type of translator that supports digital devices, primarily computers. The name compiler is primarily used for programs that translate source code from a high-level programming language to a lower level language (e.g., assembly language, object code, or machine code) to create an executable program.

Now Go Compiler stable version is 1.11. You can download Go compiler from this address: <https://golang.org/dl/>

Go compiler list (As Operating System): Windows, Linux, macOS, FreeBSD

Install Compiler on Windows;

After download Go compiler, run "setup". Compiler will be install to "Go" folder. Setup software will be make all of go environment.

You can verify installation Go compiler. Open command line (Cmd)

Conclusions

The Go programming language is quite simple and comfortable. It is completely open source. It has a fast compilation structure. Provides increased speed of operation with large data. The standard library is wide. Go programming language is a good choice for programmers who are looking for a new programming language. This article describes the basic characteristics of Go programming language. This language will provide a basis for new programmers.

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A NUMERICAL STUDY USING MIXTURES OF WATER - ETHYLENE GLYCOL BASED NANOFLUIDS ON LAMINAR HEAT TRANSFER OF AN ANNULUS

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Abstract: In this study, developing laminar flow and heat transfer behaviour of ethylene glycol (EG) and water mixture based SiO₂ nanofluids in an annulus have been numerically investigated. A constant heat flux was applied to the inner walls of the annulus with 100 W / m². Water 100% - EG 0%, water 50% - EG 50% and water 0% - EG 100% mixtures have been utilized as the base fluids. SiO₂ nanoparticles have been used with $d = 20$ nm and volume fractions $\phi = 0\%-4\%$. The Reynolds number varies from 200 to 1000. The physical model of the test section mainly consists of two concentric horizontal cylinders that form an annular space ranging from two interconnected elliptical tubes with axis ratio ($r_1/r_2=1/2$) placed at the centre of a circular cylinder with major radius of $2r_2$ with the length of 1 m. Governing equations have been solved with Ansys Fluent programme. The velocity distribution, temperature contours, average Nusselt number and thermal-hydraulic performance have been analysed and presented. The effects of nanofluids have been examined on heat and flow fields and it has been observed that the heat transfer increases together with the nanoparticle volume concentration. When the nanofluid is used in a forced convection, the amount of heat transfer increases as the Reynolds number increases. The highest value of the average Nusselt number was obtained in the EG based nanofluid with $\phi=4\%$ and $Re=1000$ as 29.14, and the lowest value was obtained in the water-based nanofluid with $\phi=4\%$ and $Re=200$ as 5.61. Results show that the use of nanofluid in the annulus channel increases the thermal performance of systems.

Key words: Elliptic annulus, heat transfer, nanofluid, CFD.

Introduction

Heat transfer describes the exchange of thermal energy, between physical structures relying at the temperature and pressure, by means of dissipating heat. The essential modes of heat transfer are conduction, convection and radiation. Engineers also consider the transfer of mass of differing chemical species, either cold or hot, to attain heat transfer. Convection is concerned with the transfer of thermal energy in a moving fluid (liquid or gas). It's far ruled by means of two phenomena: the movement of energy because of molecular vibrations and the massive-scale movement of fluid particles (2018). In preferred, convection is of sorts, forced convection and free convection. Forced convection takes place while a fluid is forced to flow. For example, a fan blowing air over a heat exchanger is an instance of forced convection. In free convection, the majority fluid movement is due to buoyancy effects. As an example, a vertical heated plate surrounded by using quiescent air causes the air surrounding it to be heated. Due to the fact hot air has a decrease density than cold air, the hot air rises. The void is crammed by using cold air and the cycle continues. Mixed convection heat transfer exists whilst natural convection currents are the identical order of importance as pressured flow velocities. The time period "mixed Convection" is also used, and the flows may be inner or external to a bounding floor (Joye, 2003). Annular pipe flow is regularly encountered in engineering applications which includes heat exchangers, combustion systems, and drilling operations inside the oil and gas industry. Furthermore, annular pipe flow gives a perception into the trouble of turbulent flows with curved walls. Commonly, flow in a flat channel generates a symmetrical velocity profile and makes the positions of zero shear stress and most velocity coincident. However, the flow in a concentric annular channel does not result in a symmetric velocity profile. The asymmetric velocity profiles end result from the interaction of flow zones with different Reynolds numbers primarily based at the outer and inner cylinder radii. In the case of annular pipe flow, boundary layers exist and each has a different distribution of turbulent quantities.

Furthermore, pipe and channel flows are the restricting cases of annular pipe flow. For a high radius ratio, the profiles of turbulent quantities near the internal cylinder are just like those of the turbulent channel flow approximately a cylinder in axial go with the flow. Alternatively, the profiles near the outer wall are similar to those of turbulent pipe flow. Notwithstanding the importance of the hassle, the numerical simulation of turbulent pipe flow has received less interest than plane channel flow due to the numerical difficulties in precisely treating curved geometries (Ghaffari Motlagh, Ahn, Hughes, & Calo, 2013). Conceptually, investigation of the heat transfer enhancement in annuluses is vital. The heat transfer enhancement technology has been stepped forward and broadly used inside the heat exchanger applications. One of the extensively used heat transfer enhancement technique is placing distinct fashioned elements with unique geometries in channel flow (Khaled, 2007; Mokhtari Moghari, Akbarinia, Shariat, Talebi, & Laur, 2011; Shoji, Sato, & Oliver, 2003; Zimparov, 2001). The tubes of elliptic cross section have drawn precise interest due to the fact that they were determined to create less resistance to the cooling fluid which ends up in less pumping power (Velusamy, Garg, & Vaidyanathan, 1995). Velusamy and Garg (Velusamy & Garg, 1996) have studied mixed and forced convection fluid flow in ducts with elliptic and circular cross sections. They found that irrespective of the value of the Rayleigh range, the ratio of friction issue at some stage in mixed convection to the corresponding value at some stage in forced convection is low in elliptical ducts in comparison to that in a circular duct in addition to the ratio of Nusselt quantity to friction factor is higher for elliptic ducts in comparison to that for a circular duct. Notwithstanding the truth that the secondary flow in elliptical ducts is very small compared to the move sensible bulk flow, secondary motions play a substantial role by means of cross-flow moving momentum, heat and mass. On the other hand, the principle benefit of the use of elliptic ducts than circular ducts is the boom of heat transfer coefficient (Sakalis, Hatzikonstantinou, & Kafousias, 2001). As a result, heat transfer enhancement in these devices is crucial, nanofluids usage may be play powerful roles to increase heat transfer coefficient. in the course of the beyond decade technology to make particles in nanometre dimensions changed into progressed and a new type of strong-liquid mixture this is referred to as nanofluid, was seemed (Choi, S. U. S., n.d.). The nanofluid is an increase form of fluid containing small quantity of nanoparticles (usually less than 100 nm) which might be uniformly and stably suspended in a liquid. The dispersion of a small amount of solid nanoparticles in conventional fluids inclusive of water or EG modifications their thermal conductivity remarkably. Thermal conductivity of nanofluids has been measured through several authors with specific nanoparticle extent fraction, material and dimension in several base fluids and all findings show that thermal conductivity of nanofluid is higher than the bottom fluids. Among them, Lee et al. (Lee, Choi, Li, & Eastman, 1999) established that oxide ceramic nanofluids including CuO or Al₂O₃ nanoparticles in water or ethylene-glycol show off more advantageous thermal conductivity. As an instance, the usage of Al₂O₃ nanoparticles having suggested diameter of thirteen nm at 4.three% quantity fraction expanded the thermal conductivity of water below stationary conditions via 30% (Masuda, Ebata, & Teramae, 1993). However, large particles with an average diameter of 40 nm led an increase of less than 10% (Choi, S. U. S., n.d.) Distinctive ideas were proposed to provide an explanation for this enhancement in heat transfer. Xuan and Li (Xuan, 2000) and Xuan and Roetzel (Xuan & Roetzel, 2000) have recognized two reasons of improved heat transfer with the aid of nanofluids: the increased thermal dispersion because of the chaotic motion of nanoparticles that accelerates energy exchanges inside the fluid and the enhanced thermal conductivity of nanofluid. Then again, Keblinski et al. (Keblinski, Phillpot, Choi, & Eastman, 2002) have studied 4 possible mechanisms that contribute to the increase in nanofluid heat transfer: Brownian motion of the particles, molecular-stage layering of the liquid/particle interface, ballistic heat transfer in the nanoparticle and nanoparticle clustering. Similarly to Wang et al., (Wang, Xu, & Choi, 1999) they showed that the effects of the interface layering of liquid molecules and nanoparticles clustering could offer paths for speedy heat transfer. These days, Izadi et al. (Izadi, Behzadmehr, & Jalali-Vahid, 2009) studied the hydrodynamic and thermal behaviours of an Al₂O₃/water nanofluid flowing through an annulus underneath a laminar glide regime. In their observe, a single-section version was used for nanofluid simulation. The effects indicated that the particle volume concentration has no considerable effect on the dimensionless axial speed, however affects the temperature subject and increases the heat transfer coefficient. Mirmasoumi and Behzadmehr (Mirmasoumi & Behzadmehr, 2008) investigated the laminar mixed convection heat transfer of Al₂O₃/water nanofluid flowing thru a horizontal tube numerically. A two-phase aggregate model was used to explain the hydrodynamic and thermal behaviour of the nanofluid. The numerical results indicated that inside the completely developed region the particle concentration has insignificant results on the hydrodynamic parameters, whilst it has crucial results at the thermal parameters. Furthermore, the consequences showed that nanoparticle concentration is higher at the lowest of the take a look at tube and on the close to wall region. However, Akbarinia (Akbarinia, 2008) and Akbarinia and Behzadmehr (Akbarinia & Behzadmehr, 2007) numerically investigated the fully developed laminar mixed convection of Al₂O₃/water nanofluid flowing through a horizontal curved tube. In their research, 3-dimensional elliptic governing equations were used. The results of the buoyancy pressure, centrifugal pressure and particle concentration on the heat transfer performance have been provided. The results confirmed that the particle concentration has no direct impact on the secondary flow, axial velocity and pores and skin friction coefficient. However, while the buoyancy pressure is more important than the centrifugal pressure, the impact of particle concentration at the entire fluid temperature can affect the hydrodynamic parameters.

Furthermore, the consequences also indicated that the buoyancy force decreases the Nusselt number while the particle concentration has a high quality impact on the heat transfer enhancement and on the skin friction reduction. In this paper, a numerical investigation on heat transfer performance and flow fields of different nanofluids flows through elliptic annulus in a laminar and turbulent flow regimes. The three-dimensional continuity, Navier–Stokes and energy equations are solved by using finite volume method (FVM) and the SIMPLE algorithm scheme is applied to examine the effects of laminar and turbulent flow on heat transfer characteristics. Dawood et al (Dawood, Mohammed, Sidik, & Munisamy, 2015) evaluated the effects of four different types of nanoparticles, Al_2O_3 , CuO , SiO_2 and ZnO , with different volume fractions (0.5–4%) and diameters (25–80 nm) under constant heat flux boundary condition using water as a base fluid. The Reynolds number of laminar flow was in the range of $200 \leq \text{Re} \leq 1500$, while for turbulent flow it was in the range of $4000 \leq \text{Re} \leq 10,000$. The results have shown that SiO_2 –water nanofluid has the highest Nusselt number, followed by ZnO –water, CuO –water, Al_2O_3 –water, and lastly pure water. They showed that the Nusselt number for all cases increases with the volume fraction but it decreases with the rise in the diameter of nanoparticles. In all configurations, the Nusselt number increases with Reynolds number. In their study, it is found that the glycerine– SiO_2 shows the best heat transfer enhancement compared with other tested base fluids.

As seen in those and/or similar works, heat transfer mechanisms in annulus can be very complicated and this geometry might be regarded in many commercial set up. Consequently, the existing work targets to investigate some behaviours of nanofluid flow in an elliptic annulus. As a result, the results of volume fraction and specific base fluids comprised of water and ethylene glycol mixtures on the thermodynamics and hydrodynamics parameters of a 3-D laminar forced convection through an elliptic concentric annulus were studied. Effect of water and ethylene glycol volume fractions were addressed as EG fractions ranges from 0% to 100% with a 50% increment. This research covers Reynolds range within the range of $200 \leq \text{Re} \leq 1000$ (laminar) with a diameter of 20 nm silicon oxide (SiO_2) nanoparticle. Different volume fractions SiO_2 nanoparticles within the base fluids ranged from 0% to 4% were also considered. Outcomes of pursuits which include Nusselt wide variety for laminar forced convection heat transfer in an elliptic annulus were stated to illustrate the impact of nanofluids on these parameters.

Physical Model

The physical model of the test section mainly consists of two concentric horizontal cylinders used to form an annular space ranging from an integrated double elliptical tube placed at the center of a circular cylinder. The outer cylinder was made from aluminium of 20 mm outer diameter, 1 mm thickness, and 500 mm length. The inner elliptic cylinder was made of aluminium with a major radius (r_2) of 10 mm and a length of 500 mm that had an axis ratio ($r_1/r_2=1/2$). The internal wall of the annular space (elliptic tube surface) was maintained under constant heat flux (q_h). Whereas the external wall of the annular space (circular cylinder surface) was kept insulated (T_c). The schematic diagram of the annular space under consideration and coordinate system are shown in Figure 1.

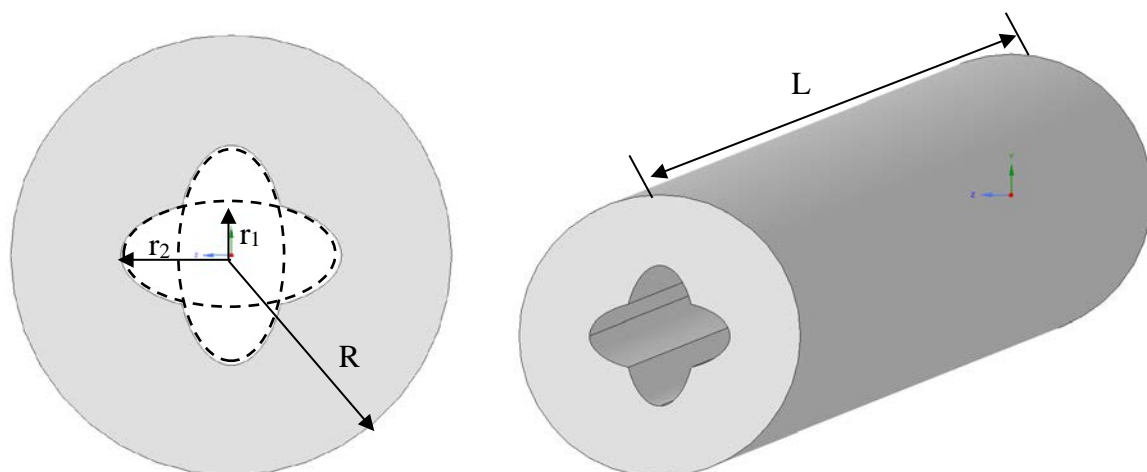


Figure 1. Schematic diagram of the computational domain of annulus.

Pure water, pure ethylene glycol (EG) and water and EG mixtures as the base fluids are selected and the thermophysical properties assumed to be temperature independent. The thermo-physical properties of base fluids and SiO_2 nano particle material used for simulation are shown in Table 1.

Table 1: The thermophysical properties of different nanoparticles and different base fluids at $T = 300$ K.

Thermo-physical property	Unit	100%W-0%EG	50%W-50%EG	0%W-100%EG	SiO ₂
Density, ρ	kg/m ³	997,1	1071,1	1132	2200
Specific heat, c_p	J/kgK	4180	3300	2349	703
Dynamic viscosity, μ	kg/ms	0,0009	0,0034	0,0151	-
Thermal conductivity, k	W/mK	0,613	0,37	0,258	1,2
Thermal expansion coefficient, β	1/K	0,00021	0,00039	0,00057	0,0000055

Geometry and the governing equations

The phenomenon under consideration is governed by the steady three-dimensional form of the continuity; the time-averaged incompressible Navier–Stokes equations and energy equation are used to describe the heat transfer in the annulus. Heat is transferred between the fluids through the wall which is separating them. Several assumptions were made on the operating conditions of the annulus: (i) the annulus operates under steady-state conditions and three-dimensional; (ii) the nanofluid is Newtonian and incompressible; (iii) the fluid is in single phase and the flow is laminar; (iv) the external heat transfer effects are ignored; (v) the outer walls of the annulus are adiabatic; and (vi) constant thermophysical properties are considered for the nanofluid.

The governing equations for flow and heat transfer in the annulus are as follows (Edition, Ashgriz, & Mostaghimi, 2002):

Continuity equation:

$$\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{v}) = 0 \quad (1)$$

Momentum equation:

$$\rho \frac{D\mathbf{v}}{Dt} = \nabla \cdot \boldsymbol{\tau}_{ij} - \nabla p + \rho \mathbf{F} \quad (2)$$

Energy equation:

$$\rho \frac{De}{Dt} + \rho \cdot (\nabla \mathbf{v}) = \frac{\partial Q}{\partial t} - \nabla \cdot \mathbf{q} + \Phi \quad (3)$$

Where \mathbf{v} is the fluid velocity vector, \mathbf{F} is the body forces, \mathbf{q} represents heat transfer by conduction and Φ is the dissipation term. These governing equations along with the given boundary conditions are solved to obtain the fluid temperature distribution and pressure drop along the annulus. These data were then used to examine the thermal and flow fields along the annulus.

Boundary conditions

At the elliptic inlet, different velocities depending on the values of Reynolds number were used, and the outlet temperature was taken as $T_{in} = 300$ K. The constant heat flux used was 100 W/m^2 to heat up the inside walls. At the domain outlet the flow and heat transfer are assumed to be fully developed. The boundary condition can be expressed as follows:

At the inlet of annulus:

$$u_r = u_\theta = u_z = 0 \text{ and } T = T_{in} \quad (4)$$

At the fluid wall interface:

$$u_r = u_\theta = u_z = 0 \text{ and } q_{w,i} = -k_{eff} \frac{\partial T}{\partial r} \quad (5)$$

At the outlet of annulus free pressure outlet is applied:

$p = p_0$ and an overall mass balance correction is applied.

Thermophysical properties of nanofluids

In order to carry out simulations for nanofluids, the effective thermophysical properties of nanofluids must be calculated first. Basically the required properties for the simulations are effective thermal conductivity (k_{eff}), effective dynamic viscosity (μ_{eff}), effective mass density (ρ_{eff}), effective coefficient of thermal expansion (β_{eff}) and effective specific heat (c_{peff}) are given in Table 1. The effective properties of mass density, specific heat and coefficient of thermal expansion are actually calculated according to the mixing theory.

By using Brownian motion of nanoparticles in three-dimensional horizontal concentric annulus, the effect thermal conductivity can be obtained as following mean empirical correlation (Ghasemi & Aminossadati, 2010):

$$k_{eff} = k_{static} + k_{brownian} \quad (6)$$

$$k_{static} = k_f \left[\frac{(k_p + 2k_f) - 2\phi(k_f - k_p)}{(k_p + 2k_f) - \phi(k_f - k_p)} \right] \quad (7)$$

$$k_{brownian} = 5 \times 10^4 \beta \phi \rho_f c_{p,f} \sqrt{\frac{\kappa T}{\rho_p d_p}} f(T, \phi) \quad (8)$$

where:

Boltzmann constant: $\kappa = 1.3807 \times 10^{-23}$ J/K

Value of the base fluid fraction goes with the nanoparticle, β is calculated as following:

$$\beta_{SiO_2} = 1.9526(100\phi)^{-1.4594} \quad 1\% \leq \beta \leq 10\% \quad 298 \text{ K} \leq T \leq 363 \text{ K} \quad (9)$$

Modelling function, $f(T, \phi)$,

$$f(T, \phi) = (2.8217 \times 10^{-2} \phi + 3.917 \times 10^{-3}) \left(\frac{T}{T_0} \right) + (-3.0669 \times 10^{-2} \phi - 3.3911123 \times 10^{-3}) \quad (10)$$

for $1\% \leq \beta \leq 4\% \quad 300 \text{ K} \leq T \leq 325 \text{ K}$

By using Brownian motion of nanoparticles the effective viscosity can be obtained by using the following empirical correlation (Mohammed, Abbas, & Sherif, 2013):

$$\mu_{eff} = \mu_f \frac{1}{(1 - 34.87(d_p/d_f)^{-0.3} * \phi^{1.03})} \quad (11)$$

$$d_f = \left[\frac{6M}{N\pi\rho_f} \right]^{1/3}$$

where M is the molecular weight of base fluid, N is the Avagadro number, $N = 6.022 \times 10^{23} \text{ mol}^{-1}$, ρ_f is the mass density of the based fluid calculated at temperature $T_0 = 293 \text{ K}$.

The effective density of the nanofluid can be calculated using (Ghasemi & Aminossadati, 2010):

$$\rho_{eff} = (1 - \phi)(\rho_f) + \phi\rho_p \quad (12)$$

where ρ_{eff} and ρ_{bf} are the nanofluid and base fluid densities respectively and ρ_s is the density of nanoparticle.

The effective specific heat at constant pressure of the nanofluid c_{peff} is computed using the following equation (Ghasemi & Aminossadati, 2010):

$$(\rho c_p)_{eff} = (1-\phi)(\rho c_p)_f + \phi(\rho c_p)_p \quad (13)$$

where c_{ps} and c_{pbf} are the heat capacity of solid particles and base fluid respectively.

The Nusselt number, the Reynolds number and the friction factor are dimensionless parameters which are calculated, respectively, as follows (Mohammed et al., 2013):

$$Nu = \frac{hD_h}{k_{eff}} \quad (14)$$

where k and h are the thermal conductivity and average heat transfer coefficient of fluid, respectively.

The Reynolds number is defined as:

$$Re = \frac{\rho_{eff} u_m D_h}{\mu_{eff}} \quad (15)$$

where ρ_{eff} , u_m , and μ_{eff} are nanofluid density, mean fluid velocity over the cross section and dynamic viscosity of the nanofluid, respectively.

The hydraulic diameter (D_h) is defined as:

where A is the cross area and P is the wetted perimeter of the cross section.

The friction factor, f , for fully developed flow is expressed as follows:

$$f = \frac{2\Delta p D_h}{L \rho_{eff} u_m^2} \quad (16)$$

and the power required to pump, P , the nanofluid is calculated as follows:

$$P = Q \Delta p \quad (17)$$

where Q is the volumetric flow rate of the nanofluid.

Numerical Solution Method

Grid testing and code validation

The computational domain resulted from the subtraction of the elliptical cylinder section from the circular cylinder section. The grid is made up of triangular elements to improve the quality of the numerical prediction near the curved surfaces.

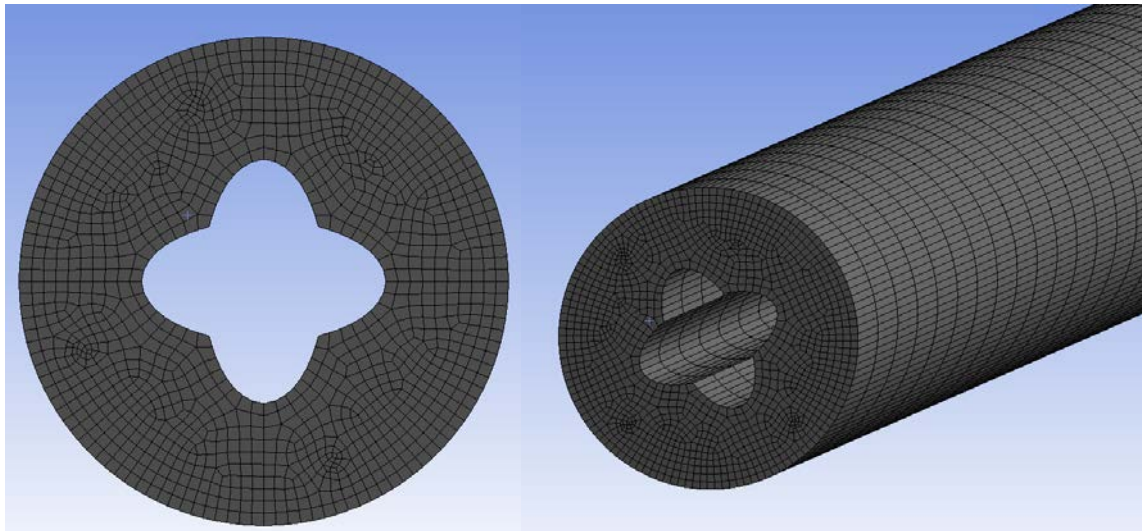


Figure 2. Computational grid of the elliptic annulus.

As shown in Figure 2 the computational grid of the elliptic annulus, built through the mesh generation, three grids types with elements count 153636, 1164822 and 8846771 show no much difference in the values of average Nusselt number and average fanning friction factor. Thus, the grid with 153636 elements is selected in this study as it is found to provide a more stable grid independent solution and due to the fact that resulting in a lower computational cost.

The code validation was done based on the geometry and boundary conditions which were used by (Shah & London, 1978). They studied the thermal characteristics of laminar and turbulent convection heat transfer in a concentric annulus with constant heat flux boundary condition. In this case, the results of the Nusselt number variation were compared with the predictions of the following well-known Shah equation for laminar flows under the constant heat flux boundary condition in the fully developed region as shown in Figure 3. To validate the accuracy of the numerical solutions, the Nusselt number (Nu) and the friction factor times Reynolds number (fRe) of the concentric annular is compared with the theoretical data. It is clearly seen that the deviation between the numerical results and the theoretical data is very low. Therefore, the present numerical predictions have reasonable accuracy.

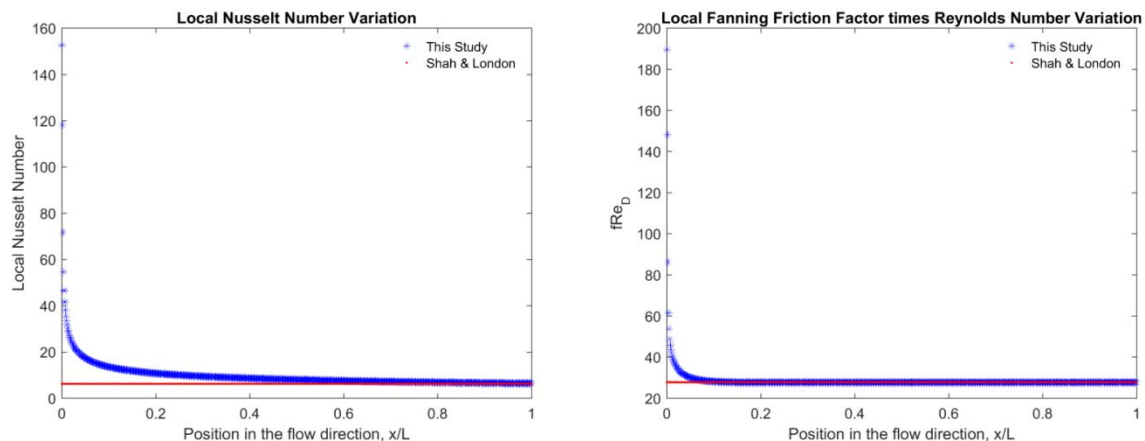


Figure 3. Model comparison Nu (upper) and fRe (lower)

Numerical implementation

A numerical steady-state simulation of the flow field through 3D elliptic concentric annulus is considered to investigate and solve complex fluid flow and heat transfer model. The commercial available CFD software, FLUENT was used to solve the governing equations of continuity, momentum and energy. The numerical computations were performed by solving the governing conservations along with the boundary conditions using the finite volume method (FVM). It is based on the control volume method; COUPLED algorithm is used to deal with the problem of velocity and pressure coupling. The pressure staggering option (second order) scheme is used to solve pressure equations. The diffusion term in the momentum and energy equations was approximated by second-order central difference which gives a stable and more accurate solution. In addition, a second-order

upwind differencing scheme was adopted for the convective terms (John & Anderson, 1995). The numerical model was developed in the physical domain, and dimensionless parameters were calculated from the computed velocity and temperature distributions. The residual sum for each of the conserved variables is computed and stored at the end of each iteration. The convergence criterion required that the maximum relative mass residual based on the inlet mass be smaller than 1×10^{-5} . Also average Nusselt number and fanning friction factor values were watched through the simulations to decide the convergence of the solution as their value not to change after a certain value.

Results And Discussion

The simulations are performed of laminar forced convection heat transfer and fluid flow for different types of base fluids in a three-dimensional through a double-integrated elliptic annulus. Effect of water and ethylene glycol volume fractions are addressed as EG fractions ranges from 0% to 100% with a 50% increment. Different values of Reynolds number were used in the range of $200 \leq Re \leq 1000$ for laminar flow and with volume fraction of SiO_2 nanoparticles in the range of $0 \leq \phi \leq 0.04$ with a diameter of 20 nm. Nanofluids are proven to enhance the heat transfer characteristics. However, there is no research done on finding the effect of the base fluid. To get the best base fluid, each base fluid is compared in terms of average surface Nusselt number and pumping power.

Effect of different volume fractions of nanoparticles

In this section, the effect of nanoparticles volume fraction on the average Nusselt number was investigated in the range of 0–4% with different values of the Reynolds number and diameter of particle $d_p = 20$ nm for SiO_2 nanofluid. As shown clearly in

Figure 4, increasing nanoparticle volume fraction enhances the Nusselt number. The Nusselt number is not very sensitive to the volume fraction of nanoparticles at lower Reynolds number and in all cases with increasing the Reynolds number, the Nusselt number increases. It can be seen that the highest

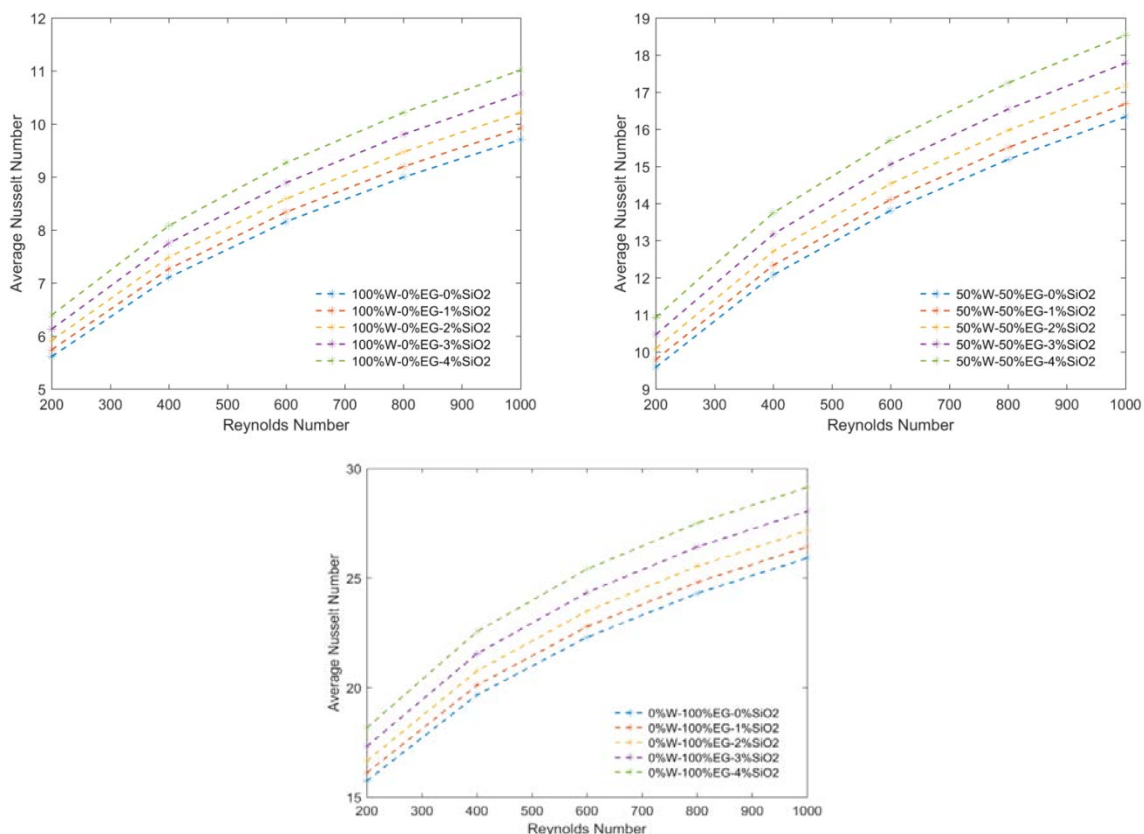


Figure 4. Average Nusselt Number variations due to effect of nanoparticle volume fraction

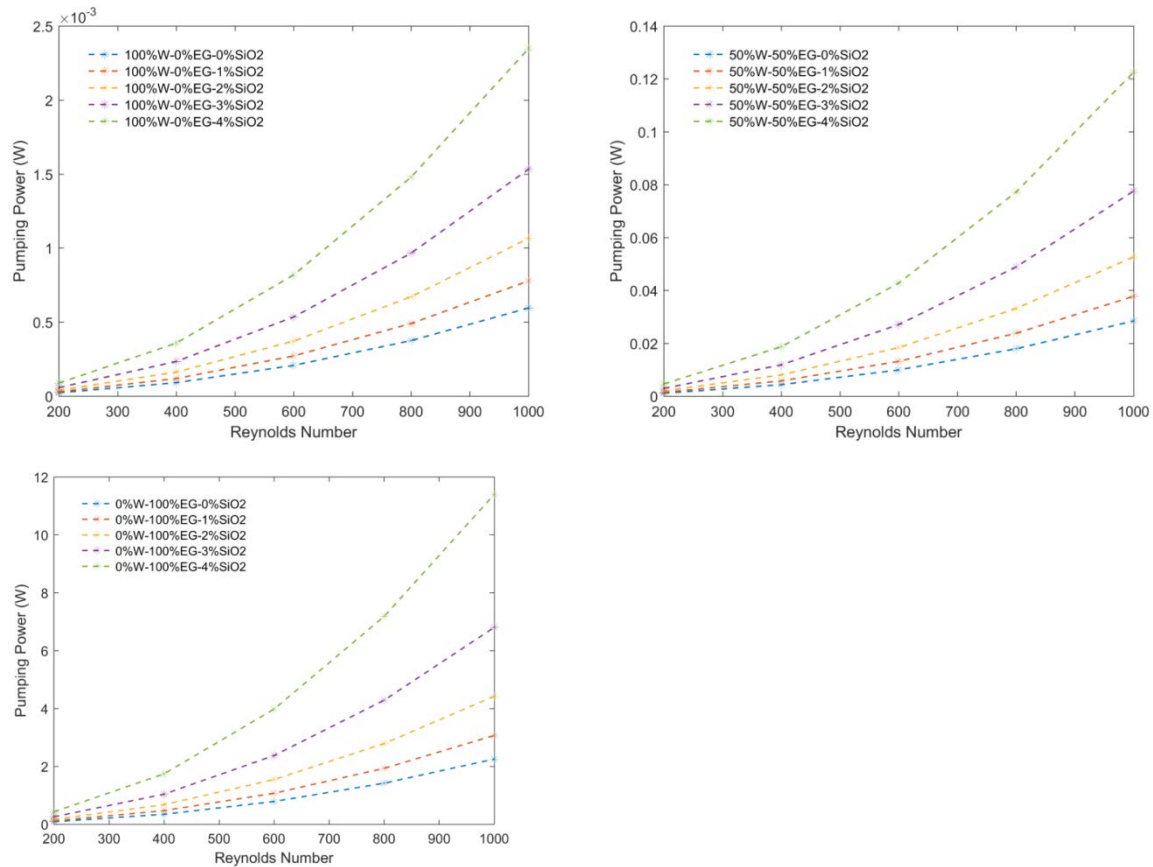


Figure 5. Average Nusselt Number variations due to effect of nanoparticle volume fraction

concentration of nanoparticles has the highest Nusselt number profiles. This is due to the enhanced effective thermal conductivity of the nanofluid which is accompanied by an increase in the thermal diffusivity. Heat transfer enhancement is increased when volume fraction is increased; it can be observed that 4% volume fraction has the highest heat transfer enhancement, while 0% concentration has the lowest enhancement as shown in

Figure 4. This is because the physical properties of nanofluid vary with the volume fraction. Thus, transfers more energy in the fluid, because of the momentum energy is much higher than the thermal energy in higher volume fraction.

As illustrated in Figure 5, the pumping power increases with the increase of Reynolds number for different volume fractions of nanoparticles. In general, the increase of nanoparticles volume fraction results in an increase of fluid viscosity which diminishes the fluid movement.

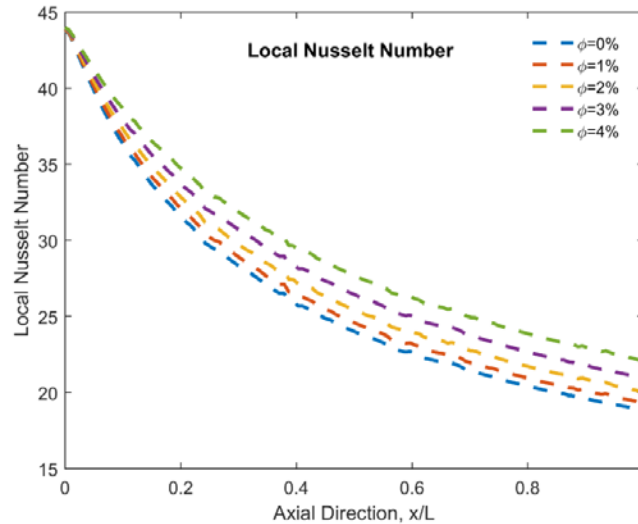


Figure 6. Local Nusselt Number variations due to effect of different volume fractions

Figure 6 shows the variation of the local Nusselt numbers through the annulus with Reynolds number chosen as 1000 and pure EG is the base fluid with different SiO_2 particle volume fractions. Local heat transfer coefficients thus the local Nusselt numbers values are very high at the entrance since the flow is developing. Because the thickness of the thermal boundary layer is zero at the entrance and it decreases continuously in the axial direction due to the thermal boundary layer that develops. As illustrated, when the nanoparticle concentration increases, local Nusselt number values also increases since the Brownian motion that dissipates heat is higher at high nanoparticle concentrations.

Velocity distribution and isotherms contours at the outlet of the annulus for pure EG nanofluid with different SiO_2 particle volume fraction at Reynolds number value equals to 1000 have been shown in Figure 7. The left hand side of the figure shows the isotherms while right hand side shows the velocity distribution. In this case local Nusselt Numbers varies as 18.87, 19.35, 20.08, 20.97 and 22.11 for volume fractions %0, 1, 2, 3 and 4, respectively. Thus there is no much difference and this is also supported by isotherms since they seem to be nearly the same for all concentrations. By adding the nanoparticle, that is by increasing the nanoparticle volume concentration, both density and dynamic viscosity of nanofluid increases. However ratio of density and dynamic viscosity decreases with increasing concentration. Velocities at the annulus walls are zero for all cases due to the boundary layer that develops. Therefore for the same Reynolds number values, the nanofluid with the highest concentration has the highest velocity in the annulus core. This fact is also supported by the velocity contours which are shown. As the intensity of red color increases that means that the velocity also increases. There are also local increments in the velocities where the length is lower between the inner and outer walls due to narrowing crosssection in this regions.

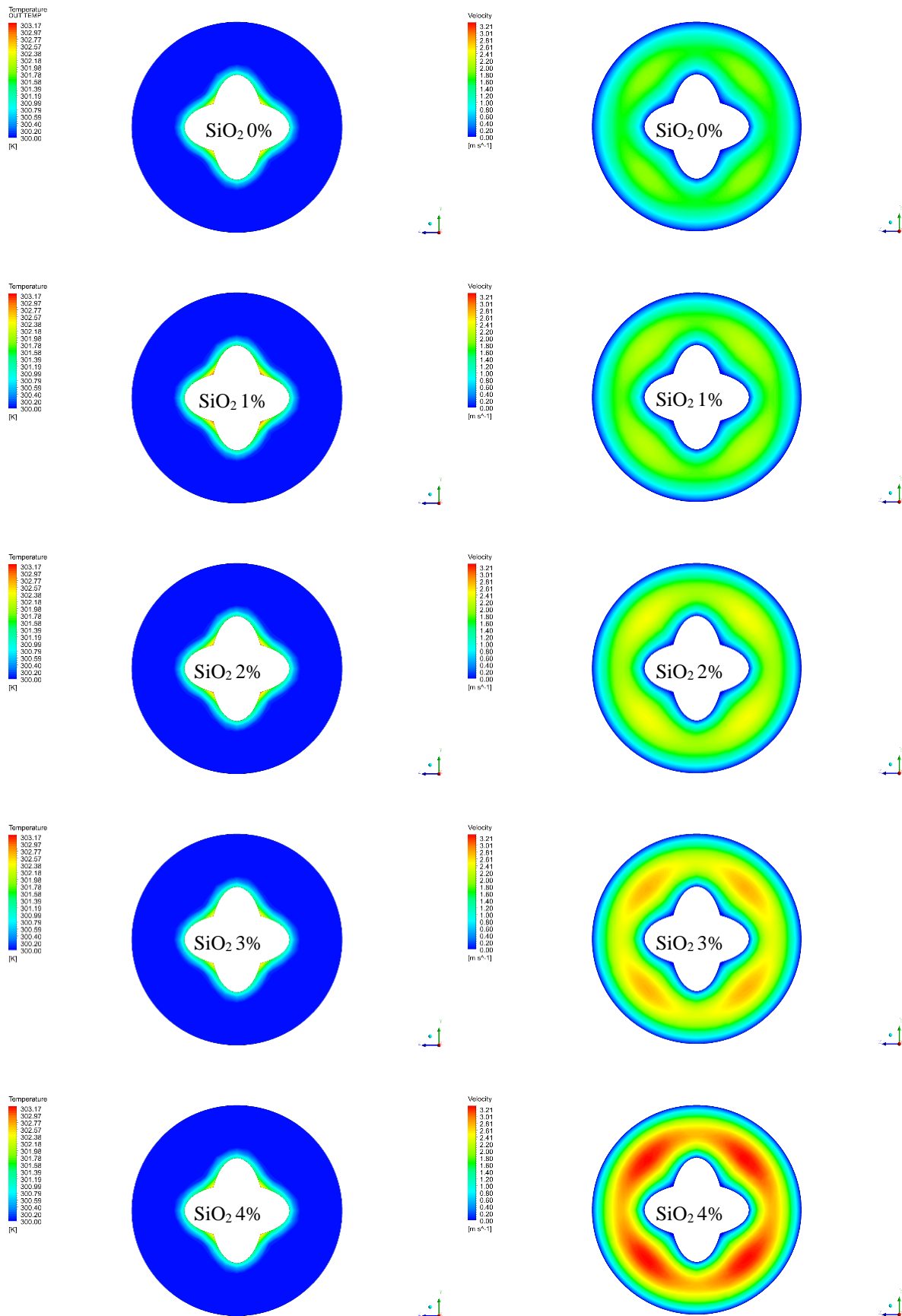


Figure 7. Isotherms (left) contours and velocity distribution (right) and for varying volume fractions

Conclusion

Numerical simulations for laminar forced convection heat transfer and fluid flow characteristics in a double integrated elliptic annulus using various nanofluids as the working fluids were presented. A three dimensional grid setup was built in order to simulate the geometry using Computational Fluid Dynamics (CFD) software. Using finite volume method (FVM), the governing equations were deciphered and correlated to case study, provided with some particular assumptions. The emphasis is given on the heat transfer enhancement resulting from various parameters, which include base fluid types and volume fraction of nanoparticle. The results were obtained through the numerical simulation that gives the highest Nusselt number. It is found that SiO₂ EG nanofluid gives the highest Nusselt number while pure water gives the lowest Nusselt number. The Nusselt number is remarkably increased with the increments of nanoparticle volume fraction and Reynolds number. However use of EG in such microchannels sharply increases the required pumping power. This may be a drawback for this nanofluid if there is no available space for larger size pumps.

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A PATTERN RECOGNITION SYSTEM FOR DETECTION OF ROAD SIGNS

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Abstract: Road sign identification in images is an important issue, especially for vehicle safety and road management applications. It is usually tackled in three stages: detection, recognition and tracking, and evaluated as a whole. To progress towards better algorithms, we focus in this article on the first stage of the process, namely road sign detection. We focus our work on a feature-based approach to build geometrical models of various kind of shapes: triangle, square, and circle form.

Keywords: Road Signs, Detection, Pattern Recognition.

Introduction

The purpose of this article is to develop a program that can detect or even recognize signs in a photo. The applications of this project are many: by equipping the camera cars and this program, we will be able not only to offer assistance to the driver (he will no longer need to search the panels since they will be displayed on a screen on the dashboard), but one could also consider a car autopilot, which would need to know the rules particular places where it rolls, and thus detect and recognize the panels.

The presented work in this paper proposes recognition system for detection of road signs, and is organized as follows:

In the first section, we introduced the problematic and then examined related works to classify method of recognition of road signs in Section 2. The third section presents details works .Our experimental results and conclusion are presented in Section 4.

Related Works

In the literature, we find several techniques applying various methods, the goal of which is to simplify the detecting of road signs; we have been interested in the following works:

A recent example of a learning-based detector is an attentive cascade of classifiers selected by Adaboost (Baro et al., 2009). The size of the input window of a detector is 30x30 (minimum size of detectable panels). This makes it possible to detect circular and triangular panels: four detectors are constructed, respectively modeling the danger panels, to give up Passage, Prohibition and Obligation. This approach gets the following results:

- Circle Prohibition: 70% detections for 3.34% false positives per image,
- Obligation circle: 60% detections for 0.82% false positives per image,
- Danger triangle: 65% detections for 2.21% false positives per image,
- triangle Give way: 75% detections for 2. 5% false positives by picture.

In (Ruta et al., 2009), the authors compare the detection of circular panels by transform from Hough to that obtained by a cascade of boosted classifiers and select the Hough transform for a geometric approach, the detection of panels is done from the outlines of the image. Thus, in (Fang et al., 2003) self-associating neural networks, whose weights are set to correspond to the desired form (circle, triangle, octagon), serve as nonlinear filters convolving the image at the level of of gray and the Hue canal. A fuzzy inference system exploits the two maps obtained to detect the panels. This process processes an image in 1 to 2 seconds, and is integrated into a tracking and recognition system, but the results are presented as illustrations only. Speed limit detection is also provided by a Hough transform by (Miura et al., 2000), the panels rectangular information being detected by a colorimetric thresholding in YUV followed by a horizontal and vertical projection of the gradient and a Kanji recognition. The performances of this approach are only illustrated by some examples.

In (Garcia-Garrido et al., 2006), they use a Hough transform to detect circles (speed limit or stop) or lines for triangles. Their approach selects closed contours in a certain width / height ratio range, which reduces robustness to out-of-plane rotations.

In (Piccioli et al., 1996), regions of interest are selected based on a thresholding in the Hue-Saturation HSV plane. Polygons are fitted to the linear contours chains, and assuming that the triangles are neither inclined nor distorted by perspective, equilateral triangles with a horizontal side and two slope sides are searched. This algorithm depends largely on the segmentation by the color, and it is strongly constrained in terms of orientation (it is restricted to the panels seen under a fronto-parallel perspective).

In the case of grayscale image sequences, (Barnes et al., 2003) use Radial Symmetry Transformation TSR with the same validation steps for the detection of 40 and 60 mph speed limit panels. (Caraffi et al., 2008) propose a detection of the signs of the end of speed limitation in grayscale image sequences. Their approach is to detect light / dark / light transitions: a Hough transform for circles validates successful candidates, and time filtering is required to eliminate many false alarms.

These filtering steps are not necessary in the approach we propose. According to our analysis, the TSR is a monovariate transformation where each contour point votes in several accumulators (one per scale) regardless of its neighborhood. This induces a relatively large number of false positives. In the generalized symmetry transformation TSG, introduced by Reisfeld (Reisfeld et al., 1995), each vote comes from a pair of points. This transformation is particularly suitable for highlighting radial and axial symmetries. It acts as a bivariate Hough transform, which reduces the number of false alarms and makes it less sensitive to noise than a single-crystal transformation.

Panel detection methods

The panel detection algorithms in a still image can be arranged according to the following three categories:

- colorimetric modeling: a related component segmentation based on a color model is performed. The regions of interest are then validated by a recognition algorithm or an appearance model. These methods are the fastest but also the least robust to variations in lighting conditions;
- geometric modeling: the contours of the image are analyzed by a structural or global approach. These methods are generally more robust than photometric ones because they process the gradient of the image, and can process grayscale images;
- methods with learning: a classifier (cascade, SVM, neural networks) is trained on the basis of examples. It is applied on a sliding window that traverses the image on several scales. These methods combine geometry and photometry but can be a costly step in computing time. They require the constitution of a learning base by type of panels, tedious step when the number of objects to be detected is large.

Evaluation of algorithms

To evaluate our algorithm, a database of 700 photos was provided by the training supervisor. These photos are accompanied by data:

A solution mask, that is to say a binary image where the pixels corresponding to the panels are at 1 and the others at 0.

An annotation, that is to say a text file describing the position of the panels, their size, and their type.

These data will allow us to test our algorithm in many cases. In fact, this image database contains images where the panels are clearly visible, but also images where the panels are less visible (high inclination with respect to the camera, brightness too low, brightness too high, signs deteriorated, it contains even some signs that a man would have trouble noticing!).

We will consider the following:

- the true positives (noted TP): the places where the algorithm says there is a panel, and that there is actually one.
- false positives (denoted TN): the places where the algorithm says that there are no signs, and that there is not any.
- False Positives (FP): The places where the algorithm believes there is a panel, but there is not actually one.
- false negatives (FN): places where the algorithm believes there are no signs but there is actually one.

We will then consider:

- Precision: $TP / (TP + FP)$.
- Accuracy: $(TP + TN) / (TP + TN + FP + FN)$.
- The specificity: $TN / (TN + FP)$
- Sensitivity: $TP / (TP + FN)$.

These values, as well as the duration of execution of each function will allow us to compare the different methods that we will test, in order to choose the best ones, and to know their advantages and disadvantages. The results of the tests of the best functions will be given in annexes.

Search Triangles And Squares

Segment Search

The first step to finding triangles or squares, is to look for segments. For this, matlab offers functions that perform Hough transforms so that you can find segments (and indeed, the documentation is very well done).

We will therefore look for a dozen segments that these functions will suggest to us. They will return struct array whose attributes point1 and point2 can allow us to find these segments.

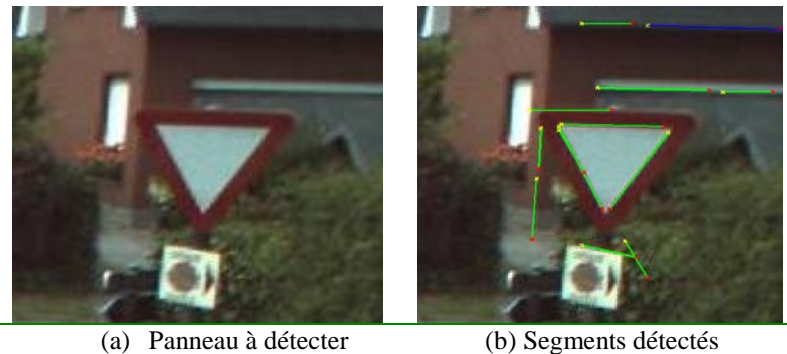


Figure 1: Segment detection

Once these segments are found, we will try to merge the points that are not too far from each other: it is likely that the detection of the segments is of poor quality, so we must expect that the segments detecting the panel edges do not touch each other perfectly.

The method that has been chosen is to separate the geometric information from the topological information.

We will build a table containing the location of points, and for each segment, we will test the proximity of its ends with the points that are already in the table. If the distance is small, we will consider that the two points are the same, otherwise we will add the current point to the table. We will then construct an array of integer pairs (that is, a matrix of size $2 \times n$) where two indices on the same column will mean that these indices form a segment. So we end up the arrival with a graph: these nodes and these arcs.

Search triangles

it is important to note that most triangular panels are either white panels with red edges or blue square panels containing a white triangle and a pictogram.

In any case, there will be a strong contrast between the colors at the borders of the triangles, which would not be the case if, for example, we had a red sign on a red background.

To find the triangles in an image, we will start looking for the paths of length 2 (that is to say containing 3 points) in the graph. So we will calculate the three angles of this triangle, and if each is worth 60° to 10° , we will retain the triangle. Assuming that the windows are well placed, we can suppose that in a window, there will be only one triangular panel, its area will be large and the triangle will be towards the middle of the window. As a result, only the triangle that has the best rating (we can for example note the triangles with a linear combination between the area and distance of the center of gravity of the triangle in the center of the window). We could also remove triangles that have no horizontal side.

Search rectangles

Unlike the previous case, the rectangular panels have no sharp edges, and therefore the detection of the segments that are the contours of the panels is significantly less effective. One can easily understand why by looking at this particular case of a parking sign :

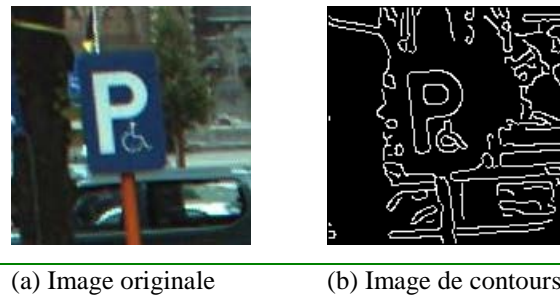


Figure 2 : Difficult case

We see on the image of the outlines (calculated with the canny filter) that the edges of the panel are not visible. From there, the function of detection of matlab segments will not give any good, and a method like the one above will not work. It was still implemented (to the extent that this problem was identified after the tests). Several techniques have been tried:

- search for parallel segments and creation of the quadrilateral
- search for perpendicular segments and creation of the quadrilateral

However, all these methods proved to be unsuccessful since the edges signs were poorly detected, it had to be particularly generous in accepting what we consider it as segments. From there, too much noise makes quadrilaterals are detected anywhere and whenever we have a window somewhere, we can be sure that this method will find a quadrilateral. This is hardly going to help us for the future. An idea to overcome this problem is to use a finer contour detector, but this has not been implemented.

Search circles

A circle detection function based on a Hough transformation was provided by the training supervisor. It has therefore been used on a smoothed contour image (since a circle viewed in perspective is no longer really a circle, so we have to leave a little room for this detection for have good results). It works well in many cases, but sometimes gives results for the least strange.

A proposal solution

One solution is to work on an outline image rather than an image that tells you about the colors. The idea was to follow these steps:

1. Calculate a contour image of the image
2. Calculate a distance map of contours
3. Drag a window (this time with a shape: triangular or circular ...)

We will keep the windows that minimize the sum of the pixels in the distance map, the idea being that since a panel is closed, the pixels inside the panel will be close to the edges and therefore of low value in the distance map.

Threshold used in our study

Dynamic thresholding

```

1 :function [red, blue] = Threshold1D(im, v1, v2)
2 :% Compute the red threshold
3 : red = im(:,:,1)/(im(:,:,2) + im(:,:,3)) > v1;
4 :% Compute the blue threshold
5 : blue = im(:,:,3) ./ im(:,:,1) > v2 & im(:,:,3) ./ im(:,:,2) > v2;
6 :% Dynamic threshold
7 :     if sum(red(:)) + sum(blue(:)) > numel(red(:))/25
8 :         [red,blue] = Threshold1(im,v1+0.1,v2+0.1);
9 :     end
10 :end

```

However, it will be noticed that this method mixes red and blue colors. Indeed, if a red wall is detected, the blue threshold will be increased, and the detection of the blue panels will be degraded. So we did a second version of dynamic thresholding as well.

```

1: function [red, blue] = Threshold2D(im, v1, v2)
2 :% Compute the thresholds
3 :red = Red(im, v1);
4 :blue = Blue(im, v2);
5 :end
6 :function red = Red(im, v1)
7 :% Compute the red threshold of the image
8 :    red = im(:,:,1)/(im(:,:,2) + im(:,:,3)) > v1;
9 :    If there is more than 5% pixels that are white,
10 :    % increase the threshold
11 :    if sum(red(:)) / numel(red(:)) > 0.05
12 :        red = Red(im, v1+0.1);
13 :    end
14 :    end
15 :function blue = Blue(im, v2)
16 :% Compute the blue threshold of the image
17 :    blue = im(:,:,3) ./ im(:,:,1) > v2 & im(:,:,3) ./ im(:,:,2) > v2;
18 :    If there is more than 5% pixels that are white,
19 :    %increase the threshold
20 :    if sum(blue(:)) / numel(blue(:)) > 0.05
21 :        blue = Blue(im, v2+0.1);
22 :    end
23 :end
  
```

Experiment Results

Threshold results

Technique	Temps moyen par image	Precision	Exactitude	Spécificité	Sensibilité
Threshold1	0.1364s	14.6791%	97.5053%	97.6732%	70.095 9%
Threshold2	0.1526s	9.0567%	95.4536 %	95.8943%	79.9986 %

Table 1: table of results with threshold1 and threshold2.

The threshold2 is the dynamic thresholding that simultaneously modifies the red and blue thresholding (same value for the threshold). The threshold1 is the one that treats red and blue separately.

Résultats pour les fenêtres et formes

We obtain these results with an average execution time of 2.1342s per image.

shapes	Precision	Exactitude	Sensibilité
Windows	31.9978%	26.1959%	59.0956%
triangles	62.5551%	40.3409%	53.1835%
circles	12.6706%	8.6782%	21.5947%

Table 2: table of results.

Images results

The results images are available on this link. Red boxes represent enlarged windows (They have been enlarged to make sure that the entire panel is in the window). Red circles, and the cyan triangles represent the detected forms.

The cyan rectangles are the smallest rectangles containing the detected shapes (for the triangles, they have been widened further since we suppose to have detected the inner border of the panel).

Conclusion

This work enabled us, on the one hand, to become even more familiar with the matlab language, and to review the techniques used in image processing and computer vision. It was also useful to see the difficulties commonly encountered in computer vision, namely the search for an algorithm that is effective in all conditions. Computer vision is a compelling topic that can be quite frustrating as it seems impossible to have an algorithm that delivers very good results.

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A STUDY ON MONITORING METHOD FOR ACCIDENT PREVENTION OF INDUSTRIAL VALVES

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Abstract: An industrial valve is a device used to control, direct, and regulate the flow of gases, liquids, and flowing solids. Valves are connected to pipes for the production or transport of products and are important because once a failure occurs, the entire production is interrupted or an accident occurs. Foreign matter, wear, cracks, scratches, sticking, operation defects may lead to accidents. It is necessary to monitor the risk factors related to breakdowns and accidents, and to take initial measures to minimize the damage in the event of a leakage accident. In this study, environmental and failure data of industrial valves were analyzed. The monitoring method was also derived through analysis of operation, failure and damage characteristics of industrial valves. As a result, we developed a valve fault diagnosis and accident prediction technique for preventive maintenance by selecting relevant sensors that can monitor the major influential factors of the valve. This technology can not only prevent accidents, but also minimize energy consumption by maximizing management efficiency.

Keywords: Industrial Valves, Monitoring Method, accident prediction technique, fault diagnosis

Introduction

Industrial valves and actuators are devices that are used to control, direct, and regulate the flow of gases, liquids, and fluid solids. Valves are bound to take post-Fordism because materials and structures are different, and their use is very broad depending on the type of fluid to be controlled and their application fields are very wide, and the proportion of the order production method of producing and supplying according to the customer's order is very large. Valves are connected to pipes for the production or transport of products and are important because once a failure occurs, the entire production may have to be stopped.

As the environmental analysis of industrial valve devices, we studied the basic matters, the valve control method based on the analysis of operating characteristics by valve type, and the current status of valve maintenance management etc. In order to analyze the characteristics such as failure and damage, we reviewed the failure mode, cause of failure, influence factor and related sensor for general valves and sliding valves and analyzed the causes of accident and failure of industrial valves and causes of detailed failure. In a study on control direction for accident prevention, we reviewed the collected data analysis based accident prevention technology, trends and cases and developed the industrial valve monitoring method by dividing it into valve lifetime management monitoring and valve self-function defect operation data monitoring.

Analysis of Environmental and Failure Statistics Data of Industrial Valves

In Korean plants, the maintenance of valves is carried out directly, and all the valves are opened and closed for checking during the regular maintenance period conducted every two to three years without performing any inspection during the process. At normal times, the inspection team conducts a leak check and does not conduct opening / closing operation tests during the process operation. Most petrochemical companies entrust the maintenance of various facilities to professional inspection agencies.

Most domestic city gas companies use ball valves and conduct their own maintenance by directly carrying out opening and closing operation without entrusting the maintenance of these valves to an external agency. Some city gas companies outsource the maintenance of valves and check through the opening and closing in a manner of checking the torque values according to the management standards in the table below the presence of employees when the service provider performs the inspection. As shown in the table below, opening and closing are not carried out for checks in winter, and approximately 30% is opened / closed in summer to check the operation status.

Table1: Criteria for maintenance of torque valves

Status	Circle, T Form($\text{kg} \cdot \text{f}/\text{m}^2$)	Linear Form($\text{kg} \cdot \text{f}/\text{m}^2$)	Note
Good	0 - 9 $\text{kg} \cdot \text{f}/\text{m}^2$	0 - 9	Other company don't classify valve handle form and consider it bad that has 30 $\text{kg} \cdot \text{f}/\text{m}^2$ or more torque value
Appropriate	10 - 19	10 - 19	
Check	20 - 29	20 - 34	
Bad	30 or more	35 or more	

Table2: Criteria for maintenance of torque valves

Valve	Winter	Summer	Note
BOX	10 %	30 %	Torque value is not measured in Jan. and Feb. due to low temperature
Buried	10 %	30 %	

A valve is an essential element for the control of equipment and system, but opening / closing failure may be caused by the connection gap from the stem to the ball during use, and foreign matter inflow, wear, cracks, scratches, sticking, operation defects may lead to accidents. According to the results of a case study, 64% of the failures are caused by seal leakage or operation defect, and most valve leaks and explosions occur during the process of eliminating operation defects such as valve sticking at the installation site. It is necessary to monitor the risk factors and to take initial measures to minimize the damage in the event of a leak accident. Gas safety management needs to be advanced by establishing a monitoring system that has the effects of diagnosis and prediction of valve status, regular monitoring of gas leakage, reduced valve maintenance costs, full cycle life management etc.

From 2011 to 2014, three domestic valve manufacturers were investigated for failures and as a result, a total of 414 valve operation defects were confirmed. As shown in the figure below, it can be divided into seal leakage, operation defect, paint defects, and other defects, and seal leakage was analyzed to be the most, 148 cases followed by 122 cases of operation defect, 117 cases of paint defects, 27 cases of others. Three types of seal leakage, operation defects, and paint defects accounted for the majority, 93% of defects.

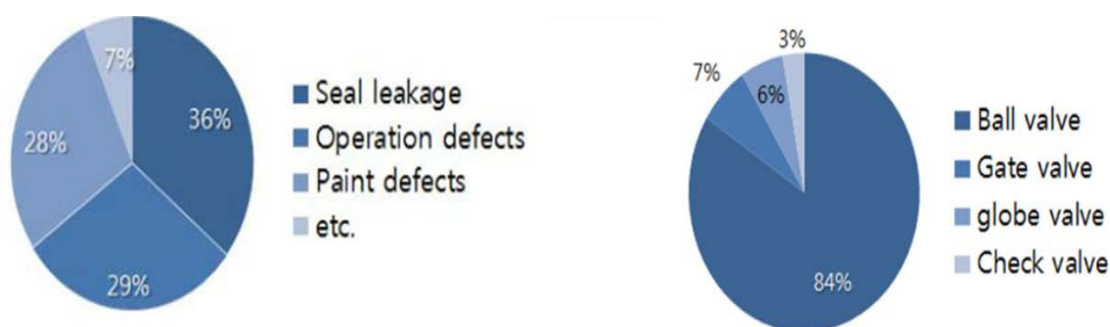


Figure 1. Valve failure related statistics graph

Monitoring Method based on Analysis of Valve Operation Characteristics

There are various valves, but typical examples of manual valves used in steam piping include globe valves, ball valves, and so on. A ball valve has excellent opening and closing function. It can be opened / closed by rotating the handle by 90 degrees and the pressure loss is small because a full port of the same size as the inner diameter of the tube where the fluid flows is possible. Another feature is that the valve shaft can be rotated 90 degrees to minimize leakage in the gland packing part. It is advisable not to use it to adjust the flow rate while opening the valve little by little, except when the valve is fully opened or fully closed. The ball valve uses a round shaped valve seat, and when used in a slightly open state, only a part of the valve seat is subjected to force, causing deformation of the valve seat. When the valve seat is deformed, the sealing property is lowered and leakage occurs. If operation data related to the use of a slightly open state is measured and stored, it is possible to predict the leakage through the prediction of the risk of deformation of the valve seat (before the deformation of the seat), and the time when the seat deformation occurs is predictable by the change of the rotational force of the valve (when the seat deformation occurs) or there is a way to notify the safety manager if it is a little open to remove this cause.

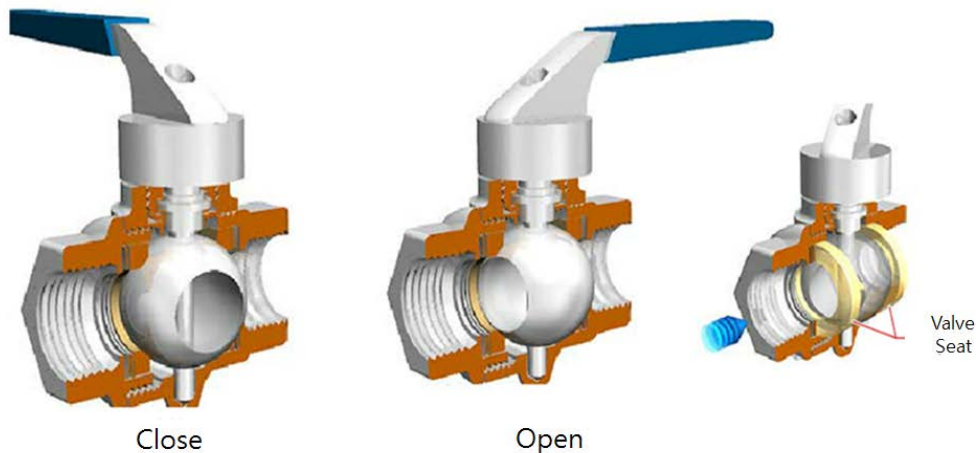


Figure 2. Structure and Operation of Ball Valve

The globe valve can be widely used not only for controlling the flow rate but also for shutting it off. Since the valve plug closes when it is in close contact with the valve seat and opens it falls off the valve seat, the flow control is performed not by the opening area of the valve seat but by the lift of the valve (distance from the valve seat).

It is characterized by the fact that the valve seat or valve is not easily damaged by the fluid even if it is used in the semi-open state. In particular, globe valves with a focus on flow control include needle valves (valves for protecting piping and pressurization facilities due to pressure rise). It should be noted that the flow path is S-shaped, so the pressure loss is larger than that of other types of valves, and the valve stem (stem) must be rotated a lot in order to open or close the valve, so leakage occurs frequently in the gland packing part. When the data related to the number of times of opening or closing of the valve is monitored, it is possible to predict the leakage through the prediction of the wear considering the material characteristics of the stamp. In addition, the valve closes like a wedge while rotating, so it is difficult to identify where to close completely, and when the valve is locked too much, there is a case where the seat surface is damaged.



Figure 3. Structure and Operation of Globe Valve

Analysis of Characteristics such as Failure and Damage of Industrial Valves

Through the review and analysis of the failure modes, causes and effects of failure in general industrial valves, related sensors that can monitor resulting influential factors were set up. The influence caused by each failure mode was reviewed to examine the related sensors as shown in the table below.

Table 3 : Types, causes and effects of failure mode of general valves and review of related sensors

Failure mode	Cause of failure	Effect	Review of related sensor
Seal leakage	<ul style="list-style-type: none"> Embrittlement (making it embrittled) Installation damage Wear Surface damage Distortion Dynamic instability 	<ul style="list-style-type: none"> Internal or external leakage 	<ul style="list-style-type: none"> Internal / external leak sensor
Worn or damaged poppet seat	<ul style="list-style-type: none"> Wear of poppet / seat assembly Pollutant 	<ul style="list-style-type: none"> Unsealed poppet causes internal leak Low or irregular pressure drop 	<ul style="list-style-type: none"> Internal / external leak sensor Pressure sensor
Damaged valve stem	<ul style="list-style-type: none"> Vibration Shock 	<ul style="list-style-type: none"> Defective valve response Open / Closed failure 	<ul style="list-style-type: none"> Torque (turning force) Sensor
Worn or damaged spool	<ul style="list-style-type: none"> Pollutant Poor adjustment 	<ul style="list-style-type: none"> Internal leakage 	<ul style="list-style-type: none"> Internal leak sensor
Valve piston fixing of main valve body	<ul style="list-style-type: none"> Pollutant Lubricant shortage Bubbles in the coating film Very high temperature Structural interference 	<ul style="list-style-type: none"> Low or irregular pressure drop Reduced operational response Valve not moving 	<ul style="list-style-type: none"> Pressure sensor and torque sensor
Broken or damaged spring ends	<ul style="list-style-type: none"> Fatigue 	<ul style="list-style-type: none"> Failure to adjust or maintain pressure 	<ul style="list-style-type: none"> Pressure sensor
Inoperative solenoid parts	<ul style="list-style-type: none"> Winding coil is opened Poor alignment in spool or poppet stem 	<ul style="list-style-type: none"> Valve open / closed failure 	<ul style="list-style-type: none"> Torque sensor
External leakage	<ul style="list-style-type: none"> Pollutant 	<ul style="list-style-type: none"> Worn poppet stem 	<ul style="list-style-type: none"> External leak sensor
Cracked parts / housing (parts cover)	<ul style="list-style-type: none"> Fatigue External shock Vibration 	<ul style="list-style-type: none"> External leakage 	<ul style="list-style-type: none"> External leak sensor

Development of Monitoring Method for Accident Prevention of Industrial Valves

A monitoring method was developed through analysis of environmental and failure statistics data, operating characteristics, failure and damage characteristics of industrial valves. In the event of a valve failure or accident, seal leakage and operation defects mostly occur, so a valve control method can be established based on 1) monitoring valve life management related to seal leakage and 2) monitoring valve self-function fault action data related to operation defects

As a valve control method through valve life related monitoring, normal leak data DB of each position sensor and real-time statistical characteristic values (moving average, standard deviation, leak frequency, etc.) can be used to determine the real-time leak sign or apply the data mining technique. When leakage monitoring is performed in a closed space, there is a method to use data mining analysis (regression analysis, etc.) because there is a characteristic that concentration at leaking increases in proportion to time. The technique selection can be applied differently depending on the valve installation environment and the characteristics of the leak sensor, and additional technology may be required.

Valve opening and closing angle can be used as a valve control method through valve self-function defect related monitoring. When the data related to the number of times the valve is opened or closed is monitored, leak can be predicted through the wear prediction (in the case of a ball valve) considering the material characteristics of the stamp. Whether the valve is defective can be determined by analyzing the degree of deviations of the valve position data. The method of monitoring the opening / closing torque of the valve can be predicted by comparison of the torque data for each operation of the normal torque valve, and whether the valve is defective can be determined by analyzing the degree of deviations of the torque data. Since the nonfulfillment of the control valve occurs when the supplied pressure is lower than the pressure required to raise the valve plug, the method of monitoring the internal pressure of the valve utilizes pressure differential data.

Conclusion

A monitoring technique for accident prevention was developed through the analysis and review of environment and operation of industrial valve devices, analysis of characteristics such as failure and damage. In the analysis of the environmental and operational data of the industrial valve device, the maintenance status, the failure statistical data, and the valve monitoring method according to the operation characteristics analysis by the valve type were examined. In the analysis of failure and damage characteristics, the main factors of monitoring were derived by reviewing failure mode, cause of failure, influential factors, related sensors for general valves. In conclusion, we developed the valve monitoring methods by dividing it into 1) monitoring the valve life management related to seal leakage, and 2) monitoring the valve self-function fault action data related to operation defects. The developed monitoring technique of the industrial valve will be applied to actual field in the future and will be evaluated for applicability and feasibility. The introduction of ICT technology in petrochemical and gas plant fields through these technologies can minimize energy consumption by maximizing management efficiency as well as preventing safety accidents caused by leakage and leakage through automation and remoting.

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A STUDY ON THE SUMS INVOLVING TRIANGULAR NUMBERS AND FACTORIALS

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Abstract

The sequence of triangular numbers comes from a pattern of dots that form an equilateral triangle. Each subsequent number in the sequence adds a new row of dots to the triangle. In this work, we consider the new integer sequences which is formed by adding corresponding numbers of the sequence of factorials and triangular numbers. We study on some algebraic relations related to this sequences. The definition, recurrence relation and the exponential generating function of this sequence are mentioned. Additionally, the relationships with the other integer sequences of this sequence are investigated.

Keywords: Triangular numbers, factorials, recurrence relations

Activating The Distance Learning System

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Abstract: In this study, the basic elements of the distance learning management system will be explained. It will provide basic information about Moodle, a distance learning management system running on a web browser. It will be emphasized that the Moodle education system, an open source remote learning management system, is a very popular educational system. The creation and generalization of a distance learning management system that can be activated on a cloud computing system running on a server will be practically explained. As a result, it will be explained that the server infrastructure required for the installation of a distance learning management system which can be accessed from any environment where the internet is available can be easily obtained by the cloud computing system. In a very short period of time, a distance learning management system with full features in terms of training infrastructure may become operative. The main aim is to express that the remote learning management system, which will meet the educational needs of people without face-to-face training, is easily applicable.

Keywords: Distance education, Moodle, BigblueButton, Moodlecloud, Live Conference Systems

Introduction

With each passing day, information technologies are developing and becoming an integral part of our lives. It has now become very easy to obtain information with mobile phones, tablet computers, desktops or laptops. Education opportunities have also had its share from this technology. Distance Education, which has an infrastructure based on Internet technologies, has been accessible to everyone. Educational institutions, voluntary organizations, private firms and many other institutions can enjoy the training they want to offer to their trainees independently from the place. A learning management system (LMS; Learning Management System) can be prepared in a very short time due to the expansion of the distance education system and the development of Internet technologies.

In this study, the basic elements of distance education system are explained. Basic information about Moodle, a distance learning system based on Internet technologies, will be given. Creating and managing a distance education system that can work on cloud computing system will be explained in practice. In this way, a separate cost expenditure will not be made for the server infrastructure required for the operation of the distance education system. In a very short time, the full-featured remote education system will be able to work.

The main aim is to express that the distance education system that will meet the educational needs of the students who do not have face to face education is easily applicable and to provide the necessary attention to the subject.

1. Distance Education

Distance education is a modern education system in which students and instructors are not required to attend the school or education institution, live, video, audio and interactive courses are taught in a virtual environment. It is a type of education which is completely independent from time and place. Distance Education System, for those who have not completed their education by entering the intensive pace of business life, and who cannot go to the universities they have gained in distant cities due to financial difficulties, provide the education they want in very favorable conditions.

In the Distance Education System, both instructors and students do not come to any educational institution or any designated place for education, they do not leave their country or city to attend classes. Everyone registered to the program at any point in the world, on the road, travel, vacation, business trip and so on. With a portable computer with a wired or wireless Internet connection, they can effectively participate in the classroom in virtual classrooms or follow the registered trainings.

Virtual lessons, such as blackboard, PowerPoint applications, videos, case studies, multimedia tools, animated texts and many current educational tools are used as in formal education. Students who cannot participate in the course on time or want to follow again can access the courses recorded in the archive at any time, regardless of

the time and space limitation, they can follow the courses at their own time and place. Especially with the development of open-source software philosophy, open-source live course server systems such as BigBlueButton have made virtual lessons much more effective.

The Distance Education System also provides serious opportunities for disabled students. Students with disabilities who do not have an associate, bachelor or master's degree due to transportation problems have the opportunity to attend classes under the same conditions as the other students.

Courses in the distance education system can be performed in a virtual classroom environment. Academicians and students can connect to the system from any environment with internet connection and participate in class. In the virtual classroom environment, academicians can tell the lesson, use the blackboard and even share the applications on their computer with the students. Students can also be connected to the lesson with audio and video, ask questions and make file sharing. Concurrent courses can be recorded, and then all students can follow that course any time they want.

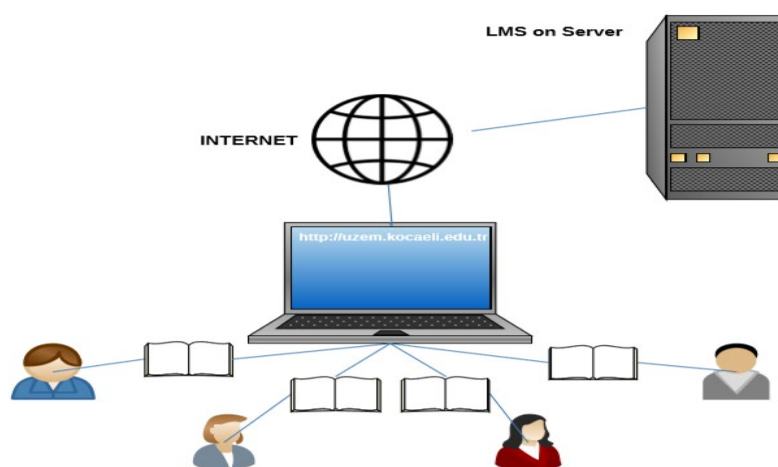


Figure 1: Distance Education working diagram

1.1. Learning Management System (LMS)

LMS is software that runs on web browsers designed to perform remote training activities. In English, Learning Management System is produced from the first letters of the words. The basic tasks of learning management systems, presenting learning material, sharing and presenting learning material, managing lessons, taking homework, taking exams, providing feedback on these homework and exams, organizing learning materials, keeping students, teachers and system records, creating reports.

The LMS may consist of many contents.

Registration component: It is the component that takes the basic information about the participants in the education by including the individuals who will participate in the education and training activities. Many websites have very similar features with the sign-up screen.

Content presentation component: The component with the management-based features required for all teaching and learning activities.

Course component: This is the component where the students will have access to the contents of the education and training, access to the course resources and other course contents.

Testing and evaluation component: It is the component in which the evaluation (examination) to be performed as a result of the learning and teaching activity is prepared and applied.

Reporting component: It is the component that provides the learning, teaching and system administrators the data related to the entire education and training process based on various criteria.

With the SCORM technique, which paves the way for interactive training, students can receive self-education. SCORM is a standard for e-learning based learning management systems. SCORM, which is named after the first

letters of the Sharable Content Object Reference Model, refers to the reference model for shareable content objects. Mobility has been adopted to standardize features such as reusability.

Fixed presentation content, animated animations, videos, sound recordings, quizzes and many more educational contents can be found in a SCORM package. Although the process of preparing these packages requires technical knowledge, the basic computer usage and the Internet literacy of a tutorial with SCORM objects has become very easy with the appropriate software. Articulate, Adobe Captivate software to create these objects can be easily. SCORM is an interactive environment created with web technology.

The most common open source learning management systems are listed below;

- Moodle (<http://www.moodle.org>)
- Sakai (<http://www.sakaiproject.org>)
- ILIAS (<https://www.ilias.de>)
- Atutor (<http://www.atutor.ca>)

The most common commercial learning management systems are listed below;

- Blackboard LMS (<http://www.blackboard.com>)
- Alms (<http://alms.com.tr>)



Figure 2: LMS (Learning Management System)

(<https://ueytlms.files.wordpress.com/2016/12/lms-e1422052431711.png?w=312&h=287>)

1.2. Moodle LMS

Moodle is an acronym for the “Modular Object-Oriented Dynamic Learning Environment”. Moodle; It is a free, open source, object-oriented, dynamic distance education system.

The Moodle current version is Moodle 3.5.2+. Moodle is able to run under MySQL and PostgreSQL database systems and in any environment that supports PHP language. Moodle, Apache + Php + Mysql trio provides a fast and effective LMS service.

The official site is <http://www.moodle.org>. [Http://download.moodle.org](http://download.moodle.org) address can be used to download the installation files. The installation stages are quite simple.

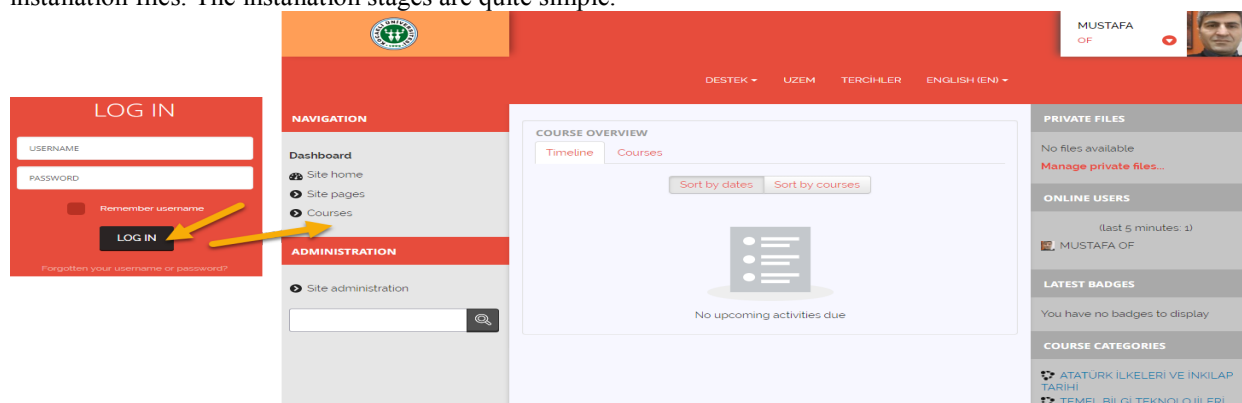


Figure 3: Moodle LMS

1.2. Sakai LMS

M.I.T. (Massachusetts Institute of Technology) is a learning management system created by Sakai Foundation and related volunteers as a result of the joint work of Indiana, Stanford and Michigan universities. Today, it is used by many educational institutions for Distance Education purposes.

Sakai LMS is developed with Java Programming Language. It is an open source learning management system created with the support of many people or institutions. Supports Windows, Linux, MacOS operating systems. The current version of Sakai LMS is version 12.3.

The following packages are required for Sakai installation.

- Java Development Kit 8 or higher (Java Development Kit - JDK)
- Apache Tomcat 8 or higher as application server
- Mysql 5.6 / Oracle database or Oracle 12c database management system
- Sakai installation package files

Conclusions

Distance education systems provide facilities for those who want to receive and give education. As mentioned above, it is clear that an LMS can be created in a very short time. Every trainer or person with Internet usage information can create this system immediately. Distance education is an education system that can be used effectively in primary, secondary, high school and university education.

Educational institutions, trainers have a great task in this regard. It is necessary to bring this education method together with the students as soon as possible. In this system, where the necessary infrastructure is an excuse, as mentioned above, the LMS will be ready at a very low cost. It is our greatest hope that the instructors and administrators who are able to see that the future education system is a distance education system is urgently transitioned to these education systems.

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Applicable Relaying in Power Schemes

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Abstract. In this paper, we are focusing to give an overview of Zaremski's study on the energy scheme. Applicable relaying defines safety schemes which conform situations and reason of actions created on the usual situations of the pattern. The modifications could contribute to escape repeating of bad situations. Modifications may contain well changing relay parameters, the recording of material for old way examination and statement through the scheme. The electrical distribution scheme is correlated with the greatest convoluted apparatuses in presence at many countries. Mechanical wonders in which a composite pattern could impose severe harms. This requires damage anticipation at safeguard patterns. It had a safety problem among volume to transport energy and the mandate until last years. The safety patterns worked on reliability permitting the interruption of shapes and modifiers with the drive of separating the harm part (Zaremski, 2012). In this paper, Applicable safety patterns for energy scheme safety will be discussed, one of which is communication.

Keywords: Applicable relaying, safety pattern, energy scheme safety

Introduction

The technique of transporting energy to industries was one of the most complicated schemes in many countries all over the world. Later, energy workers are enforced to the restrictions on the volume that could transport with the structure. That has run to various alterations in the method of power circulation, specially a sophisticated approach in the schemes of defensive spreading (Zaremski, 2012; Horowitz and Phadke, 2008).

Zaremski (2012) stayed which safety against reliability is an option completed to the modest of security forms. According to him, this is the easiest method of safety in detaching a problem in the scheme. A melting argument is choice constructed on the extreme current to be permitted. They noted which a melt below the minimum error present estimated. And, this type of argument for a present above the maximum present estimated under normal operation (Zaremski, 2012).

Normal spreading and developments of scheme transmitting could provide positive impact in some areas (Vassel, 1991; Zaremski, 2012). He pointed out which computer-based relays present safety workers' important tackles. Vassel noted the other useful advantages as below (Zaremski, 2012):

- They permit to transmitting that model could change
- Scheme permit for the sorting of substantial that could be investigated
- They permit for the sorting of substantial which could be investigated for potential difficulties.

Because of it advanced as a consequence of the overview of protecting materials, smart electrical materials and announcement organizations, Applicable relaying is an important concept (Zaremski, 2012; Chapman, 2002). According to Chapman, it allocates a safety pattern to routinely change transfer situations created on the usual settings of the energy scheme safety. It has a special important and meaning which a transmit could be active in the dependability range grounded on the position of pressure of the scheme in the current discussion of Applicable safety. The stress of the scheme could turn out at the time it has a fuller capacity within a scheme with detached conveniences. This transmit could conform to the safe lateral of the range to avoid the bad results when the scheme is strained. Also, Chapman noted which the transmit could be conformed to reply in a reliable position to insulate shares of the scheme if the scheme was not stressed (Zaremski, 2012).

Applicable Safety Patterns

Shortfall in energy scheme safety performance are applied at both communication and delivery networks. Many factors are the reason of which containing improved dispersion of dispersed generation, diverse functioning situations and extensive zone conflicts (Abdulhadi at all. 2010; Horowitz at all. 2008 and Salman & Rida, 2001). Salman and Rida stressed which continuing tolerable safety presentation is vital for a practical nifty net as the patterns confirm the dependable and harmless procedure of the main scheme safety. Applicable safety spending advanced situation methods has been suggested as a (Abdulhadi at all. 2010; Tholomier at all. 2009).

Applicable safety basically is dependent on adapting its performance created on the usual energy scheme situations (Abdulhadi at all. 2010; McLaren at all. 2011). According to them, this reality increases some trepidations connected to the rationality of applicable performance, the environment and extent of material essential for conclude the scheme and the suitable pattern presentation (Abdulhadi at all. 2010). Applicable safety patterns are the outcome of the presentation of small parts in defensive transmits. This safety patterns are increasing in position in the electrical energy schemes all over the world (Zaremski, 2012).

Differential Safety

Zaremski pointed out which percentage dissimilarial safety of convertors determines the change among two current stages which could be near to equivalent. This work operated by tapping the production of double current models in the same way

by transmit which perceives current movement. When the both currents are same, the other current would go way to transmit. The scheme includes the mismatch due to current transformer limitations (Zaremski, 2012).

The system built transmits could provide resolutions to the matters to rise the accurateness of function for a proportion dissimilarly safety pattern. According to Zaremski, the chief mistake produced by incompatible relations is arbitrated by a software could income the yield from the present convertor. But, current transformers don't want to have currents which are nearby to the positions. In this situation, current transformers could be selected based on their accuracy and their incorporation limits to prevent some of the other issues. Moreover, he added which the computer could be registered contributions on dissimilar portents getting on the unusual functions (Zaremski, 2012).

Communication

Zaremski (2012) stayed which material could be approved excessive detachments among substations rapidly and precisely by extra material opinions than last situations. We know which inexpression and full circulation can go slowly communication in the internet so patterns necessitating prompt message should need a devoted connection. According to Zaremski, snaps from nearby position could enlarge the capabilities of dissimilarly safety outside convertor safety using an intranet.

He also pointed out which, the accurateness of the material arguments can be authorized over harmonized material group using the internet. A precise period level provides for the organization of material reserved on a extensive zone. This can be confirmed which the power quantities are not actuality documented if the voltage between two stations is dissimilar. In this step, we need to add which all the out issues as the position withing current and power, leaving and entering current designated usual procedure. We also point out which this doesn't need instant act and van effort by full circulation on the internet connection. But, such technological developments can decrease undesirable movements in protecting transmissions (Abdulhadi at all. 2010; Zaremski, 2012; Catterson at all., 2011).

Result

In this study we focused to give general overview of the main lines of Zaremski's (2012) study. By establishing the supervisory zone, which is a clear method to help to transmit differentiate among an error situation and a weight infringement, transmit could well respond to strained scheme formal deformities. We believe which the stressed scheme conditions have established to be extra shared and would stay to develop more collective as energy scheme workers are enforced to do additional applications. Also, at the time the idea is done properly it will not obtain more disrepute (Zaremski, 2012).

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ADSORPTION OF MALACHITE GREEN BY CHITOSAN MODIFIED MONTMORILLONITE

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Abstract: This work, the potential of using chitosan modified montmorillonite (CM) for adsorbing malachite green (MG) was studied. Batch tests were carried out as function of contact time, initial adsorbate concentration, initial solution pH and temperature. Adsorption rate was initially rapid and the equilibrium was reached after 360 min. The dynamic data fit well with the pseudo-second-order kinetic model ($R^2 > 0.9999$). An aqueous solution without controlling pH shows no effect on the MG adsorption. The Langmuir model agrees very well with the experimental data ($R^2 > 0.9900$). On the basis of the Langmuir analysis, the maximum adsorption capacities were determined to be 322.58 mg/g. The negative values of Gibbs free energy indicate the spontaneous nature of the adsorption. It is suggested that the adsorption is likely to be chemical adsorption.

Keywords: chitosan modified montmorillonite, malachite green, adsorption, kinetics, isotherm

Introduction

Water pollution from dye contamination in natural stream in Ubon Ratchathani province, Thailand is one of significant problems. The problem gains more serious due to the rapid growth of household scale textile industries to meet increasing population and exporting demands. There are two types of dye such as natural and synthetic dyes which are usually used in dyeing process. The synthetic dyes are preferred because of their bright and lasting colors, resistance to heat and light and ease applications. After finishing dyeing process, approximately 40% dye amount is left in water body and usually find their way into nearby rivers and/or spaces under houses. The synthetic dyes are high water solubility, heat and light resistance and low biodegradability (Chuah et al., 2005). High amount of accumulated synthetic dyes in water support can cause unsightly scenery, obstruction of light transmission into water body and being harmful to humans, animal, and aquatic life. Therefore, it is very important to remove the synthetic dyes from wastewater before discharge. In order to persuade the villagers in household scale industries concern water pollution and pay attention to wastewater treatment, the treatment methods should be simple, fast and low cost. Adsorption technology is one of treatment methods which can achieve those suggestions. Adsorption process is the adhesion of dye molecules, adsorbate, from wastewater to a solid surface, adsorbent.

The activated carbon is a well-known adsorbent and widely used in dye removal from wastewater; however, the commercial activated carbon is expensive due to high energy consumption during its preparation. Recently, alternative ways to develop composite adsorbents from natural materials as modified mineral clay also exist to decrease the cost. The composite materials that have received considerable attention to use adsorbent for dye removal are chitosan immobilized montmorillonite clay (CM) (Umpuch and Songsak, 2013). Montmorillonite (MMT) is a natural mineral and high support in Thailand. MMT is a lamellar structure composed of an octahedral sheet of alumina sandwiched by two tetrahedral sheets of silica. The individual crystals of MMT are interacted by van der Waal force hence water can intervene, causing the clay to swell. The MMT layers has negative charges, which normally adsorbs high amounts of cationic species due to an electrostatic attraction (Wibulswas, 2004).

In addition, chitosan (CTS) is a linear polysaccharide composed of deacetylated unit and acetylated unit. It is made from deacetylation of chitin shells of shrimp and other crustaceans with sodium hydroxide. The amino group in CTS is water-soluble and a bioadhesive, which readily binds to negatively, charged surface (Lim et al., 2015). It also highly adsorbs both anionic and cationic species such as heavy minerals, dyes, and oils from the water (Yong, 2015). On the other hand, the application of CTS in wastewater treatment has a limitation, which is insoluble in water and organic solvent at neutral pH and alkaline medium. The limitation can be overcome by immobilization of CTS onto MMT. In addition, the immobilization causes improvement of mechanical and material properties of CTS. It has been proven that the chitosan modified montmorillonite is effective for organic compound adsorption.

However, the adsorption of cationic dyes by chitosan modified adsorbent is seldom studied.

This study focused on preparation of CM, which is a novel material for MG, a cationic dye, removal from aqueous solution. Experiments were carried out as function of contact time, initial dye concentration, initial solution pH and temperature. Also, the dye removal efficiency of CM was determined by single-stage batch adsorption tests including kinetic model, adsorption isotherms and thermodynamic study.

Materials And Methods

MG supplied by Aldrich, Ireland was used as an adsorbate. Distilled water was employed for preparing all the solutions and reagents. MG has a molecular weight of 364.91 g/mol, which corresponds to chloride salt ($C_{23}H_{25}ClN_2$). A stock solution of MG was prepared by dissolving 1.0 g in 1 L of distilled water, and the solutions for adsorption tests were prepared from the stock solution to the desired concentration by successive dilutions.

The commercial MMT clay was purchased from Thai Nippon Chemicals Industries Co., Ltd., Thailand, and used without further purification. The chemical composition (wt.%) of MMT was SiO_2 (56-60%), Al_2O_3 (16-18%), Fe_2O_3 (5-7%), Na_2O (2.4-3%), MgO (1.5-2.0%), CaO (1.9-2.1%), K_2O_3 (0.3-0.5%) and TiO_2 (1.2-1.5%), CaO (1.9-2.1%), K_2O_3 (0.3-0.5%) and TiO_2 (1.2-1.5%). The cation exchange capacity (CEC) of MMT was 0.8 meq/g, a value provided by the supplier.

CTS solution was prepared by dissolving 0.5 g in 50 mL of 5%v/v acetic acid, designated as sol. Then, Agitation at 200 rpm was allowed for 3 hours at 60°C using an orbital shaker. The sol was left naturally to meet 30 °C. Subsequently, 6.0 g of MMT was added and agitation at 200 rpm was applied again for 24 hours at room temperature. Afterwards, the obtained particles, chitosan modified montmorillonite (CM), were filtered with a microfilter (Whatman, UK), washed with distilled water several times to remove superficially retained CTS, and dried in an oven at 70 °C until weight being constant. To have uniform modification and reproducible results, the CM particles were sieved (100 mesh) before use for adsorption studies. All adsorbents were packed in plastic bags and stored in desiccators for further use.

The batch sorption experiments were carried out in a set of Erlenmeyer flasks (250 mL) by agitating desired amounts of CM particles with 100 mL of dye solutions of desired concentration and pH, in an isothermal shaker. A series of adsorption experiments were investigated in different operating conditions related to the contact time, initial MG concentration, initial solution pH and temperature. First, the effect of contact time was investigated. A series of 250 mL Erlenmeyer flasks containing 100 mL of the 200 mg/L MG solutions were mixed with 0.1 g of CM. These flasks were closed with paraffin to avoid evaporation. Then horizontally shaking at 200 rpm was allowed. The samples were measured at a certain time interval. Secondly, the effect of the initial solution pH was carried out in the same manner with the first experiments but varying the pH_0 of 200 mg/L MG solution from 2.0 to 10.0 and agitation time was fixed at 24 hours. Thirdly, the effect of initial MG concentrations was carried out in the same fashion with that in the second experiment, but the initial concentrations were varied in a range of 200 to 400 mg/L of MG solution ($pH_0 = 2.0$) and the contact time was assigned at 24 hours. Finally, the effect of temperature was investigated by repeating the first and second experiments but investigating at other temperatures such as 35, 45 and 55°C (Umpuch and Jutarat, 2012).

The collecting samples were filtered by micro-filter to remove adsorbent particles. The MG concentration in the filtrate was analyzed by measuring absorbance using UV-Vis Spectrophotometer at wavelength corresponding to the maximum absorbance for MG of 611 nm. The absorbance values were converted to MG concentration by calibration curve. The MG adsorbed quantity and the removal MG percentage (%MG Removal) were calculated using the following equations:

$$q_t = \frac{V(C_0 - C_t)}{m} \quad (1)$$

$$\% \text{ MG Removal} = \frac{C_0 - C_t}{C_0} \times 100\% \quad (2)$$

where q_t (mg/g) is the quantity of MG adsorbed per unit mass of adsorbent, C_0 (mg/L) is the initial MG concentration, C_t (mg/L) is the MG concentration after adsorption, m (g) is the mass of adsorbent, and V (L) is

the volume of aqueous solution.

Results And Discussion

The effect of contact time on the instantaneous adsorption capacities of MG by CM, q_t , is shown in Fig.1. The dye uptakes sharply increased in the first 5 minutes and then gradually increased until reaching a constant. The rapid rate in the initial stage was probably due to the abundant availability of active sites on the external surface of the CM particles. The adsorption rate gradually increased in the later stages because of the reduction in available active sites. The saturation of MG molecules on the CM was addressed at the final stage. The equilibrium time required for the adsorption of the MB was approximately 360 min.

To find the mechanism controlling the adsorption process, pseudo-first-order and pseudo-second order reaction equations were used to check the experimental data. The q_t (mg/g) is the amount of MG adsorbed at time t . The pseudo-first order kinetic model is normally applicable for only the initial 30 minutes of adsorption process. If the diffusion rate of adsorbate across the boundary layer to adsorbent surface is at a rate of limiting step, the kinetic data are well fitted to the pseudo-first order model (Lagergren and Svenska, 1898). It is generally expressed as follows:

$$\ln(q_e - q_t) = \ln q_e - k_1 t \quad (3)$$

where k_1 (min^{-1}) is the rate constant of first-order adsorption.

The pseudo-second order reaction equation was proposed in 1995 (Ho and McKay, 1998). If the chemical sorption is the rate-limiting step, the experimental data follow the pseudo-second order expression according to Eq.(4). It is expressed as:

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{1}{q_e} t \quad (4)$$

where k_2 ($\text{g}/(\text{mg} \cdot \text{min})$) is the rate constant of second-order adsorption.

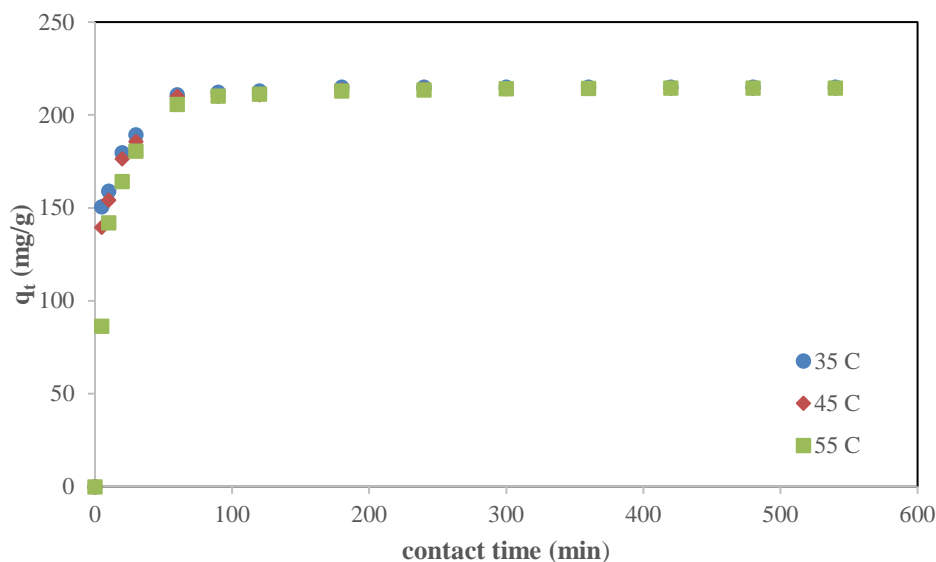


Figure 1. Effect of contact time on the adsorption of MG onto CM: influence of temperature.

Table 1 Constants from pseudo-first and pseudo-second order reaction equations for MG adsorption on CM

Model	Parameters	T(°C)		
		35	45	55
Pseudo-first order	$q_{e,exp}$ (mg/g)	215.11	214.42	214.52
	k_1 (min ⁻¹)	0.0061	0.0018	0.0021
	$q_{e,cal}$ (mg/g)	3.85	5.41	6.14
	R^2	0.1342	0.0261	0.0349
Pseudo-second order	k_2 (g/(mg*min))	2.07×10^{-3}	1.68×10^{-3}	1.11×10^{-3}
	$q_{e,cal}$ (mg/g)	217.39	217.39	217.39
	R^2	0.9999	1.0	1.0

The calculated values of $q_{e,cal}$ (Table 1) from the pseudo-first-order reaction equation was dramatically lower than the experimental value (q_{exp}). The linear plot of t/q_t against t according to Eq. (4) was observed. The constant k_2 and the corresponding linear regression correlation coefficient values, R^2 , are given in Table 1. As the values of R^2 were limited to unity ($R^2 > 0.9999$), the adsorption data conform to the pseudo-second order reaction equation. This indicated that the rate of limiting step was the formation of chemical bonding between the MG and the dissociated functional groups on the surface of the CM.

The activation parameter was determined by the Arrhenius equation. The slope of the plot of $\log k_2$ vs. $1/T$ can then be used to evaluate the activation energy, E_a , according to equation (6). The Arrhenius equation is expressed as:

$$\log k_2 = \log A - \frac{E_a}{RT} \quad (6)$$

where E_a is the activation energy (J/mol) and A is the Arrhenius factor (g/(mol.s))

The experimental results obtained gave $E_a = +26.07$ kJ/mol for the adsorption of MG onto CM. Low E_a values (<42 kJ/mol) indicates diffusion control processes, and the higher E_a values (>42 kJ/mol) indicates chemically controlled process. In this study, low value of the E_a indicates that the adsorption process of MG adsorption on CM might be a diffusion control process.

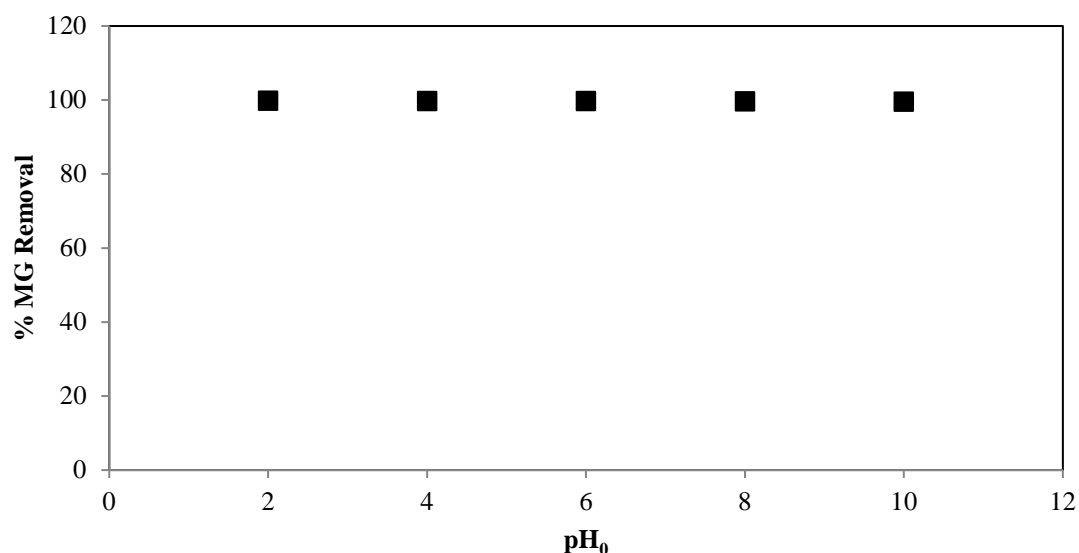


Figure 2. Effect of initial solution pH on the adsorption of MG onto CM.

The effect of initial solution pH on the equilibrium adsorption capacities of MG by CM is shown in Fig.2. The results of adsorption experiments with MG cations at different initial pH without pH-control during the adsorption process. It shows no differences in adsorption capacity. The differences between these pH-values are rather small,

which explains the similarity between percent MG removal regardless of initial solution pH. The results was also found in literature (Benavente). However, the effect of pH on the adsorption should be further studied under the controlled pH condition.

The study of adsorption isotherm is fundamental and plays an important role in the determination of the maximal capacity of adsorbent. Adsorption isotherm of MG on CM, which is the plot of equilibrium MG concentration in solid phase versus that in liquid phase, was illustrated in Fig.2.

Well-established isotherm models such as Langmuir and Freudlich isotherms usually are correlated the equilibrium data. For the adsorption on almost homogeneous surface, generally the Langmuir equation applies because the interactions between adsorbed molecules are negligible. The Langmuir equation is most often used to describe equilibrium sorption isotherm (Anwar et al., 2010) which is valid for monolayer sorption with a finite number of identical sites. The linear form of Langmuir isotherm is given below.

$$\frac{C_e}{q_e} = \frac{C_e}{q_m} + \frac{1}{K_L q_m} \quad (7)$$

where q_m (mg/g) is the maximum sorption of monolayer, C_e (mg/L) is a final equilibrium concentration of cadmium, q_e (mg/g) is the MG adsorbed per unit weight of the CM at final equilibrium concentration, and K_L (mL/g) is the Langmuir constant related to the affinity of binding sites.

The essential characteristics of the Langmuir isotherm can be expressed by means of " R_L " which is a dimensionless constant referred to as a separation factor of equilibrium parameter. The R_L is defined by

$$R_L = \frac{1}{1 + K_L C_0} \quad (8)$$

This parameter suggests the type of isotherm is irreversible ($R_L=0$), favorable ($0 < R_L < 1$), linear ($R_L=1$), or unfavorable ($R_L > 1$). As can be seen from Table 2, the R_L values are between 0 and 1.0, indicating that the adsorption of MG onto CM is favorable.

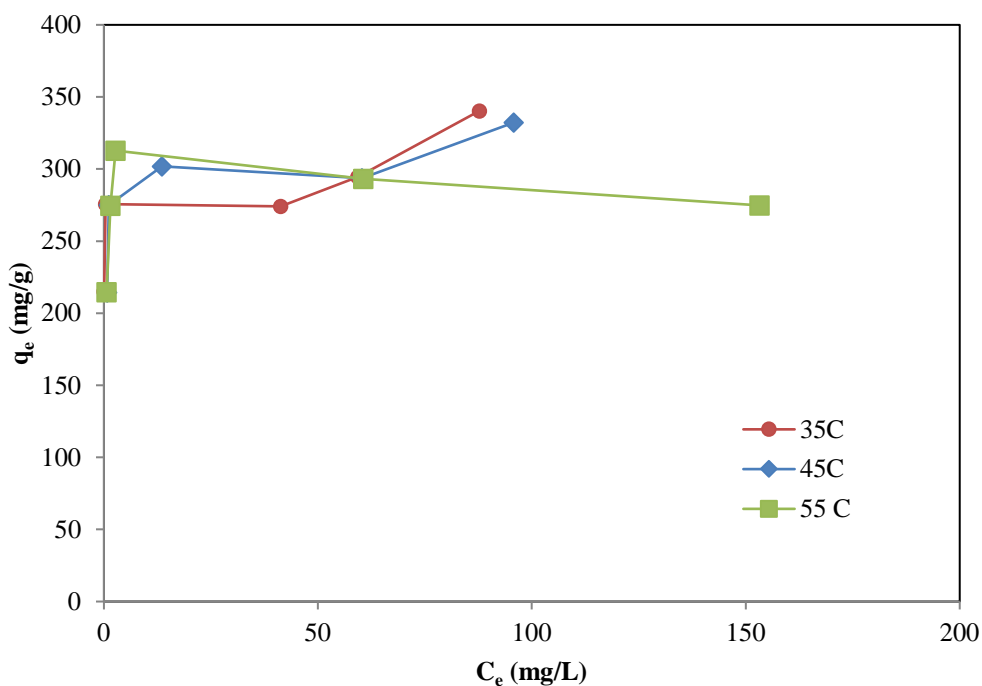


Figure 3. Adsorption isotherms of MG onto CM: influence of temperature of 35, 45 and 55°C.

The widely used empirical Freundlich equation based on sorption on a heterogeneous surface is given by

$$\log(q_e) = \log(K_F) + \frac{1}{n} \log(C_e) \quad (9)$$

where K_F ($\text{mg}^{1-1/n} \cdot \text{L}^{1/n} \cdot \text{g}^{-1}$) and n are the physical constants of the Freundlich isotherm. The K_F and n are the indicators of adsorption capacity and adsorption intensity respectively (Salleh et al., 2011).

The results showed the Langmuir isotherm was better fitted to the experimental data for MG indicating that the monolayer of MG molecules covers along the CM surface. Table 2 shows the monolayer capacity of absorbed MG onto CM was 322.58 mg/g at 35 -45 °C and 277.78 mg/g at 55°C.

Table 2: Isotherm constants and correlation coefficients for the adsorption of MG on CM at different temperatures

Model	Parameters	T(°C)		
		35	45	55
Langmuir isotherm	q_m (mg/g)	322.58	322.58	277.78
	K_L (L/mg)	0.449	0.838	1.57
	R_L	0.005-0.01	0.003-0.006	0.002-0.003
	R^2	0.9842	0.9944	0.9944
Freundlich isotherm	K_F (l/g)	258.79	244.74	257.70
	n	24.51	16.23	37.74
	R^2	0.6998	0.6957	0.2

The effect of operating temperature on the instantaneous and equilibrium adsorption capacities of MG by CM is shown in Fig.1 and 2. The increase of temperature in the system caused a slight decrease of the adsorption capacity. This result was in accordance with those observed in the previous literature (Yan et al., 2007). Thermodynamic parameters can be determined from the variation of the thermodynamic equilibrium constant K_L with temperature.

$$\Delta G^0 = -RT \ln K_L \quad (9)$$

where R is the universal gas constant (8.314 J/mol.K) and T is temperature in Kelvin. The average standard enthalpy change (ΔH^0) and the standard entropy change (ΔS^0) are determined from the Van't Hoff equation (Umpuch and Sakaew, 2013).

$$\ln K_L = -\frac{\Delta H^0}{RT} + \frac{\Delta S^0}{R} \quad (10)$$

As seen in Table 3, ΔG^0 shifted to a less negative value when the temperature increased suggesting the adsorption occurred less spontaneously at higher temperature. The positive value of the enthalpy change (ΔH^0) indicated that the sorption was an endothermic process. This also suggested that the adsorption process takes place with energy consumption. The positive value of entropy change (ΔS^0) corresponded to a decrease in the degree of freedom of the adsorbed species. However, a little change of entropy can be observed showing that CM did not change significantly because of adsorption.

Table 3: Thermodynamic parameters for the adsorption of MG on CM

T(°C)	K_L (L/mol)	ΔG^0 (kJ/mol)	ΔH^0 (kJ/mol)	ΔS^0 (J/(mol.K))
35	0.449	-2.05	+52.55	+2.37
45	0.838	-0.47		
55	1.57	+1.23		

Conclusion

The immobilization of chitosan onto montmorillonite clay caused a presence of biopolymer, which is cationic and anionic active sites on the external surface of the precursor enhancing adsorption capacity to MG dye. The MG uptakes rapidly increased in the first 5 min and achieved equilibrium at 360 min. The sorption of MG is pH independent. The sorption process is well described by Langmuir equation. The kinetic study demonstrated that the adsorption kinetics followed pseudo-second order kinetic model. The activation energy of +26.07 kJ/mol was determined. The calculated ΔH^0 , ΔS^0 and ΔG^0 suggested that the adsorption was endothermic and spontaneous. From the above results, the CM was an effective adsorbent for the removal of the cationic dye from synthetic effluents.

Acknowledgements

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AĞIRLIKLIL ERKEN VE GEÇ BİTİRME MALİYETLİ ÇOK MODLU KAYNAK KISITLI ÇOKLU PROJE ÇİZELGELEME PROBLEMİ

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Özet

Birden fazla projeyi yönetmek zorlu bir karar verme sürecidir, bu ortama bir de faaliyetlerin çok modlu olma durumu eklendiğinde zaten NP-Zor sınıfta yer alan problem iyice zor hale gelmektedir. Bu çalışmada, küçük bir atölyede üretilen mutfak projelerini çizelgelemek adına dörder faaliyetli üç projeli çok modlu kaynak kısıtlı çoklu proje çizelgeleme problemi için bir model önerilmiştir. Önerilen modelde her bir faaliyetin iki moda sahip olduğu varsayılmıştır. Her modda ise iki farklı kaynak türünün kullanımı söz konusudur. Modlar arasında değişim yapılmasının maliyeti vardır ve proje teslim zamanlarının önceden bilindiği varsayıldığı için erken ve geç bitirme maliyetleri de oluşabilmektedir. Çalışmada problemin matematiksel modeli verilmiştir. Modelde amaç, ağırlıklı erken ve geç bitirme maliyetleri ile mod değiştirme maliyetlerinin toplamının minimize edilmesidir. Önerilen model, ele alınan çizelgeleme problemi için farklı senaryolar göz önüne alınarak GAMS optimizasyon programında çözülmüş ve elde edilen sonuçlar umut verici bulunmuştur.

Anahtar Kelimeler: Kaynak Kısıtlı Proje Çizelgeleme, Çoklu Proje, Çoklu Mod, Erken Bitirme, Geç Bitirme

MULTI-MODE RESOURCE-CONSTRAINED MULTI-PROJECT SCHEDULING PROBLEM WITH WEIGHTED EARLINESS AND TARDINESS

Abstract

Managing more than one project is a challenging decision-making process, and the problem that is already included in the NP-Hard class becomes more difficult when the multi-mode nature of activities are added. In this study, we propose a model for the multi-mode resource-constrained multi-project scheduling problem with three projects each with four activities in order to schedule kitchen projects produced in a small job-shop. In the proposed model, it is assumed that each activity has two modes. There are two different types of resource in each mode. There is a cost to change between modes, and earliness and tardiness costs can occur as project due dates are assumed to be known in advance. The mathematical model of the problem is presented in the study. In the model, the objective is to minimize the sum of the cost of mode changing with earliness and tardiness costs. The proposed model is solved by GAMS optimization program by considering different scenarios for the scheduling problem and the obtained results are found promising.

Keywords: Resource Constrained Project Scheduling, Multi-Project, Multi-Mode, Earliness, Tardiness

Giriş

Proje çizelgeleme problemleri, projelerin zaman, kaynak, öncelik ilişkisi, özel istekler gibi kısıtlarını dikkate alarak optimum çözümü arar. Önceleri kaynak kısıtsız örneklerle başlamıştır. Kaynak kısıtlı proje çizelgeleme problemleri ise literatürde çok kez çalışılmıştır. Daha sonraları problemin çok modlu, çok projeli, çok amaçlı vb. gibi uzantıları üretilmiştir.

Kaynak kısıtlı proje çizelgeleme problemi (KKPÇP), kısıtlı kaynaklar kullanılarak bir projeyi oluşturan faaliyetlerin, öncelik ilişkilerini ihlal etmeden amaç işlevini optimum yapacak şekilde çizelgelenmesidir. Problemin temelini oluşturan varsayımlar aşağıdaki gibi sıralanabilir (Ulusoy, 2000:4):

- Faaliyet süreleri önceden bilinir.
- Faaliyetlerin birim zamanda kaynak kullanımı sabittir.
- Bir faaliyete atanan kaynak faaliyet süresince o faaliyet tarafından kullanılır.
- Başlatılan faaliyetler kesintisiz bitirmek zorundadır; ara verilemez.
- Faaliyetler iptal edilemez. Proje ağındaki her faaliyet gerçekleştirilmek zorundadır.

Kaynak kısıtlı birden çok projenin çizelgelenmesi uygulamadaki gerçek durumu yansıtmaması bakımından önemlidir. Nitekim, farklı şantiyelerde iş yapan bir inşaat firması bu şantiyelerin tamamında kısıtlı kaynaklarını ortak kullandığından, çoklu proje çizelgeleme ortamında görünmektedir. Aynı şekilde, bir otomotiv firmasının aynı anda birden fazla ürün geliştirme projesinde ortak ve kısıtlı kaynaklarının kullanıldığı ortamın planlanması da kaynak kısıtlı birden çok projenin çizelgelenmesini gerektirir (Ulusoy, 2000:20).

Lawrence ve Morton (1993) ağırlıklı geç bitirme maliyetlerini minimize eden amaç fonksiyonlu çoklu KKPÇP tarif ederken, Chiu vd. (2002) toplam proje gecikme sürelerini minimum tutan ve indirgenmiş nakit akışlarını kullanan kaynak kısıtlı çoklu proje çizelgeleme problemini incelemişlerdir. Bir bakır madeni bakım örneği ile çok projeli KKPÇP çalışan Chen (1994) proje tamamlamada gecikme maliyetlerini de hesaba katarken, Lova vd. (2000) çok projeli çizelgelemede çok kriterli bir sezgisel geliştirmişler ve ilk kriterleri zamanla ilgili olup ortalama proje gecikmesini baz almışlardır. Kolisch (2000) çoklu, büyük ölçekli, siparişe göre montajların olduğu çizelgeleme problemini düşünerek KKPÇP çalışıp amaç fonksiyonunda ağırlıklı gecikmelerin toplamını minimize etmek isterken, çoklu proje çizelgeleme için genetik algoritma öneren Gonçalves vd. (2008) algoritmanın tanımladığı gecikme sürelerine dayanan aktif çizelgeler hazırlamışlardır.

Çok modlu problem türünde bir faaliyet, bir veya daha fazla süre-kaynak gereksinimi kombinasyonundan biriyle yapılabilir. Her faaliyet belirli bir modda bir kez başlatıldığında tamamlanana kadar seçilen mod değiştirilemez (Mori vd. 1997:134). Temel çok modlu kaynak kısıtlı proje çizelgeleme probleminde amaç, öncelik ilişkileri ve kaynakların mevcut miktarlarını dikkate alan kısıtların bulunduğu minimal bir tamamlanma zamanı çizelgesine ulaşmaktır.

Çok modlu KKPÇP çalışan Neumann vd. (2002) proje süresi, maksimum gecikme, ağırlıklı gecikme gibi fonksiyonları incelemişlerdir. Lorenzoni vd. (2006) ise çok modlu KKPÇP olan bir gerçek hayat gemi problemi için diferansiyel gelişim algoritması uzantısı üzerinde çalışmışlar, ilk aşamada ise erken ve geç bitirmeyi minimize eden gemilerin ideal varış zamanlarını belirlemişlerdir. VoB ve Witt (2007) çalışmalarında bir gerçek hayat çok modlu çok projeli çizelgeleme problemi için ağırlıklı gecikmeyi minimize etmeye çalışmışlardır. Bu çalışmaların haricinde; Dumond ve Mabert (1988) tarif ettiği modelde toplam gecikmeden bahsetmiş, Nudtasomboon vd. (1997) KKPÇP modelinde gecikme için ceza maliyeti kullanmış, Viana ve Sousa (2000) KKPÇP için faaliyetlerin ağırlıklı gecikmesini minimize etmiş, Vanhoucke vd. (2001) probleminde toplam ağırlıklı erken-geç bitirme ceza maliyetlerini minimize etmeyi hedeflemiş, Achuthan vd. (2002) probleminde projelerin erken ve geç bitirilmesi durumunda ceza maliyetlerini kullanmış, Ballestin vd. (2006) yine toplam gecikmenin minimize edildiği problemi çalışmış ve Nadjafi (2014) probleminde ilgili erken-geç bitirme maliyetlerini minimize etmeyi de eklemiştir.

Materyaller ve Metotlar

Bu çalışmada, faaliyetleri birden fazla moda sahip, birden fazla kaynağı olan kaynak kısıtlı birden çok projenin aynı anda üretim ortamında bulunduğu bir çizelgeleme probleminin, ağırlıklı erken ve geç bitirme maliyetleri ile mod seçim maliyetlerini minimize edecek doğrusal programlama modeli önerilmiştir.

Küçük bir atölyeye belirli bir dönemde gelen üç mutfak projesinin ve bunların ikişer moda sahip dörder faaliyetinin işlem süreleri, mod seçim maliyetleri firmanın geçmiş yıllardaki gözlem ve deneyimlerine göre belirlenmiştir. Teslim süreleri, erken ve geç bitirme cezaları ise müşterinin, projenin ve üretim ortamının şartları ölçüsünde işletme yönetiminden temin edilmiştir. Üretimde kullanılacak iki farklı kaynak kullanılabilir durumdadır.

Problemin temel varsayımlarına şu şekilde ilaveler yapılmıştır: Faaliyet işlem süreleri, teslim süreleri, mod seçim maliyetleri, birim erken ve geç bitirme cezaları, faaliyetlerin en erken ve en geç başlama zamanları önceden bilinmektedir. Farklı projelerin faaliyetleri kaynak ve öncelik kısıtları el verdiği sürece aynı anda işlem görebilir. Her projenin kendine has başlangıç ve bitiş düğümü vardır. Projeler arası öncelik ilişkisi yoktur. Her projenin faaliyetleri arası öncelik ilişkisi bilinmektedir. Eldeki kaynak miktarı modlara göre farklılık göstermektedir.

Önerilen “Ağırlıklı Erken ve Geç Bitirme Maliyetli Çok Modlu Kaynak Kısıtlı Çoklu Proje Çizelgeleme Problemi” karışık tam sayılı DP matematiksel modeli;

$$\begin{aligned}
 & \text{Min} \sum_{i \in I} \sum_{j \in J_i} \sum_{m \in M_i} \left(e_{ij} (E_{ij}^+ + E_{ij}^-) + t_{ij} (T_{ij}^+ + T_{ij}^-) \right) + c_{ijm} \cdot Y_{ijm} \\
 & (1) \sum_{i \in I} \sum_{j \in J_i} \sum_{m \in M_i} X_{ijmt} = 1 \quad \forall i \in I, \forall j \in J_i \\
 & (2) \sum_{i \in I} \sum_{j \in J_i} \sum_{m \in M_i} X_{ijmt} \cdot t + \sum_{i \in I} \sum_{j \in J_i} \sum_{m \in M_i} p_{ijm} \cdot Y_{ijm} \quad \forall i \in I, \forall j \in J_i \\
 & (3) f_{il} - f_{ik} \geq \sum_{m \in M_i} p_{ilm} \cdot Y_{ilm} \quad \forall i \in I, \forall (k, l) \in J_i, \forall m \in M \\
 & (4) E_{ij}^+ - E_{ij}^- \geq d_{ij} - f_{ij} \quad \forall i \in I, \forall j \in J_i \\
 & (5) T_{ij}^+ - T_{ij}^- \geq f_{ij} - d_{ij} \quad \forall i \in I, \forall j \in J_i
 \end{aligned}$$

$$\begin{aligned}
 (6) \sum_{m \in M} Y_{ijm} &= 1 & \forall i \in I, \forall j \in J_i \\
 (7) \sum_{i \in I} \sum_{j \in J_i} Y_{ijm} \cdot W_{ijmr} &\leq BW_{mr} & \forall m \in M, \forall r \in R \\
 (8) \sum_{t \in T} X_{ijmt} &\leq Y_{ijm} & \forall i \in I, \forall j \in J_i, \forall m \in M \\
 (9) X_{ijmt}^{ES} &\in \{0,1\} \\
 (10) Y_{ijm} &\in \{0,1\} \\
 (11) E_{ij}^+, E_{ij}^-, T_{ij}^+, T_{ij}^- &\geq 0
 \end{aligned}$$

Amaç fonksiyonu, ağırlıklı erken ve geç bitirme maliyetleri ile mod seçim maliyetlerinin toplamını minimize eder. İlk sınır, her bir projenin her bir faaliyetinin iki modun birinde ve toplamda bir kez yapılmasını sağlar. İkinci sınır, her bir projenin her bir faaliyetinin bitiş zamanını verir. Üçüncü sınır, öncelik ilişkilerini dikkate alır. Dördüncü sınır, her bir projenin her bir faaliyetinin erken bitme zamanını verir. Beşinci sınır, her bir projenin her bir faaliyetinin geç bitme zamanını verir. Altıncı sınır, her bir projenin her bir faaliyetinin iki modun sadece birinde gerçekleşmesini sağlar. Yedinci sınır, kaynaklarla ilgili miktar sınırlarını dikkate alır. Sekizinci sınır, X ve Y 0-1 değişkenlerinin aralarındaki ilişkiyi sağlar. 9, 10 ve 11 no lu sınırlar, değişkenleri tanımlar.

Bulgular ve Tartışma

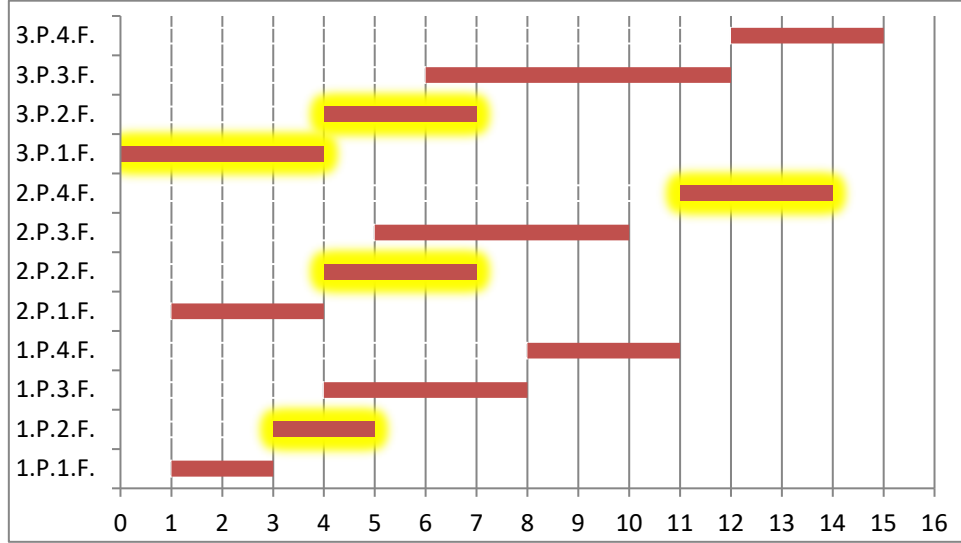
Gerek firma yöneticilerinden elde edilen bilgilerle gerek de bu verilerden hesaplanan girdilerle GAMS optimizasyon programında kod yazarak önerdiğimiz doğrusal programlama modelinin optimum çözümüne ulaşılmıştır.

Üç projeli ikişer modlu dörder faaliyetli bu proje çizelgeleme problemi için GAMS paket programından alınan çözüm sonuçları şu şekildedir:

$$\begin{aligned}
 X_{1111} &= 1 \quad Y_{111} = 1 \quad f_{11} = 3 \quad E_{31}^+ = 1 \\
 X_{1223} &= 1 \quad Y_{122} = 1 \quad f_{12} = 5 \quad \forall E_{ij}^- = 0 \\
 X_{1314} &= 1 \quad Y_{131} = 1 \quad f_{13} = 8 \quad T_{22}^+ = 1 \\
 X_{1418} &= 1 \quad Y_{141} = 1 \quad f_{14} = 11 \quad \forall T_{ij}^- = 0 \\
 X_{2111} &= 1 \quad Y_{211} = 1 \quad f_{21} = 4 \\
 X_{2224} &= 1 \quad Y_{222} = 1 \quad f_{22} = 7 \\
 X_{2315} &= 1 \quad Y_{231} = 1 \quad f_{23} = 10 \\
 X_{242(11)} &= 1 \quad Y_{242} = 1 \quad f_{24} = 14 \\
 X_{3120} &= 1 \quad Y_{312} = 1 \quad f_{31} = 4 \\
 X_{3224} &= 1 \quad Y_{322} = 1 \quad f_{32} = 7
 \end{aligned}$$

Bu sonuçlara göre 1. projenin 1. faaliyeti 3. zaman diliminde işlem görmeye başlamış ve 3. zaman diliminde bitirilmiştir. Sırasıyla 2, 3 ve 4. faaliyetleri ise 5, 8 ve 11. zaman dilimlerinde sonlandırılmıştır. Böylelikle 1. projenin tamamlanma zamanı 11 olmuş herhangi bir faaliyetinde erken ya da geç bitirme söz konusu olmamıştır. Diğer sonuçları da aynı şekilde okuduğumuzda 2. projenin 14, 3. projenin ise 15. zaman diliminde bitirildiği görülmektedir. Ayrıca E değişkeni ile 3. projenin 1. faaliyetinin 1 birim erken bittiği ve T değişkeni ile de 2. projenin 2. faaliyetinin 1 birim geç bittiği tespit edilmiştir. Bu erken ve geç bitirmeler ile mod seçim maliyetleri toplamı olarak amaç fonksiyonu değeri 90 birim çıkmıştır.

Grafik 1: Mod 1 ve Mod 2 için Gantt Şemalı Görünüm



Grafik 1’de her bir projenin her faaliyetinin hangi modda üretilip hangi zaman diliminde başlanıp bitirildiğini gösteren Gantt şeması yer almaktadır. Kırmızı renkli gösterim Mod-1 içindir. Sarı çerçeveli gösterim Mod-2 içindir. Grafikten gördüğümüz üzere; 1. projede sadece 1 faaliyet 2. modda üretilirken 2. ve 3. projede ikişer faaliyet 2. modda işlem görmüştür. Önerdiğimiz matematiksel model amaç fonksiyonunu minimize etmek için modların maliyetlerini ve faaliyetlerin erken-geç bitirme durumlarını karşılaştırmış ve daha küçük amaç fonksiyonu değeri elde etmek için bu mod seçimlerini gerçekleştirmiştir.

Sonuç

Elde edilen bulgulara göre; 3. projenin 1. faaliyeti belirlenen teslim süresine göre 1 birim erken bitmiştir, 2. projenin 2. faaliyeti ise yine belirlenen teslim süresine göre 1 birim geç bitmiştir. Bununla birlikte modların seçim maliyetleri de eklenince amaç fonksiyonu değeri $Z=90$ çıkmıştır. 1. proje 11, 2. proje 14, 3. proje ise 15. zaman diliminde tamamlanmış olup bu problem için toplam tamamlanma zamanı da dolayısıyla 15 zaman birimi olarak gerçekleşmiştir.

Problemin veri setinde değişiklikler yaparak farklı senaryolar geliştirmek mümkündür. Örneğin kaynak miktarlarını azaltmak ya da miktar artışı yapmak, teslim sürelerini erkene almak ya da bollaştırmak, erken-geç bitirme ceza maliyetlerinde değişiklik yapmak gibi. Bu birtakım veri değişiklikleriyle hazırlanan senaryolarda çözümler elde ederek duyarlılık analizi oluşturulabilir.

Önerilen DP modeli nispeten küçük veri setlerinde optimum çözüm vermektedir. Daha büyük veri setleri için sezgisel yöntemlere ihtiyaç duyulabilir. Ancak önerilen modelin, çok modlu çok projeli örnekler arasında ağırlıklı erken-geç bitirme maliyetlerini dikkate alan öncü çalışmalardan olması önemlidir. Böylelikle model, gelecek çalışmalar için umut vadetmektedir.

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AISI 430 PASLANMAZ ÇELİĞİNİN LAZER NOKTA KAYNAĞIYLA KAYNATILMASININ MİKROYAPI ÖZELLİKLERİNE ETKİSİ

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Özet: Bu çalışmada, özellikleri bakımından ferritik sınıfına giren, düşük karbonlu ve krom içerikli bir paslanmaz çelik olan AISI 430 kalite paslanmaz çeliğinin kesitleri 150-250 mm olan, 1 mm kalınlığındaki çelik levhaların ön ve son ısıtım işlem uygulanmadan lazer nokta kaynak birleştirmesinin mikroyapı üzerine etkileri incelenmiştir.

Kaynak bölgelerinin dayanımlarını belirlemek için çekme testleri uygulanmıştır. Kaynaklı numunelerin kaynak bölgeleri, kaynak dikiş derinlikleri optik mikroskopla incelenerek ölçülmüştür.

Anahtar Kelimeler: AISI 430 paslanmaz çelik, Lazer nokta kaynağı, mikroyapı incelemesi

Giriş

Kaynak ile malzeme birleştirme özellikle metal işlenen sanayilerde çok yoğun olarak kullanılan bir üretim yöntemidir. Levha veya blok malzemeden üretilen nispeten basit parçalar daha sonra kaynak yardımı ile birleştirilerek daha karmaşık şekilli parçalara ulaşılabilir. Kaynak ile malzeme birleştirmenin temeli, herhangi bir dış enerji kaynağı ile birleştirilecek iki malzemenin birleşim bölgesinin ve eğer varsa dışarıdan eklenecek dolgu maddesinin yüksek enerji ile ısıtılarak malzemelerin eriyip birbirine yapışmasının sağlanmasıdır (Dahotre, 2008) (Timings, 2008).

Kaynak yapmak için kullanılan dış enerji kaynaklarından bir tanesi lazer ışınıdır. Lazer ışınının diğer enerji kaynaklarından en büyük farkı, kolaylıkla parça üzerinde istenilen noktaya yönlendirilebilmesidir. Bu sayede kaynakla birleştirilecek bölgeye istenilen miktarda enerji lokal olarak uygulanabilmektedir. Lazer kaynağında, lazer ışın üreticiden çıkan yoğunlaştırılmış enerjinin çeşitli optik malzemeler vasıtasıyla iki malzemenin birleşme bölgesinde odaklanıp bu bölgenin aşırı ısınma sonucu eriyerek iki malzemenin birleşmesi esastır. Çeşitli uygulamalarda lazer ışını ile kaynak sırasında ilave malzeme eklenebilir veya lazer ışını diğer konvansiyonel yöntemlerle birlikte, eşzamanlı olarak kullanılabilir (F., 2009).

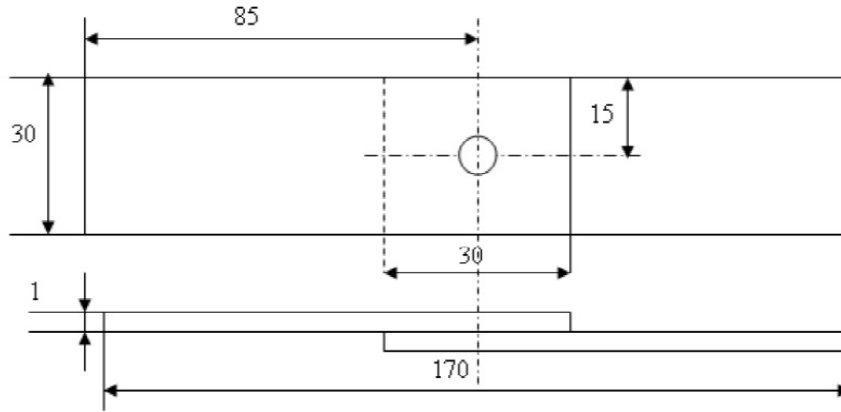
Çeşitli endüstrilerde ve çevrelerde yaygın olarak kullanılmakta olan Paslanmaz çelikler, mühendislik malzemelerinin önemli bir sınıfını oluşturmaktadır.

Günümüz endüstrisinde paslanmaz çelikler mükemmel korozyon direncinden dolayı tercih edilmektedir. Paslanmaz çeliklerin yüksek korozyon direncine sahip olmasının önemli etkeni içerisinde yüksek miktarda krom bulundurmasıdır. Demirin içerisinde % 5 oranında krom katılması dahi korozyon direncini artırır. Ancak paslanmaz bir çelik üretmek için en az % 12 Cr katılması gerekir (Türkyılmazoğlu, 2006).

Ferritik paslanmaz çelikler, genellikle Ni yerine % 10,5 ila % 30 arasında yüksek oranda Cr ve karbür yapıcı ve ferritik yapıyı kararlı yapabilecek olan Mo, Ti ve V gibi alaşım elementlerini içeren çeliklerdir. Oda sıcaklığında yüksek korozyon direncine sahip olmasının yanı sıra manyetik özelliklere de sahiptir. Ancak içerisindeki karbon oranı düşük olduğundan tavlama dışında herhangi bir ısıtım işlemi tabi tutulamazlar. Ferritik paslanmaz çelikler korozyon direncinin yüksek olması nedeni ile iç ve dış dekorasyon işlerinde, mutfak araç ve gereçlerinin yapımında, gıda sektöründe, otomotiv imalatında, petro-kimya endüstrisinde geniş bir kullanım alanına sahiptirler (Osmanoğlu, 2012).

Malzeme ve Metot

Bu çalışmada AISI 430 Ferritik paslanmaz çelik malzeme kullanılmıştır. Kaynatılan numunelere ait şematik gösterim Şekil 1'de verilmiştir. Ferritik paslanmaz çeliğe ait kimyasal ve mekanik özellikler Tablo 1 ve 2'de sunulmuştur.



Şekil 1. Lazer nokta kaynağı ile kaynatılacak numune şematik gösterimi

Tablo 1 ve 2 de Ferritik paslanmaz çeliğe ait kimyasal ve mekanik özellikler görülmektedir.

Tablo1. Deneyde kullanılan malzemenin kimyasal bileşenleri (% Ağırlık) (A.Ş., 2015)

Malzeme	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Co	Fe
AISI 430	0,046	0,6	0,586	0,022	0,001	17,13	0,132	0,019	0,121	0,044	Kalan

Tablo2. Malzemenin mekanik özellikleri [6]

Malzeme	Akma Mukavemeti (MPa)	Çekme Mukavemeti (MPa)	Uzama (%)
AISI 430	205	450	22

Şekil 1’de şematik olarak gösterilen 1 mm kalınlığındaki AISI 430 paslanmaz çelikler üst üste olacak şekilde lazer nokta kaynak yöntemi ile birleştirilmiştir. Lazer nokta kaynak yöntemine ait şematik görüntüler Şekil 2’de verilmiştir.

Çalışmada kimyasal bileşimleri Tablo.1’de verilen AISI430 ferritik paslanmaz çelik saclar kullanılmıştır. İlk olarak numuneler yüzeylerindeki atıklarından temizlenmiştir. Bu işlemten sonra malzemelerin kaynaklı birleştirilmesinin özelliklerini tayin edebilmek için lazer nokta kaynağı yapılan paslanmaz çelik sac malzemeler zımpara yapılamayacak kadar küçük boyutlarda olduğundan olmalarından dolayı, rahatlıkla zımpara yapabilmek amacıyla mikro yapı çalışmaları için üç adet numune hazırlanarak bakalite alınır. Bakalite alınan paslanmaz çelik malzeme numuneleri sulu zımpara makinasında çeşitli hassasiyeti olan (600,800,1000 ve 1200) zımpara kâğıtlarıyla sırasıyla zımparalama işlemine tabi tutulur. Zımparalama işlemi biten malzemeler parlatma işlemine tabi tutulur ve metalografik hazırlığın ardından görüntü alınacak yüzeyler elde edilmiş olur.

Sonuç ve Tartışma

Numuneye ait ana malzeme mikroyapısı Şekil 4’de verilmiştir. Yapılan deneysel çalışmalar neticesinde Şekil 5’te görüldüğü üzere AISI 430 paslanmaz çelik malzemeler üst üste lazer nokta kaynak yöntemi ile birleştirilmişlerdir. Kaynak öncesinde numunelerin birbirleri üzerinde tam bindirilmesi kaynakta büyük önem taşıdığı görülmüştür. Şekil 5 incelendiğinde arada kalan boşluğun/temas eksikliğinin, kaynak dikişinde bu boşluğa dolarak nüfuziyet eksikliğine sebep olduğu görülmüştür.



Şekil 4. AISI 430 Paslanmaz çelik ana malzeme



Şekil 5. Lazer nokta kaynak yöntemiyle kaynatılmış AISI 430 paslanmaz çelik



Şekil 6. Tam temas halinde lazer nokta kaynak

Tam temasın sağlanması ile birlikte kaynak dikişindeki nüfuziyete ait görüntü Şekil 6’da verilmiştir. Şekil 7’de ana malzemedan kaynak dikişine ait geçiş bölgesi verilmiştir. Şekil 8’de ise kaynak dikişine ait görüntü verilmiştir. Kaynak dikişi görüntüsü incelendiğinde kaynak tanelerinin merkeze doğru yönlendiği görülmektedir. Kaynak geçiş bölgesine ait Şekil 8 incelendiğinde ise dar bir bölgede oluştuğu görülmektedir.

Ayrıca kaynak dikişi üst noktasında içeri doğru kaynak yanma kraterinin oluştuğu görülmüştür. Krater derinliği optik mikroskop ile ölçüldüğünde 300-400 mikron derinliğinde olduğu saptanmıştır. Oluşan bu krater izi sadece üst yüzeyde olup alt bölgede iz tespit edilmemiştir. Bunun nedeni lazer nokta kaynağı için kullanılan kaynak gücünün düşük olmasıdır. Kaynak gücü artırıldığında diğer tarafta da iz oluşmakta hatta numuneler delinmektedir.



Şekil 7. Lazer nokta kaynak geçiş bölgesi



Şekil 8. Lazer nokta kaynak dikişi**Sonuç**

Bu çalışmada, AISI 430 ferritik paslanmaz çelik malzemenin, lazer nokta kaynak yöntemiyle birleştirilmesinin mikroyapı üzerine etkileri incelenmiştir. Elde edilen sonuçlar aşağıda sıralanmıştır;

- Numuneler lazer nokta kaynak yöntemleri ile birleştirilebilmektedir.
- Lazer ışınının numuneye temas ettiği ilk noktalarda yanma kraterlerinin oluştuğu görülmektedir.
- Birleştirilen numunelerde kaynak izi sadece bir noktada (üst yüzeyde) oluşmuş diğer bölgede ise herhangi bir iz oluşumu görülmemiştir.
- Numuneler üst üste tam temas ettirilmediğinde kaynak nüfuziyetinin azaldığı neredeyse numunelerde kaynama değil yapışmanın olduğu tespit edilmiştir.
- Kaynak dikişi tanelerinin merkeze doğru yönlendiği tespit edilmiştir.
- Numuneden kaynak dikişine doğru geçiş bölgesinin dar olduğu görülmüştür.

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AKILLI KASIS SİSTEMİ İLE ŞEHİR İÇİ HIZ KONTROLÜ

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Özet: Ülkemizin gelişen ekonomisine bağlı olarak araç ve sürücü sayısı her yıl hızlı artmaktadır. Son on yılda motorlu araç sayısında %64, sürücü sayısında ise %56 artış olmuştur. Hızla artan araç sayısı, buna paralel olarak ortaya çıkan trafik yoğunluğu ile birlikte trafik kazalarını çözülmesi gereken önemli bir problem haline getirmiştir. Trafik kazaları, birey ve toplum yaşamı üzerindeki olumsuz etkileriyle günümüzde çok önemli bir sosyal problemdir.

2016 TÜİK verilerine göre trafik kaza oranları sürekli olarak artmaktadır. Kazaya neden olan kusurlar içinde sürücü kusurları %89,6 ile ilk sıradadır. Bu kusurların en başında ise ölüm oranı diğer kaza türlerine göre en yüksek olan aşırı hız gelmektedir. Çağımız teknolojisine göre yeni üretilen araçların hız kabiliyetleri ise sürekli artmaktadır. Bunun paralelinde aşırı hızdan kaynaklı kazaların oranları da sürekli olarak artmaktadır.

2001 – 2017 arası TÜİK verilerine göre şehir içi kazaların büyük çoğunluğu dolaylı veya direk olarak aşırı hızdan dolayı meydana gelmektedir. Ülkemizde şehir içi hız kontrolünü sağlamakta günümüz teknolojisine uygun olmayan kasisler kullanılmaktadır. Belirli standartlara uyulmadan yapılan bu kasisler günümüz teknolojisine uymamasının yanı sıra amacına hizmet etmediğini belirten birçok haber bulunmaktadır. Bunun yanı sıra hız düşürme amacıyla yapılan bu kasislerin kazaya bizzat sebebiyet verdiğine dair birçok haber bulunmaktadır.

“Akıllı Kasis” sistemi ile hız sınırlarının üzerinde seyreden araç için kasis ile araç hızının düşürülmesi sağlanmış olacaktır ve hız sınırları içerisinde hareket eden araç için gereksiz veya ani yavaşlamalar önüne geçilmiş olacaktır. Böylelikle, yerleşim yerleri içerisinde hız limitlerinin üzerinde seyreden araçların yavaşlatılması ve hız limitleri içerisinde seyreden şoförlerin daha konforlu bir yolculuk ile ödüllendirilmesi sağlanmış olacaktır. Bunun yanı sıra kasis içerisine yerleştirilecek bir sensör ile geçen araç sayısı ve ağırlıklarının plaka bilgileri ile kayıt edilmesi sağlanabilecektir.

AN ANALYSIS OF EMISSION DISPATCH AT POWER SYSTEMS USING VORTEX SEARCH ALGORITHM

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Abstract: Thermal power plants releases great amount of emission gases to the nature. These gases have harmful effects to our nature so that they must be controlled. In this study, Vortex Search Algorithm (VSA) is proposed for solving emission dispatch (ED) problem. VSA is developed by take as an example of blended liquids. Two different power system is selected to shown applicability of VSA and compared with genetic algorithm (GA). It can be seen that obtained results, VSA is very powerful and practical method to solve emission dispatch problem compared to GA.

Keywords: Emission dispatch, Transmission losses, Vortex search algorithm, Optimization

Introduction

Emission dispatch is a fundamental subject for advanced power systems for both human being and nature. While power generating from the thermal power plants, no matter the types of fuel used, great amount of gas emission are released to the air (Farhat and El-Hawary, 2012). These gases are caused a lot of negative effect to our world such as acid rain, global warming etc.

Emission Dispatch (ED) problem is solved similar to economic load dispatch (ELD) problem. While fuel cost coefficients are used for solving ELD problem, emission coefficients are used for solving ED problem. All other steps of ED are similar with the ELD. From this point of view, the deficiencies in the optimization methods used in solving ELD problem are also valid for the ED problem.

Maclaurin Series based Lagrangian (MSL) (Hemamalini and Simon, 2009), Novel direct search (NDS) (Lin et al. 2011) methods have found poor global optimum solutions (Dieu et al. 2011). A number of optimization techniques for instance, Particle swarm optimization (PSO) (Niknam and Golestaneh, 2013), Ant colony optimization (ACO) (Sum-Im, 2004) etc. needs a lot of parameters. These requirements may be negative influence for reached the optimal solutions.

This paper formed by five part. First part is a basic of the problem definition. Emission dispatch formulation is given in part 2. VSA is identified and its numerical characteristics were given in part 3. Two different test systems and its values were specified in part 4. Furthermore, results of VSA compared with GA and Conclusion is given in part 5.

Emission Dispatch

Emission dispatch problem very important for the world. Thermal power plants are strongly affected the nature due to released emission gases. Main goal of emission dispatch problem is to reduce the amount of released emission gases from the thermal power plants while meet the total demand power.

Emission dispatch problem can be modeled as a quadratic function as follows (Varma et al. 2013):

$$E = \sum_{i=1}^N \alpha_i P_i^2 + \beta_i P_i + \delta_i \quad (1)$$

Here; α_i , β_i , δ_i are emission coefficients and P_i is generated power from generator i .

While emission dispatch problem is solved, total generated power must be considered. This power must be equal to summation of total demand power and loss power at the transmission lines. This situation can be expressed as follows (Danaraj and Gajendran, 2005):

$$\sum_{i=1}^N P_i = P_d + P_l \quad (2)$$

Here; P_d is total demand power and P_l is transmission line losses power. These line losses can be expressed as follows (Danaraj and Gajendran, 2005):

$$P_l = \sum_{i=1}^N \sum_{j=1}^N B_{ij} P_j P_i \quad (3)$$

Here B is $N \times N$ dimension loss coefficient matrix.

Generators must be operated between the maximum operation limits and minimum operation limits:

$$P_{l,max} \geq P_i \geq P_{l,min} \quad (4)$$

Vortex Search Algorithm

VSA is new optimization technique in the literature. This optimization method developed from the considered stirring liquids (Dogan and Olmez, February 2015; Dogan and Olmez, September 2015). Due to controllable circle size, it has flexible and very influential method for ED problem.

It can be assumed that this system is composed of circled circles. The largest circuit's center is calculated as follows (Dogan and Olmez, September 2015):

$$\mu_0 = \frac{upperlimit + lowerlimit}{2} \quad (5)$$

and radius of this circuit is determined as follows (Dogan and Olmez, September 2015):

$$\sigma_0 = \frac{\max(upperlimit) - \min(lowerlimit)}{2} \quad (6)$$

Here; upperlimit is maximum limit of problem and lowerlimit is minimum limit of the problem.

Candidate solutions are constituted in this first largest circuit. If these solutions exceed the exploration region, they must be shifted into the exploration region. For apply this situation Eq.(7) is used (Dogan and Olmez, September 2015):

$$s_k^i = rand \times (upperlimit^i - lowerlimit^i) + lowerlimit^i \quad (7)$$

Here; k is symbolized number of candidate solutions ($k=1, 2, 3 \dots n$), i is symbolized dimension of problem ($i=1, 2, 3 \dots d$) and $rand$ is random variable between 0 and 1.

After this step, best candidate solution is selected and appointed as a new center. Radius of the center decreased this mathematical expression as follows (Dogan and Olmez, September 2015):

$$r_t = \sigma_0 \cdot \left(\frac{1}{x}\right) \cdot \text{gammaincinv}(x, a_t) \quad (8)$$

and a_t :

$$a_t = a_0 - \frac{t}{MaxItr} \quad (9)$$

Here; $MaxItr$ is maximum iteration number, t is current iteration number ($t=1, 2, 3, \dots, MaxItr$), x is random selected number. gammaincinv is inverse incomplete gamma function and a_t is its parameter. a_0 is generally selected 1.0 for include all exploration region.

Test Systems and Results

Two different power system model are selected for emission dispatch problem. Vortex search algorithm are applied to these systems and obtained results compared with genetic algorithm outputs. ED problem of these systems solved for different power values as well.

Case A: Three Units System

Three units system is used for this case. Emission coefficients, B loss coefficients and generator limits are taken from (Dixit et al. 2011) and given in Table 1 and Table 2. ED problem is solved for 400 MW, 500 MW and 700 MW. The results obtained from VSA and GA are given in Table 3.

Table 1: Emission coefficients and generator limits of Case A

Unit	α	β	γ	Pmin	Pmax
G1	0.00683	-0.5455	40.26690	35	210
G2	0.00461	-0.5116	42.89553	130	325
G3	0.00461	-0.5116	42.89553	125	315

Table 2: B loss coefficients of Case A

B=	0.000070	0.000025	0.000030
	0.000030	0.000069	0.000032
	0.000025	0.000032	0.000080

Table 3: Results of Case A

Power	Method	P1	P2	P3	Ploss	Emission
400MW	VSA	108.5643	146.0067	152.8051	7.37	200.4960
	GA	95.6208	155.8501	155.9876	7.45	201.0200
500MW	VSA	124.8484	196.0834	190.7744	11.70	311.5620
	GA	126.2340	193.6950	191.7695	11.69	312.5373
600MW	VSA	164.2780	221.2746	231.3635	16.91	461.7612
	GA	149.9812	234.7531	232.3009	17.03	463.5991
700MW	VSA	181.8988	274.6757	266.7453	23.32	651.8460
	GA	176.8590	274.9974	271.5423	23.40	655.2074

It is shown from these results, VSA gives better emission values than GA for different power values.

Case B: Six Unit System

Six units power system is chosen and solved for emission dispatch problem. Emission coefficients, B loss coefficients and generator limits are taken from (Dixit et al. 2011) and given in Table 3 and Table 4. 900 MW and 1000 MW power values are selected and the results obtained from VSA compared with the obtained results from GA. These results are given in Table 6.

Table 4: Emission coefficients and generator limits of Case B

Unit	α	β	γ	Pmin	Pmax
G1	0.00419	0.32767	13.85932	10	125
G2	0.00419	0.32767	13.85932	20	150
G3	0.00683	-0.54551	40.26690	35	225
G4	0.00683	-0.54551	40.26690	35	210
G5	0.00461	-0.51116	42.89553	130	325
G6	0.00461	-0.51116	42.89553	125	325

Table 5: B loss coefficients of Case B

$B=10^{-4} \times$	1.40	0.17	0.15	0.19	0.26	0.22
	0.17	0.60	0.13	0.16	0.15	0.20
	0.15	0.13	0.65	0.17	0.24	0.19
	0.19	0.16	0.17	0.71	0.30	0.25
	0.26	0.15	0.24	0.30	0.69	0.32
	0.22	0.20	0.19	0.25	0.32	0.85

Table 6: Results of Case B

Power	700MW		800MW		900MW		1000MW	
Method	VSA	GA	VSA	GA	VSA	GA	VSA	GA
P1	56.0064	115.5853	95.7516	98.7248	119.9250	109.8048	124.9218	109.6536
P2	72.0072	61.6553	111.7739	114.5385	87.7273	108.4026	118.1436	150.000
P3	111.0105	112.7969	131.1361	147.3876	142.4752	133.1661	182.2220	173.8693
P4	105.0097	73.8579	113.6275	108.8930	150.3685	128.7935	166.0636	149.6760
P5	208.0108	170.2182	187.4628	177.3401	224.0126	206.9004	217.1612	254.8613
P6	165.1030	183.4905	181.7115	174.2780	203.8033	241.3030	225.5095	195.3610
Ploss	17.1478	17.6041	21.4633	21.1620	28.32	28.37	34.02	33.42
Emission	447.1885	454.3430	550.5760	554.5516	692.1430	693.4780	848.4420	852.0169

These results showed that, VSA has lower emission values compared with GA for six units power system.

Conclusion

VSA has presented for solving emission dispatch problem in this paper. To shown the effectivity of VSA three units system and six unit system are selected. ED problem of these systems are solved VSA and compared with GA for different demand power values. It is point out that, VSA method has better outputs than GA for different power values and usable technique for solving ED problem.

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AN ARCHITECTURAL EVALUATION OF KONYA CITY

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Abstract

Konya is an important city that has been home to different civilizations throughout history, has been used as a capital by the Seljuk State for a long time and extending to the neolithic turn of the past. The foundation of the historical city center of Konya started around the mound settlement known today as Alâeddin Hill. This area has been used centrally by different civilizations for many years and the most magnificent time of this area was the Seljuk period. The development of the historical city center was realized between Alâeddin Hill and Mevlana Tomb. The rich architectural content of different civilizations is clearly seen on this powerful axis. It contains many different artifacts belonging to the Seljuk, Ottoman and Republican era, where the architectural values that can be accepted as our cultural heritage of different periods are together and serve as a whole. This axis, which contributes to the rich architectural content of the city today, still maintains its vitality. With this study, the daily contribution of the historical city center was examined through the buildings. Alaeddin Hill - Mevlana Museum, which are contain many qualified building, has been accepted as an area study. The three qualified samples which are identified on the axis were analyzed in terms of historical, urban and structural, and the influence of these structures on the area was determined. The effects of urban and cultural heritage of architectural values are revealed in the analyzes made. As a result of these analyzes; It has been reached that the buildings give an identity to the center of the city and its surroundings, that it is an important factor in the perception of the places it is in, its reading and that it creates a focus reflecting character of the its period.

Keywords: Konya, Architectural Space, Historical City, Historical Buildings

Introduction

Anatolia has been regarded as the whole of architectural values that reflect the architectural values of our country in the best and clearest way. Anatolia has also prosperous architectural content which is exhibiting the history of the past for us. Different civilizations, cultures and way of lives with the existing architecture have shed light on our age. Existing architectural structures have traces of different periods and all together have determined social, cultural, economic and artistic values. The architectural texture, which is a major factor in the formation of the region or the city, is a focal point for tourists and visitors. With its strong past, strong culture and spatial relation, the attraction power of the region for the users is also high. Thus, this has increased the value and quality of the city/region. In this way, all the qualified architectural values of the city have been seen as a gain.

Konya is a city that has preserved its significance thanks to its geographical features and position on the caravan routes in Anatolia and the significance as the capital of the Seljuk Sultanate of Rum for many years. Hence, Konya has been called as “Dârü’l- Mülk” (capital city) and become one of the most important centres of Turkish-Islamic culture and art in Anatolia (Baykara, 2002).

Historically, Konya has developed as a single-centred city. The central business areas of the city are Alaeddin Hill and its surroundings. The historical city center is located on Mevlana Street, which is the most significant transportation artery of the city, and mainly south side between Alaeddin Hill and Mevlana Külliyesi. The historical city center located between Alaeddin Tepesi and Mevlana Külliyesi is the area with the highest accessibility in the city (Ter and Özbek, 2005).

Mevlana Road has a significant texture among the architectural sides of the city. This texture has been destroyed several times in the last 100-150 years and has been subjected to reconstruction studies. In this study, the main aim is to examine and analyse the losses and gains experienced in terms of street and building scale throughout the historical process. It has been aimed at searching the current situation of the area and its positive and negative aspects. In this context, the development of the axis of Alaeddin Hill and Mevlana Tomb has been researched. In the area, three buildings which have functionally, structurally and spatially interesting historical process have been selected as sample. These buildings: Konya Governorship Building, İplikçi Mosque, the Central Bank Building.

Materials And Methods

The architectural transformation and transformation of the city center was discussed at Konya Governorship Building, Iplikci Mosque, Central Bank Building and it has been determined how the city entered into a process of changing during different periods. The historical, urban, structural and spatial values of the area were analyzed in the sample building. In the light of the researches and evaluations, the impact of architectural values on the city and cultural heritage has been revealed. The contribution of the sample building to the field has been determined in the historical process and the interaction of the area with the building has been analyzed. In this context, the existing architectural works of the area and its richness have been revealed. The values of the buildings belonging to different periods ensure that the field has rich content. The coexistence of different cultures in the field ensures the architectural quality. Therefore, user and visitor density increases in this area as a normal result.

Historical Development Process Of Konya City Center

Konya with its geographical location, its historical and cultural wealth has always preserved its significance as a settlement. Konya was the capital of the Seljuks and important architectural works were brought to the city during this era (Baykara, 2002).

The development of the city from the Seljuks to our age has been organized around Alaeddin Hill which is an old tumulus. This hill has been dominating over 750 years and has provided control. The Phrygians, Lydians, Persians and Romans used this area as a settlement in the past (Bala, 2002). The city remained as a province of the Roman Empire until 395 AD. In Byzantium era, it became a Byzantine city aftermath of fragmentation/dissolution of the Roman Empire. The "Iconium" (the country of icons) in the Byzantium encountered Islamic raids and was compressed into Alaeddin Hill (Karpuz, 1998). The Turks, after 1071, have regarded this region as homeland. Because, the region familiar to Central Asia in terms of their natural and climatic conditions. This area surrounded by grazing lands suitable for horses and livestock is easy to defend in the Turkish war tactics and to be evacuated when necessary and it is appropriate for being a capital with a hill which is appropriate/suitable for the ruler-army-headquarters. Alaeddin Hill has important architectural content because it has been housed in the entire history from the Phrygian period to the Seljuks as the first place where Konya was founded (Kuştepe, 2011).

The first settlement area of Konya (Ikonion), a Roman colony city, has been Alaeddin Hill and the south side of the hill. In the Byzantine period, the locals established settlements in the areas of Alaeddin Hill and the southern areas. In the 13th century, the settlement texture of the city concentrated around the Alaeddin Hill. The Seljuk period constituted the best period of history in terms of both the social structure and political life of Konya, as well as transformation on physical texture. Alaeddin Keykubat brought Rumi (Mevlana Jelaeddin Rumi) and his father Bahaeddin Veled to Konya in 1229. Their immigration has increased the attractiveness of the city. Meanwhile, the scientists and intellectuals of the era began to come to Konya. After Rumi came to the city, the city overflowed from the city walls. It can be stated that the reason behind this overflow Rumi settled down outside of the city walls. Thus, apart from the baileys, free textured, enclosed streets and neighbourhoods that are integrated with garden and rich interior architecture began to be formed. After the death of Rumi, the city started to become a visited place and a social center which has commercial functions. As a capital, Konya was organized with an artistic, aesthetic architecture and understanding of a system that befitted Seljuks' dignity in their era. In 1308, the city was under the dominance of different principals with the collapse of the Seljuks. It was under the Ilkhanids' dominance and then it ruled by Karamanid and finally it was under the suzerainty of the Ottoman Empire. The city, which had been under Ottoman rule in 1465, became a provincial state where princes became the governor of the Ottoman Empire, the army camped in for the military expeditions towards the East. As a result, with the Ottomans, reconstruction activities in Konya began to decline. However, after the death of Rumi, the activities continued in the dervish lodge (dergah) which was founded for the name of Rumi. At the same time Rumi's thoughts have continued to pervade around the dervish lodge. Thus, the dervish lodge has become a center of visitation and social center and has continued to contribute to its neighbourhood. In addition, thanks to its significance, the region has had functionality for trade. It has been known that in addition to these riches, the number of the houses has intensified in this area. With the beginning of the construction of the Mevlana Tomb, the Mevlevi people began to gather around the dervish lodge. Therefore, new residential areas began to form outside the city walls. As shown by the large cemetery area behind the dervish lodge, the understanding of being close to the tomb of Rumi became widely seen after the death (Konyalı, 1997). This condensation, which emerged around the dervish lodge, also affected roads of the city. During the Middle Ages and the following period, the city consisted of the center of a circle around Alaeddin Hill where the inner castle is located, and the radial roads leading to that centre (Kuştepe, 2011).

Due to the authority provided by a central empire in the Ottoman era, the walls lost their former significance. However, the entrance points of the roads to the city were again the fortifications. The perimeter of each door has become an art and trade district, and shops have been opened and bazaars have been formed around them. These

city walls, which were connected to the city roads, have influenced the formation of the urban road system (Ter and Özbek, 2005).

It was the period when the Ottoman Empire suffered economic difficulties from 1880 to 1900. In this period, there was no maintenance of historical monuments. The visuals of Konya in the early 19th century has proven this situation (Kuştepe, 2011).

The fire that started in 1867 and continued for three days became one of the important events that affected the physical structure of the city. After the fire, slow but continuous construction/zoning activity was seen in the city. These activities gained momentum in 1898-1902, and streets and roads which were crossing each other in the city center were opened. The most important of these streets is Mevlana Road which stretches between Alaeddin Hill and Mevlana Külliyesi, which still have been preserved its significance today (Kuştepe, 2011).

In the 19th and 20th century, Mevlana Külliyesi and its surroundings became the prestigious settlement area of the city, and buildings that have 2 or 3 floors have started to be built in Mevlana Road where houses of wealthy merchants and civil servants of the city were located. For the signalizing the borders of the old city center, the restrictive order of old transportation spine which can be defined as an embedded channels system played an active role. Historically, Konya has developed as a single-centered city. The business areas in the center of the city are located around Alaeddin Hill and its vicinity (Kuştepe, 2011).

The beginning of the 1900-1923, the early times of the 19th century, the First World War period when the Ottoman Empire participated and defeated. In this period, many architectural works on Mevlana Road demolished due to wrong policies. 9 madrasahs and 2 mosques between Alaeddin Hill and Governorship Building were ruined and disappeared and Mevlana Road was also built during this period (Kuştepe, 2011).

The process of development and change of the axis have caused the current situation of the city. Many civilizations, cultural and architectural values have combined and formed the city center of Konya as a whole. Each structure and space has had a separate value and contribution to the axis. The buildings belonging to different periods and different styles have fulfilled functions of our age and provide the opportunity to utilize facilities of the city. A few of these structures are Konya Governorship Building, İplikçi Mosque, Central Bank Building, which have been located on the axis in different periods. All have reflected the best of their era and provide a rich architectural content to the region. These constructions, which existed during the development process of the axis and continued to be carried to our age, are the cultural components that connect the past and the future (Semerci, 2017).

İplikçi Mosque

The İplikçi Mosque is a building which was built on the southern side of the main road extending from Alaeddin Hill (from the citadel) to the east. The front entrance gate of the building which was built on Alaeddin Road, a central place in the city, is opened into the main road. The date of construction of the building is 1201 (Figure 1). It has been thought that the mosque was constructed since there was a necessity for Friday prayers. It has been known that there was a madrasah (Altunaba) in the vicinity of the building which does not exist today.



Figure 1. An old photograph of the building (Karpuz, 2009).

The dome in front of the mosque's niche is from the Friday prayer masjids (Mescid-i Cuma) of the Great Seljuks. The building has been considered as one of the first examples of the system adopted in Seljuk mosque in terms of plan, in the 13th century (Figure 2). It is one of the two examples in Anatolia where bricks are used as building material (Kustepe, 2011), (Figure 3). It has been known that the mosque has been restored many times during

different periods in the past. As a result of these restorations, the mosque has constantly changed. But it has never lost its original identity.

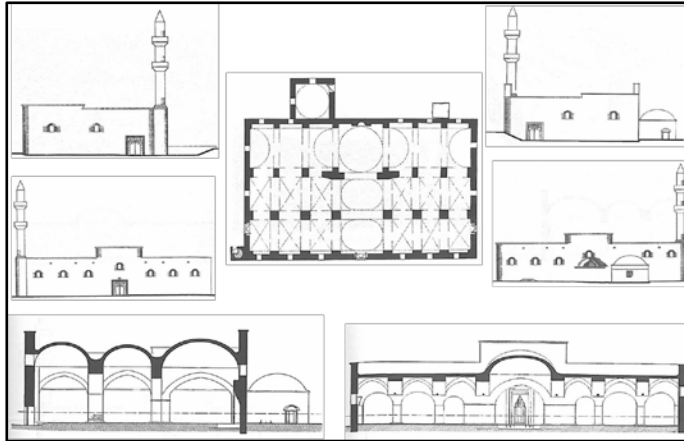


Figure 3. Building's plan, sections and views (Aygör, 2010).



Figure 3. Today's photo of the building.

The Mosque which reflects the Seljuk period on the axis in the best way, has added a distinctive value to the area. The building, which has enriched the functional and historical influence of the area, has been continuing to transmit the architectural value of its period.

Konya Governorship Building

The Governorship Building, also known as the Government Building, was built with using regular stones of the outer fortress walls of Konya in 1885-1886 during the period of Said Pasha of the Pre-Republican Governors of Konya (Figure 4). It has the architectural style of the 1st National Architecture Period. The building has a rectangular plan, courtyard and 3 floors (Duran, 2006).



Figure 4. An old photograph of the building (Karpuz, 1998).

Governorship Building is one of the administrative structures that were ordered to be built in the provinces by Abdul Hamid II within the framework of the strengthening policies of the Ottoman provincial organization. The governorship building is a public building that has been directed to the square and to the Mevlana Museum and which has been continues to pursue its function located in the exact center of the Alaaddin-Mevlana axis. It is a building that we can figure out the features of the period (1st National Architecture) with looking its façade and plan and it distinguishes itself in silhouette and its gabarite is in tune with the buildings in surrounding. It has quadrangular form, so that we can easily perceive symmetry and rhythm. It is a masonry building which was constructed by using cutting stone (Karpuz, 2009), (Figure 5).



Figure 5. Today's photo of the building.

Central Bank Building

The Central Bank of Konya was built in 1975-1976. The building is located on the historical axis between the Alaeddin Hill and the Mevlana Tomb (Mevlana Road) in Konya city centre (Kapuz, 2003). It can be stated that Konya Branch of the Central Bank draws attention as a good example of modern republican structures (Figure 6-7).



Figure 6. A photo of the building (Mimarlık s.76).



Figure 7. A photo of the building (Mimarlık s.76).

The Central Bank, where the different functions are appeared together as planning is unique for also distinctive details on its façade. In order to provide natural lighting of mezzanine which is above the ground floor, liveliness has been provided on the façade.

The liveliness that provides uniqueness in modern lines of the building has shown itself within the elevation differences (Mimarlık p.76).

Konya Branch of the Central Bank Building is one of the prominent examples of modern buildings during the Republican Period. The building, which is one of the rare examples of modern buildings in the city of Konya and the Central Anatolia, appropriately summarizes the architectural movement that it has (Karpuz, 2003). This structure also is a pioneer work for other modern constructions of the city. Building has gained unique condition, since construction of the building was determined as a result of a project competition and it has modern identity. Having been registered as an example of modern building, the Central Bank has maintained its presence and function since its establishment with its strong identity.

Conclusion

Mevlana Road has been an economic, educational, religious, administrative, social and cultural center throughout history. This center has needed to be perceived well as the connection between the past and the present. Therefore, the history of the area and the process of spatial change should be appropriately analysed. The axis has witnessed different transformation and transformation processes in different periods and has functional diversity by incorporating different spaces. On the axle, changes have taken place in different scales during the process. As it can be figured out from the historical process of the area, structures belonging to different civilizations were destroyed while structures belonging to other civilizations (cultural) were found in the region. A typical example of this situation is the İş Bank Building. After finding a place in a different position on the axis, it has maintained its continuity functionally with a different architectural style in a different position afterwards. As we have pointed out here, the function of architectural understanding, position, characteristic and quality of structures have constantly

changed. It is interesting to protect the function within the strong central character of the area. As a result, structures, architects, spaces and functions in the historical city centres are constantly undergoing a change. In parallel, the city center reflects different cultures, civilizations and understandings as a whole. The important thing to note here is that the richness of the urban center, enriched by architectural diversity, can be included in this concept. This is because every building (architecture) that has taken place in the past and actively participated in the period has constant value that the area possesses and still contributes to the richness of the area.

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AN ASSAY WHETHER EARLY COMMUNICATION (TEACHING TURKISH) METHODS AFFECT THE THINKING PROCESS THROUGH TURKISH AND MATHEMATICS COURSE

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Abstract: The scientific knowledge asserts that the language learning center of the human species is designed in a way to understand the whole better than the single parts. In other words, inductive method which is particularly applicable and necessary for the scientific field, is superseded by deduction method due to its superiority when it comes to learning a language. It is necessary to conduct studies whether the teaching method of the native language affects the thinking process and on the cause-and-effect relationships. Immediate motivation of people is not possible. This process is performed gradually and the initial stages are of great importance in the formation of the governance of the masses. An individual who can see single parts but can not see the whole (the big picture as colloquially expressed by the Western), can not think analytically, has an underdeveloped reasoning ability or not at all developed; does teaching method of native language have any effect on creating people who cannot make a whole out of relevant parts or, as literally expressed by native of Anatolia, in creating people who cannot tie up the ends of the ropes? How does the early communication method of 'mathematical' knowledge, a must for life, affect the ability to grasp and apply it? What does it have to do with using Turkish language?

As it can be seen from the above paragraph, this assertion has two goals: The first one is as follows by means of an example from social sciences: It is based on how the teaching method of native language can influence the thinking process through a practice to complicate the task of language learning center in brain, that is contrary to its functioning. And the second one: With use of an example from life sciences, will be starting discussion with respect to the effect of not teaching abstract mathematical knowledge through concrete examples on thinking process, its consequences, and how the way of teaching mathematics influences language skills since 'linguistic' is based on mathematics.

Key words: Induction, Deduction, Analytical Thinking, Reasoning, Early Communication Method, Big Picture, Mathematics Skills, Turkish Skills

Introduction

"Idea + Phrase + Articulation = That is Human."

Stanislavsky

The language, which is considered as a universal and ancient quality as man's making of tools, helps to hand the inheritance of social experience down from generation to generation. Language skill is naturally regarded as one of the primary differences between man and animal (Taşer, 200: 49). All members of a society can tell others what they see, hear, experience, and do by use of the same symbols in the language (Taşer, 200: 47).

"Man's achievements rest upon the use of symbols"

Alfred Korzybski

Language is a more advanced phenomenon than simply handing down traditions, customs, information, experiments. At the same time it affects the legacy left; in short, language makes the tradition rational (Taşer, 200: 47). The main focus of the article originates from this. *Why does a society resist to change their trials and experiences according to reason and science?* Although this is available in the nature and development of the language, why is there a movement in the opposite direction of this structure in some societies? The particular focus of this paper is to discuss this question with respect to our society in which we are born.

"Any method that improves thinking also improves speaking; and vice versa any method that improves speaking improves thinking as well."

AT Weaver; MV Ness

What are the factors that can cause disruption in the normal development of thought? Is it due to the fact that customs and traditions assume a role of religious elements? When religion and language considered in the same context, language acts like a link as expressed by Confucius. Contrary to popular belief, it is not the religion that holds together like glue. At best, it might be transfer of religious elements, but in any case this does not exhibit a permanent characteristic, and history witnesses that. To rephrase, the possible external dynamics that can influence the formation of thinking: Is the teaching method of Turkish and Mathematics constitute the main problematic question of the article?

A large majority of the population in our society we live in experiences problems with the use of mathematics and language. Our mathematical knowledge is weak and we generally fail to practice it in our lives. It does not make our life easier, on the contrary, it can make our life more difficult if the information that is taught creates confusion. However, mathematics is there to make us understand the life and make it easier. Using hand like an abacus- counting on the fingers is common and those who have never attended a school can get ripped off less in market. Our sense of direction has not improved as well. However, our society descends from ancestors who were quite good at using world map.

The teachers, who are native speakers of English Language with pedagogical formation (on writing, note-taking, listening, reading) have attempted to divert tendency of public high school graduates on whole sentence, instead of constantly focusing on the parts of sentences and trying to learn separately. The first time this is experienced by the author of this paper is when she was a student at preparation class in YADYOK (the school of foreign languages) at Bosporus University, and at that time the idea of making a paper on this topic has come to her mind. Teachers did not experienced such a difficulty with international students, however they were constantly obliged to motivate public high school graduates to focus on whole sentence instead of its constituents (actually, this should be easy to achieve later on due to the nature of language). The graduates of Italian High School, Saint Michel French High School, Saint Benoit High School, Notre Dame de Sion French High School - all of which excels at providing a proper education even for a second foreign language, do not have such a problem. As author of this paper, hereby, I would like to share my personal experiences pertaining to that time. In YADYOK at Bosporus University, I have participated in the same language courses together with some of the graduates of the aforementioned high schools, and I have my personal observations thereof. No matter in which language they were trained in their high schools, they had a proper language learning experience such that, with some effort, they would not be even required to be participate in an English preparation class. In those days, I have found the answer to my question on functioning of the language learning center in brain when I have read a sentence by Noam Chomsky in his book borrowed from the library at Bosporus University. The functioning principle of the language learning center in brain is based on the requirement of "deduction" (Chomsky, 2001: 20).. Now the puzzle is completed for me, who has graduated from high school with a certificate of commendation, with high grades in English, had opportunity to spent time with people from different societies, and had a pen friend since my early childhood - That's why, in this society, there is a colloquial saying as follows:

If you want to learn a language, live in the country where it is spoken or have boyfriend or girlfriend, who is a native speaker of the language to be learnt. (Or you may use a more direct translation of what is explicitly meant here: without French kiss, you can't learn French.) Why ? Because you learn as a whole. Just like a baby learning to speak. Hereby, it is emphasized that exposure to whole sentence, observing action and reaction - also referred to as interaction- and communication depend on presence of interaction. (Please revise this part: etkileşimetkileşim olmasına bağlıdır) After such interaction, which tense should be used, should the verb be at the end of sentence? A baby can start talking with simple and grammatically correct sentences without caring if it is a head-final language or not

Then wearing red ribbon was clear to me. Why was red ribbon so important?

The answer to this question lies in how we talk. Let's discuss it in more detail.

How Do We Talk?

Speaking a quality of human race. The emergence and development of languages have naturally been directly or indirectly a field of interest to a wide range of different sciences such as anthropology, ethnology, sociology, psychology, linguistic, psycholinguistic, social psychology... (Taşer, 2000: 39-40). The air exhaled from lungs strikes at a great speed to the throat and mouth and causes vibrations. The sound is vibration heard through the ear, and the physiological elements will not focused on in this paper.

G. Herbert Mead claims that speaking is possible though "meaningful others". The people who really care about themselves will be the meaningful others of a baby. Every day, a baby observes the meaningful as a whole. Baby follows communication with itself and with others. When water is requested, it sees that a glass of water is served. A baby hears a plethora of sentences about diaper, baby poop or baby pee and / or physical appearance such as hair, head, hands, eyes, legs etc. when diapered. A baby notices that attention is drawn on its hair when we say you have such lovely hairs, or on hands when we say you have such lovely hands and similarly to legs, foot etc. A baby does not hear hundreds of sentences only about itself but also about everyday life. The important point here is to communicate using correct, long or short sentences. There should be no discourse attributed to the baby language such as sounds like eh, neh, heh, owh, eairh in baby talk making a false assumption that it is a baby after all. It should not be forgotten that a baby is a small yet inexperienced person, but with some genetic traits. The more qualified communication a baby is exposed, the more quickly it will develop its skills. We can figure out the importance of the quality of the language used in communication based on correlation between language and intelligence. The more stimuli stimulates brain, the better they are for a baby. As Maria Montessori has said, there are some assertions that a baby should be communicated with even if it is still in mother's womb since a baby is ready to perceive you. That is referred to as interaction. The receiver and the transmitter face each other. In other words, it contains the principle of reciprocity: action and reaction are observed, a reciprocal exchange is experienced and the definition of communication is based on this. Communication is only possible through interaction and there would be no conversation if there is no interaction.

Child psychiatrists and psychologists say that lack of interaction can lead to mental retardation in children. It is even asserted that in unilateral (one-sided) communication - such as leaving the child in front of the TV screen - interaction would be out of question, speech problems such as delayed speech or mental retardation may be experienced. If there is interaction, there is speech.

We learned to speak through interaction and what is clear by now is that a baby born into an environment where native language is tried to be taught with split parts (words will be uttered in syllables, tenses will be focused on, sentences will be studied as separate words and so on) either will be able to talk late or suffer from other problems due to confusion. Trial-and-error is required. In other words, this trial should be done with a baby (it is objectionable to have such trials from human aspects). Science may suggest that the results may be similar to those encountered in babies exposed to unilateral communication.

Well! How did we learn our native

language? Let's analyze...

How did we learn native language (Turkish)?

The method that we learned our native language: In a nutshell: First 29 letters are taught. We wrote and studied. Then they gave us syllable cards: A lot of syllables cards such as fa-ther, moth-er, ap-pple. Then we proceeded with sentences. Transition from letters to syllable cards was made with use of addition method. By adding syllables after each other. First "f" then an "a", this is "fa", similarly "t", "h", "e", "r", "ther", thus "faaaaaaaaaa" "theeeeer". By repeating the letter "a", so many similar syllables were studied over and over again by spelling, writing and memorizing. Then it was time to use 'sentence cards'. Ali throw the ball. Run, Ayşe run. Ali caught the ball. Ayşe run towards Ali. These were the kinds of first basic sentence forms. What addition method was preferred? Does it originate from a tradition that has existed in this society before? This tradition is based on pronunciation of the Qur'an.

It is based on pronunciation of Arabic letters one after another without knowledge of Arabic grammar. A small book called Elif Ba (made of the first two letters in Arabic language just like the word "alphabet" is constituted from Alpha and Beta in Greek alphabet) is a step by step guide for pronunciation of Qur'an and is generally pronounced under supervision of a Muslim scholar. It is a method based on teaching only the pronunciation of the Qur'an without any idea about meaning and this method has similar characteristics. For example: if the letter "b" has a Fathah (short vowel mark on it), it is pronounced with a short /a/ (like the initial sound in English word "up"), and it is taught with addition of sounds just like "ba". Was it made a false assumption based on such a tradition that it make mastery of reading easier. Is this how it is taught since the early days? Since it coincides with the adoption of Latin Alphabet on 1 November 1928, were they convinced that it could only be taught in this way? (Please revise). In this paper, there are no answers to these questions and they are intended to be researched. At that time, they did not have this knowledge about the functioning of the language learning center in brain, and it was thought that this habit in the society would facilitate the mastery of reading, it did not evolve within time according to reason and science. Now the knowledge that science offers us is that this method makes learning difficult. It can cause situations that hinder analytical thinking, may interrupt the ability to see whole picture (able to see individually, but incapable of seeing the whole), and cause short-term memory due to correlate things. Although this method is abandoned for a specific period, all of the teachers are trained in inductive method. When we analyze the characteristics of a language to transfer the knowledge, it can be clearly predicted that long years will be required for transformation.

How is mathematics, essential for life, lectured? In which way is Turkish language mathematical? How does deficiencies in teaching of mathematics affects usage of Turkish?

Life is based on mathematics, and mathematics is based on formulas. There is a logic in formulas, but it is necessary to introduce this logic to children in commensurate with mental development of children in order to encourage children to love mathematics. Until the age of eleven, human beings can not grasp abstract knowledge in general. Introducing mathematics through concrete examples will make it easier to learn and this is the way to build a solid foundation. Comprehension of the logic behind mathematics depends on establishing a solid foundation. If this is not done, multiplication table nightmare starts to haunt, one cannot make up peace with mathematics no matter what, and identifying directions, giving directions, using maps might be a nightmare.

Moreover, language knowledge is also based on mathematics. Individuals with no exposure to the mathematical knowledge through the right method remains weak in terms of linguistic knowledge. Many people fail to separate "de" in Turkish language, having the meaning of "also", which should be separated from the word it follows. Short-term memorization is immediately forgotten when the examinations are over and many other similar examples can be given. The language can not be fully mastered somehow. Of course, it should be noted that generalization is made here. Depending on location, such difficulties may be experienced to some extent or we can observe that such problems are still experienced in society-wide. Eventually, what happens?

Conclusion

"Experimenting with the genetics of the formation of thinking (with the functioning of the language learning center in brain) from the very beginning will only serve to (create) shape minds or shaped minds. If this is done, people can easily be manipulated through ad hoc means (internalized motifs, cultural codes, etc.), then nothing will be rejected or found odd by them, because they might already have ceased to question such means."

Nevin Algül

"The universe is entirely based on mathematics. Mathematical knowledge is essential to understand the world, make sense of it, and make our life easier. Teaching of mathematics by use of a method contrary to the developmental stages of the human brain can serve to make a contribution to not only raising people who cannot find their way, give directions, use maps, but also people who has no real knowledge about grammar of native language, and accordingly no real mastery of native language."

Nevin Algül

How does an individual feel that? They may not feel, but they may be exposed to an inferiority complex. Student gets six years of foreign language education (foreign language is taught through induction method), let alone speaking, fails to speak in simple sentences, and has never enjoyed grammar and mathematics throughout all study period. How many adults are there out to know multiplication table by heart? Student gets red ribbon later than classmates and thus receive a nasty blow by native language before life really begins. What happens then? The feeling of inferiority complex may develop. A feeling emblazoned in his or her unconscious (in the first quarter of 2000, the definition of subconscious concept has changed and it is redefined as our attitudes and behaviors that are shaped through our life experiences (Mlodinov, 2013: 21-23)

Unity of education is a must. All schools are affiliated to the Ministry of National Education by the Law on Unity of Education, enacted under law No. 430 on March 03, 1924, and enforced on March 06, 1924 by TGNA (<http://mevzuat.meb.gov.tr/html/110.html>), and thus unity of education is ensured (If definition of education includes to make changes in attitude and behavior through information transfer, then would it not be more appropriate to call it unity of teaching-education?)

The fact that there may be a difference between the methods of transferring information in schools of foreign origin and state-owned schools is within the scope of this paper, but it should be discussed if such differences in methods cause creation of different minds, exposure to foreign culture, feeling close to it, receiving information as it should be, and formation of a naturally dominant ruling class.

If native language is not taught by means of induction, it may end up in a group of people who cannot establish causa - effect relation, who can comprehend events independently but cannot make a whole out of it, who close the door on reasoning, who readily accept dogmas and never question them, and who has a weak memory.

This may even be the reason for short-term memory. To create masses that assimilates the cultural codes of the social circle in which they are born without questioning them. It is very easy to manipulate such people through the instruments of religion, ideology, race. If you deprive man of ability to question (reasoning, comparison, correlating events but doing all these things in an objective and sound manner), man attempt to give a meaning to his presence through religion, ideology, race, factions, groups, even NGOs (civil society organizations) and in this context someone who considers to be a very modern person and some other person who is considered to be very narrow-minded can be put in the same equation. It should not be forgotten that the cultural character of the family, namely the first social environment, plays a decisive role in the quality of education a person gets, and covers up its deficiencies. The greatest evil here is that it is not noticed that objective thinking is a plus for the future of the humanity and societies and that minds can become a putty in the hands of imperialist powers as 'programmed minds', ignoring the fact that science also supports this assertion. Now it will be very easy to make all these 'programmed minds' to welcome people, who have the same appearance with them serving others. The real task here is under responsibility of who call themselves as "intellectuals". This can be solved with a brain to see and understand the situation and courage to disclose it. It is the way to use the science. Of course, the facts need to be updated in line with scientific knowledge. One can come out and prove that two plus two may not always equal to four. It would be possible through these 'intellectuals' to establish an order for cultivation of a viewpoint in people in which the doors to reasoning would be wide open. A society should be able to solve the events through the instrument of reasoning and science, and also to be able to do crosscheck such reasoning via science. It is possible to have all kinds of beliefs and belief systems that will keep the human being alive, but common ground should be science. All other ways would create manipulable societies, which can only lead to a transformation into a society that enriches others, is easily driven away from here to there, and even collapses.

World governance is based on commercial intelligence. The rulers who are keen on domination want a manipulable consumers suitable for the perception management, who can think in parallel with rulers' interests, masses that contribute all their resources to rulers, and actually they do create such people. Today, the means of manipulation are still religion, language, race, democracy (even all NGOs), all religions, belief systems, yoga, ayurveda, astrology as they abuse. That is to say, all the teachings that exist for their own purposes can be transformed into abuse-liable means. These tools may vary. For the continuation and continuity of society it is necessary to establish language policies, which are independent of dominant powers, and put reasoning and science on its focus.

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AN EXPERIMENTAL AND COMPUTATIONAL STUDY ON NOVEL 1-ARYL-2-BENZYLIDENEHYDRAZINE-1-CARBOTHIOAMIDE DERIVATIVES

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Abstract

In this study it was aimed to synthesize and characterize novel 1-aryl-2-benzylidenehydrazine-1-carbothioamide. For this purpose, in the first step, 2-benzylidenehydrazine-1-carbothioamide was synthesized via the reaction of benzaldehyde and thiosemicarbazide. In the second step 2-benzylidenehydrazine-1-carbothioamide was reacted with various aryl halides to obtain novel 1-aryl-2-benzylidenehydrazine-1-carbothioamide derivatives. Reaction pathway is given in Fig. 1.

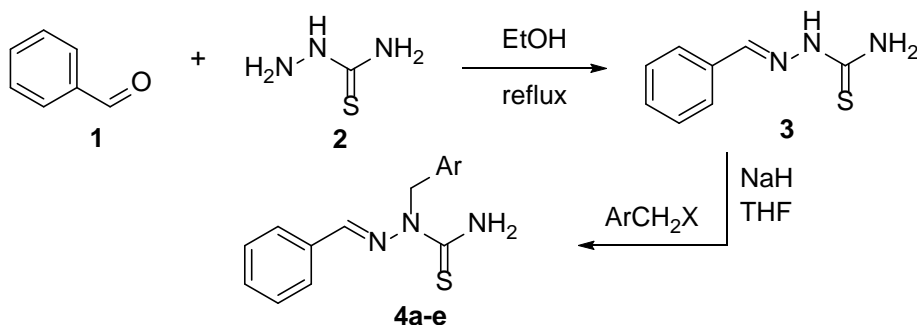


Fig. 1: Reaction pathway.

In the second part of the study, some DFT calculations have been performed on the investigated molecules. Geometry optimizations, vibrational analysis, molecular electrostatic potential maps, frontier molecular orbital calculations, determination of some global reactivity descriptors and NMR calculations have been performed. In the computational part, calculations have been performed at DFT B3LYP level of theory using various basis sets including 6-31G(d), 6-31G(d,p), 6-311G(d,p) and 6-311+G(2d,p) basis sets. NMR calculations have been performed using both CSGT and GIAO methods. Results show that there is a good agreement between experimental and computationally obtained data.

Keywords: sonochemistry, computational chemistry, thiosemicarbazide, 2-benzylidenehydrazine-1-carbothioamide, DFT

AN INVESTIGATION ON THE EFFECTS OF ECAP ON THIXOTROPIC MICROSTRUCTURE OF AA7075 ALUMINUM ALLOY

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Abstract: With Zn as the primary alloying addition, alloy from the 7000 family offers higher tensile strength than many steel especially in T6 temper. These family are widely employed for aircraft, wheels and major structural components, due to its high strength-to-density ratio. Semi-solid forming has many advantages such as able to produce high density material, long tool life, less production forge and near net shape. Also less liquid fraction then cast, results as less shrinkage. Semi-solid products are more durable then cast ones because of non-dendritic microstructure and less porosity, also cheaper than both cast and forged products. ECAP is an operation that involves simple shear deformation by severe plastic deformation processes. However, the material will not be subjected to any cross sectional changes. No cross sectional changing is the most important feature that distinguishes it from conventional methods. In this study, one of the most important wrought alloys for aerospace applications, AA7075 was used. In order to get the best semi-solid forming feedstock, thixotropic character has been determined in terms of predeformation rate, heating temperature and holding time.

Keywords: AA7075, Semi-solid Processing, ECAP

Introduction

With copper as the main alloying addition, alloys from the 7XXX family offer high strength at low specific weight and are widely employed in the form of forged parts for aircraft structural components (I.J. Polmear 1996 and J.E. Hatch 1984). However, they suffer low forging speeds, require high pressures (M. Goncalves 2002) and are thus assigned a low forging index. Hence, it is very attractive to forge these alloys in the semi-solid state for technical as well as economic reasons. Thixoforging process offers higher productivity, lower pressures and energy consumption, longer die life and more uniform microstructures than conventional forging at competitive cost (K. Kiuchi 2014)

Semi-solid research and develop studies are ongoing and usually contain pre-feedstock preparations and semi-solid forming. Forming of a metal in semi-solid state can only be managed with a material which has globular microstructure showing thixotropic behaviour (Kirkwood 1994; Choi and Park 1998; Tzimas and Zavaliangos 2000). Although different methods have been invented in order to get this microstructure, most of them are complex and need special apparatus (Bergsma 1996; Tzimas and Zavaliangos 2000; Margarido and Robert 2003; Liu et al. 2003). But SIMA process, based on partially melting, recrystallization and occurring of equiaxed globular microstructure, is easy to use, has simple equipment and minimum subsequent problems. Thus, researchers widely prefer SIMA process (Young et al. 1983; Yong et al. 2001; Dong et al. 2003; Zoqui 2003; Chayong et al. 2004; Wang et al. 2008; Akar 2011). While casting and forging of aluminium alloys in the semi-solid state have received a great deal of attention in recent years M.C. Flemings (1991) and Birol (2001) there are very few reports on ECAP based thixoforging (S.K. Kim 2007). In this study, feed stock of semi-solid forging will be deformed by ECAP (Equal Channel Angular Pressing) which is one of the severe plastic deformation processes. ECAP is an operation that involves simple shear deformation. While square or circular cross sectioned material is passed into the "L" shaped die, which have horizontal and vertical channels with an inner angle (Φ) and an outer angle (Ψ), will be severe plastic deformed by shear forges at the intersection of two channels. However, the material will not be subjected to any cross sectional changes. No cross sectional changing is the most important feature that distinguishes it from conventional methods.

Materials and Methods

The EN AW-7075 alloy (Table 1) was supplied as industrially cast bar in T4 temper. Differential scanning calorimetry (DSC) was employed to determine the solidus and liquidus temperatures and thus the solidification interval of the present alloy. 3mm diameter disc samples, weighting about 30 mg were cut and placed into alumina pans in an argon atmosphere using a SETARAM Labysys DSC unit. The samples were heated at a rate of 2.5 Kmin⁻¹ between 450 °C and 700 °C. The heat flow vs. temperature curves obtained by DSC were used to calculate the change in liquid/solid fractions with temperature.

Table 1. Chemical composition of the EN AW-7075 alloy used in the present investigation (wt %).

Zn	Mg	Cu	Cr	Mn	Fe	Si	Al
5.1-6.1	2.1-2.9	1.2-2.0	0.18-0.28	<0.3	<0.5	<0.4	87.1-91.4

ECAP die was machined with 120° inner and 20° outer angles and 50 mm long were sectioned from extruded bar as ECAP samples. The samples, 10mm in diameter, subjected to ECAP procedure for only one pass. ECAP die and plunger heated up to 250°C and pressing performed at the same temperature.

Approximately 50 mm long slugs were sectioned from the as-received ECAPed bar. A medium frequency induction coil (12 kHz, 12.5 kW) was used to heat these slugs into the semi-solid temperature range at a rate of approximately 300 °Cmin⁻¹. Temperature was monitored with a K-type thermocouple inserted in a 3 mm diameter hole drilled at the center of the slugs. Slugs were then soaked in this temperature range for up to 5 minutes to allow globularization of the grains. Thixoforging was performed with a DARTEC model universal tensile testing equipment modified into a vertical press.

The test specimens for microstructural examination were prepared by standard polishing methods. All specimens were grinded by using the Metcon Forcipol 2V rotating polishing machine with various grades of SiC papers up to 2400 grid. Specimens were subjected to fine polishing by using 1 µm diamond paste and then final polishing by using 0.06 µm colloidal silica suspension. Specimens were cleaned with water and dried with acetone before etching. Polished specimens were immersed into Keller's etchant (190 ml distilled water, 5 ml HCl, 3 ml HNO₃, 2 HF) for 20 seconds and washed with warm water in order to neutralise residual of etchant. Different etchant solution (2 g NaOH, 100 ml distilled water at 50°C) was used to appear grain boundaries and also to obtain better contrast. Leica optical microscope was used for microstructural examination.

Results and Discussion

The DSC spectrum of the present alloy and the change in solid fraction with temperature (dFS/dT) across the melting interval are plotted in Fig. 1. The solidus and the liquidus temperatures are estimated from Fig. 1 to be 485.9 °C and 645.3 °C, respectively. Even if thixoforging processes are often carried out with as much as 50 to 70% solid in the feedstock, in order to prevent same operation difficulties, alloy was heated up between 580 - 600°C. In this range solid fraction in % 80 - 87.

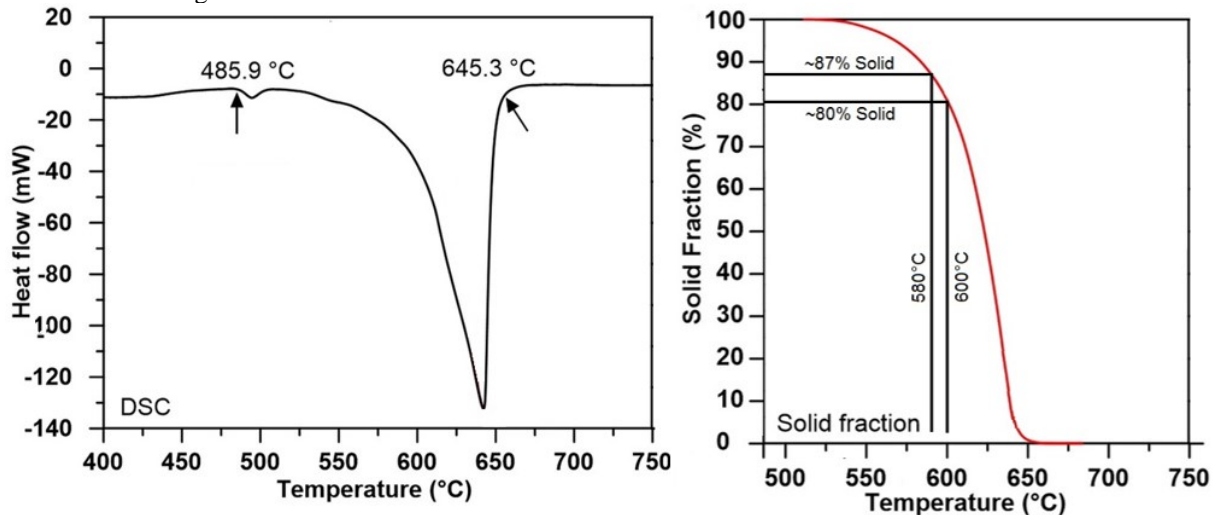


Figure 1. DSC scan of the melting interval and change in solid fraction with temperature across the melting interval.

Equiaxed α -Al grains and strings of intermetallic particles are seen in the microstructure of as-cast feedstock (Fig. 2a). After one pass ECAP operation, it is seen that grains have been transformed to fibrous α -grains and aligned in the pressing direction by shear forces (Fig. 2b). All type of structures including of dendritic are tending to transform spherical microstructure under required thermal conditions. Spherical transformation is easier and fast at semisolid region. During the heating stage, liquid is formed around the solid phase, by melting of the eutectic, and the solid tends to transform globular shape, to reduce internal surface energies. Changing in grain shape with soaking time and holding temperature of ECAPed samples are shown in Fig. 2 c to f. Heavily distorted microstructure creates the location of the re-crystallization nucleation. During the heating stage, as the temperature increases, re-crystallization is occurred in the solid state and new grains nucleate and start to grow. When the temperature reaches to solidus, new grains are penetrated by liquid and become globular equiaxed. It can be seen

that by increasing soaking temperature and time, amount of liquid

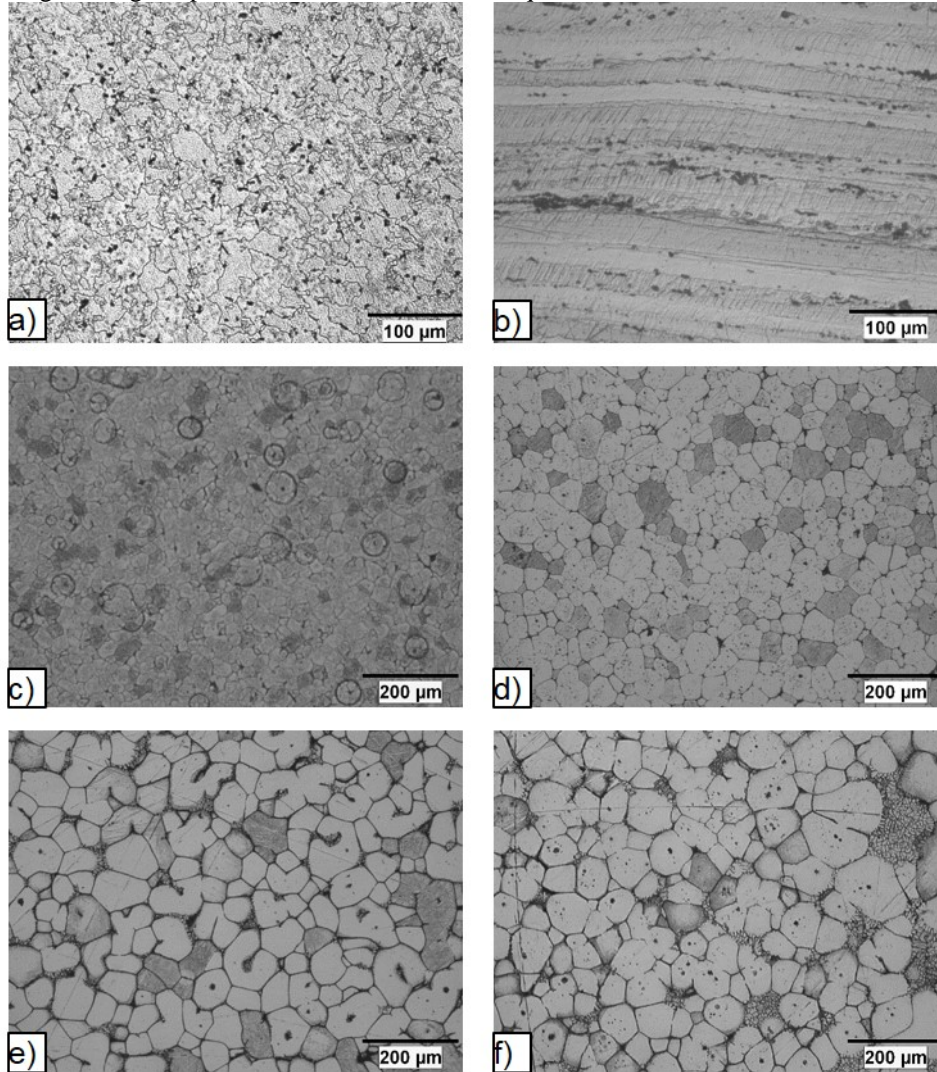


Figure 2. Microstructures of 7075 (a) as-cast, (b) ECAPed and quenched in water during semi-solid soaking at 580 °C (c) without isothermal holding, after (d) 5 min.; during semi-solid soaking at 600 °C (e) without isothermal holding, after (f) 5 min.

phase located at grain boundaries increases and penetrate between the solid grains. So grains have become increasingly more globular and can be seen that to heating lower temperature and holding more time acts as conditions of higher temperature and less time. The temperature and time compensate for each other as seen fig. 2d and 2f.

Conclusion

All type of structures is tending to transform spherical microstructure under required thermal conditions. Heating in semisolid region encourages the grains more globular. Not only heating enough for required globularization but also pre-deformation is needed. ECAP process can be easily used for pre-deformation without any cross sectional change. Increasing heating temperature and time expedite globularization but the grains are tending to grow easily. In order to achieve the best microstructure for semi-solid processing temperature and time combination must be determined.

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ANALYSIS OF BLACKOUT CASES IN THE POWER SYSTEMS

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Abstract: Power quality is an issue that has generated much interest to both electric utilities and customers today. Identification and classification of frequency, voltage and current disturbances in power systems is an important task in power system monitoring and protection. Thousands of disturbances occurred in the modern power systems every year in the world and some of them led to blackouts. Large scale blackouts rarely happened in power systems, but they caused enormous economic and social damages. This paper presents a different approach for classifying the events that represent or lead to the degradation of power quality and analyses some major blackouts in the world. In this context, the purpose of this study is to examine in the causes, on sequences and effects of the system blackouts and emphasize the importance.

Keywords: Blackout, Power Quality Disturbances, Voltage Variations, Voltage Imbalance.

GÜÇ SİSTEMLERİNDE SİSTEM ÇÖKMELERİNİN ANALİZİ

Özet: Güç kalitesi, günümüzde elektrik kuruluşları ve tüketiciler için önemli bir ölçüt oluşturan bir konudur. Güç sistemlerinde frekans, gerilim ve akım bozulmalarının tanımlanması ve sınıflandırılması, güç sisteminin izlemesi ve korumasında önemli belirtilerdir. Dünyadaki her yıl modern güç sistemlerinde binlerce bozulma meydana gelmektedir, bunların bazıları sistem çökmesi olarak adlandırılır. Büyük ölçekli elektrik kesintileri olarak ifade edilen sistem çökmeleri, güç sistemlerinde nadiren meydana gelmekte, ancak çok büyük ekonomik ve sosyal zararlara neden olmaktadır. Bu çalışmada, güç kalitesinin bozulmasına neden olan ya da bunları temsil eden olayları sınıflandırılmakta ve dünyadaki bazı önemli sistem çökmeleri analiz edilerek, farklı bir yaklaşım sunulmaktadır. Bu bağlamda, bu çalışmanın amacı, sistem çökmelerinin nedenleri, oluşları ve etkilerini incelemek ve önemini vurgulamaktır.

Anahtar Kelimeler: Sistem Çökmesi, Güç Kalite Bozulmaları, Gerilim Değişimleri, Gerilim Dengesizlikleri.

Giriş

Güç kalitesi, günümüzde elektrik kuruluşları ve tüketiciler için en önemli ölçüt haline gelmiştir. Bazı ülkelerdeki güç kalitesi eksikliğinden her yıl milyar dolarlık kayıplar söz konusu olmaktadır. Bunun genel nedeni birçok endüstri kuruluşunun tesislerini iyileştirmemesinden kaynaklanan güç kalitesi sorunlarıdır. Yeni teknolojinin karmaşık ve hassas donanımları şebekede gerilim dengesizliği gibi elektrik kirlenmesine neden olabilmektedir (Owyong, 2001).

Güç kalitesi tanımlanırken genellikle akım, gerilim ve frekans sapma problemleri ile belirtilir. En yaygın olan gerilim anormallikleri harmonikler, gerilim çökmesi, gerilim yükselmesi ve kısa kesintilerdir. Endüstriyel işlemlerde hassas ekipmanlar üzerinde olumsuz etkilerinin olabilmesinden dolayı güç kalitesi çok önemsenmektedir (Zhang, 2008).

Güç kalitesi çeşitli anlamlarda kullanılmakla birlikte en yaygın olanı gerilim kalitesidir. DC veya AC gerilim kaynağından normalden herhangi bir sapma ya da frekans veya dalga saflığında önemli ölçüde değişiklik güç kalitesi sorunu olarak tanımlanır. En yaygın olan gerilim anormallikleri; harmonikler, gerilim çökmesi, gerilim yükselmesi, gerilim dengesizlikleri ve kısa kesintilerdir (Zhang, 2008). Bunlar önemli ve pahalı hatalara neden olabilmektedir.

Güç kalitesi hatalarının günümüzde en önemli sonucu olarak sistem çökmeleri karşımıza çıkmaktadır. Yaşanan sistem çökmeleri neticesinde meydana gelen hasarlar ülkelerin sosyal ve ekonomik açıdan büyük oranda zarar görmelerine neden olmaktadır. Tüm bunlar sistem çökmesinin etkilerinin insanlar ve ülke ekonomisi açısından ne kadar önemli olduğunu göstermektedir.

Bu çalışmanın amacı sistem çökmelerini nedenleri, sonuçları ve etkileri açısından incelemek ve sistem çökmelerinin önemini vurgulamaktır. Bu bağlamda gelecekte meydana gelebilecek hasarları önleyebilecek tedbirlerin alınmasına katkı vermektir.

Güç Kalitesi Bozulmaları

Güç kalitesi dengesizliği genel olarak iki ana gruba ayrılır. İlki sürekli ya da değişim gösteren dengesizlik ikincisi ise, aralıklı dengesizliktir. Sürekli dengesizlikte, her periyotta dengesizlik devam eder ve gerilimi, dengesizlik, titreşim ve harmonikleri içerir. Ayrık dengesizlik olayları birbirinden bağımsız olarak görülür, her olayın zamanı kaydedilir ve günlük girişler seri olarak verilebilir. Ayrık dengesizlik genel olarak gerilim düşmesi, yükselmesi, salınımlı ve ani kesintileri içerir (Heralth et al., 2005)

Bir elektrik güç sisteminde çeşitli güç kalitesi bozuklukları vardır. Bu bozulmalar sonucun büyüklüğüne göre güç kalitesi sorunlarına yol açabilir. Bazı bozulmalar şebekeden kaynaklandığı gibi bazıları da yükün kendisinden kaynaklanmaktadır.

Kısa süreli gerilim değişimi (Short-Duration Voltage Variations): Kaynak gerilimi ya da yük akımının 0,1 p.u.'den daha az seviyeye 1 dakikadan uzun sürmemek şartıyla azalmasıdır. Kesintiler sistem hatalarına, sistem parçalarının bozulmasına veya kontrol ve üretim arızalarına neden olabilir (Dugan et al., 2004).

Uzun süreli gerilim değişimi (Long-Duration Voltage Variations): Uzun süreli değişimler güç frekansının rms değerinde 1 dakikadan uzun süren sapmalar olarak tanımlayabiliriz. Yüksek gerilim veya alçak gerilim genellikle sistem hatasının bir sonucu değildir ancak sistemde yük değişimlerine neden olabilmektedirler (Dugan et al., 2004).

Geçici bozulmalar (Transients): Besleme gerilimi veya yük akımının istenmeyen anlık sapmaları geçici sürekliliği olmayan olaylar olarak adlandırılır. Geçici olaylar genellikle geçici itici ve geçici salınımlı olarak ikiye ayrılır. Geçici itici olayda gerilim ve/veya akımın ani değişimi söz konusudur ve tek yönlü olarak meydana gelir (Stones& Collinson, 2001; Dugan et al., 2004)

Gerilim dengesizliği (Voltage Imbalance): Gerilimin dengede kalması esas güç sistemlerinin tasarımı ve işleyişi ile ilgili bir konudur. Gerilim istikrarsızlığı ve çöküşü önemli sistem hatalarını peşinde getirdiği bilinmektedir. Gerilimin dengede kalması belki basitçe şu şekilde açıklanabilir; güç sisteminin yeterli reaktif güç sağlayamaması veya sistem tarafından ciddi reaktif gücün tüketilmesidir (Huang& Zhao, 2006)

Gerilim dalgalanması (Voltage Fluctuation): Gerilim değerinin 0,9 ile 1,1 p.u. değerini aşmadığı rastgele değişimlere dalgalanma denir (Dugan et al., 2004).

Dalga şeklinin bozulması (Waveform Distortion): Güç frekansı ideal sinüs dalgasının kararlı-hal durumundan sapması olayına dalga şeklinin bozulması denir. Dalga şekli bozulmalarının beş şekli vardır. Bunlar; DC Offset, harmonikler, interharmonikler, notching (çentikleme) ve gürültüdür (parazit) (Owyong, 2001).

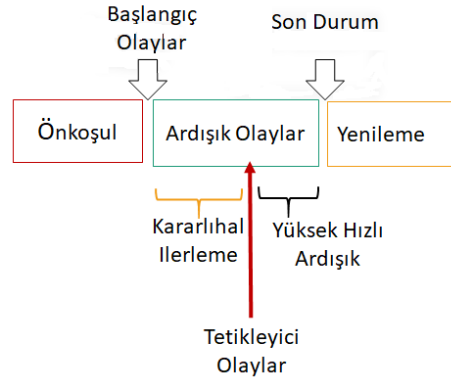
Güç frekansı değişimi (Power Frequency Variations): Frekans değişimi, normal kaynak frekansından önceden belirlenmiş seviyeden $\pm 0,1\%$ aşağı veya yukarı değişmesidir (Stones& Collinson, 2001).

Sistem Çökmesi

Genellikle sistem çökmesi, elektriğin geniş bir alanda kayda değer ölçüde kesilmesi olarak tanımlanır.

Önceki çalışmalar bize gösteriyor ki, başlangıç olaylar meydana geldikten sonra sistem çökmesi kararlı hal ilerleme ve kısa süreli ilerleme olarak ikiye ayrılır. Sonuçlar, sistem çökmesi ilerlemesinin birkaç safhaya ayrıldığını göstermektedir. Aşağıdaki tabloda bu safhalar açıkça belirtilmektedir. Şekil 1'de belirtilen safhalar; önkoşul, başlangıç olayları, ardışık olaylar, son durum ve yenilemedir (Gou et al., 2006; Iberraken et al., 2014).

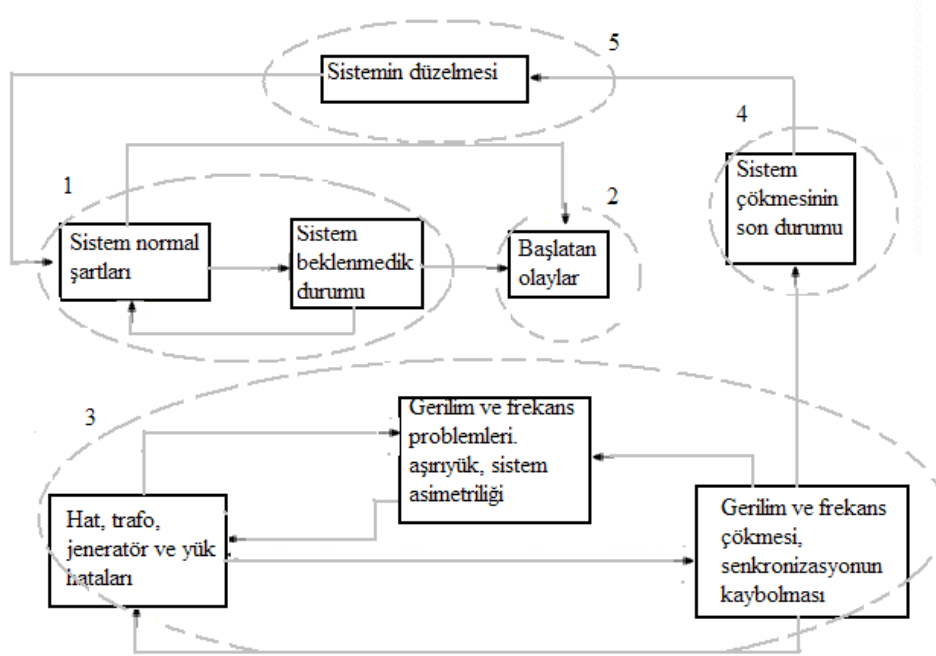
Bu beş safhanın içerisinde kademeli olayları bazı sistem çökmelerinde kendi içinde üçe ayırmak mümkündür. Bu üç safha; kararlı hal ilerleme, tetikleyici olaylar ve hızlı kademeli olaylardır. Fakat bütün sistem çökmeleri bu safhaları içermek zorunda değildir. Bu olaylarda başlangıç olayları ve tetikleyici olaylar yüksek hızlı kademeli olayları başlatmaktadır (Iberraken et al., 2014).



Şekil 1. Sistem Çökmesinin Safhaları

Sistem çökmeleri kademeli hatalar neticesinde meydana gelir. Ama kademeli hatalar neticesinde sistem çökmesi mutlaka meydana gelmek zorunda değildir. Kademeli hatalar veya sistem çökmesi tanımı, önemli ölçüde bölgenin elektrik kaybı miktarı ile ilgilidir. Eğer ardışık hatalar sonucunda büyük bir alan etki altında kalıyorsa, bu durumda sistem çökmesi olarak tanımlanmaktadır (Gou et al., 2006).

Sistemde meydana gelen kritik durumlardan dolayı, güç sistemi tehlike durumuna girebilir. Genellikle sistem koruma ve kontrol sistemleri tarafından normal şartlara çekilebilir. Fakat bazen sistem iyi bir zamanda normal şartlara çekilemeyebilir ve yeni olaylar durumu hızlı bir şekilde kötüye götüren ardışık olayları başlatabilir. Bunun sonucunda da sistem çökmeleri meydana gelebilir.



Şekil 2. Sistem Çökmesi İşleyişi (Lu et al., 2006)

1. Ön Koşul, 2. Başlangıç Olaylar, 3. Ardışık Olaylar, 4. Son Durum, 5. Sistemin Yenilenmesi (Düzelmesi).

Sistem Çökmesinin Nedenleri

Sistem çökmesinin işleyişinde var olan mekanizmalar; önkoşul, neden olan olaylar olarak tanımlanabilecek başlatan olaylar ve ardışık devam eden olaylar başlıkları altında ele alınarak, yaşanmış önemli sistem çökmeleri bu başlıklar altında sunulmuştur.

Önkoşul (Pre-Condition)

Literatüre geçmiş büyük çaplı güç sistemleri hatalarının birçok farklı önkoşulu bulunmaktadır. Buna rağmen bazı ortak noktalarından bahsetmek gerekirse (Lu et al., 2006; Bompard et al., 2013; Oral & Dönmez, 2010;);

- Sistem performansının yazın veya kışın en yoğun zamanda baskı altında kalması: Çalışmada yaşanan olaylara göre, yedi olay yaz mevsiminin yoğun olduğu anlarda, sekiz olayın ise, kışın en yoğun zamanlarda meydana geldiği görülmektedir. Bu durum gösteriyor ki, sistem çökmelerinin % 78,9'u yazın ve kışın sistemin yoğun olduğu zamanlarda, % 21,1'i diğer normal zamanlarda gerçekleşmiştir.
- Yıpranmış ekipmanlar ve yetersiz bakım: 25 Mayıs 2005 tarihinde yıpranmış ekipmanların neden olduğu Moskova'da meydana gelen sistem çökmesi bu duruma en uygun örnektir.
- Yetersiz reaktif güç stoku: 14 Ağustos 2003'de Kuzeydoğu Amerika ve Kanada'da meydana gelen sistem çökmeleri yetersiz reaktif güçten etkilenmiştir.
- Bazı önemli ekipmanların servis dışı kalması: Atina ve Yunanistan'ın güneyinde meydana gelen sistem çökmesinden 1 gün önce iki tane jeneratörün parçaları servis dışı kalmıştır.
- Doğal nedenler: 17 Ağustos 1999 tarihinde Türkiye'nin Marmara Bölgesinde yaşanan deprem sonrası meydana gelen sistem çökmesi bu durum için en önemli örneklerden biridir.

Başlatan veya neden olan olaylar (Initiating/ Causal Events)

- Kısa devre
- Aşırı yük
- Güç tesislerindeki ekipman hataları
- Koruma hataları
- Sistem çalışmasının hataları
- Yük artması

Ardışık (Kademeli) Olaylar (Cascading Events)

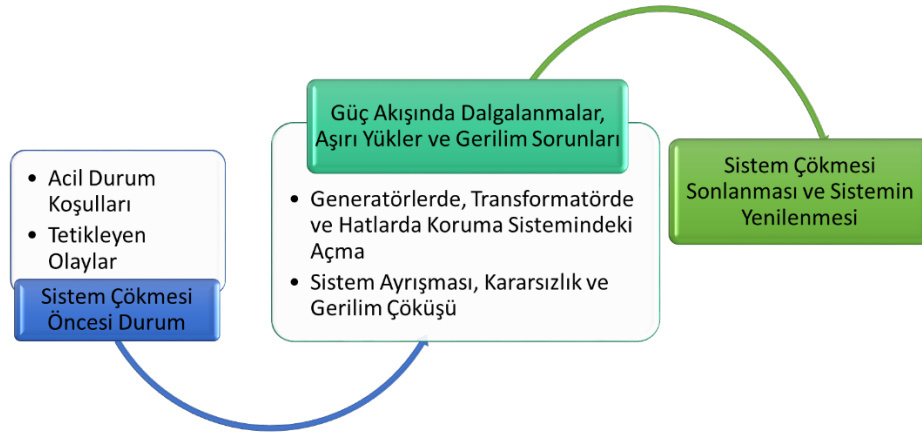
Kademeli (ardışık) olaylar dinamik bir olgudur. Başlangıç olayları tarafından tetiklenebilir. Güç değişimleri ve gerilim dalgalanmalarına neden olan ilk olaylar şebekenin diğer taraflarında aşırı yüklemelerin oluşturduğu etkilerle tetiklemelere neden olabilir

Koruma rölesi sistemleri hatları ve generatörleri zararlardan iyi korumalı ve sistemin normalin altında ve anormal şartlarını izole edebilmelidir. Fakat sistemin çalışması ve tasarım kriterleri, oluşan kesintilerin durumuna göre sistemi koruyamamaktadır. Genellikle hata anında kullanılan, yüksek akım ve gerilim ölçen koruma röleleri kademeli sistemde akımla gerilim arasında ayırım yapamaz. Bu da hatlarda ve generatörlerde hataya ve genişleyen bir sistem çökmesine neden olur.

Enterkonnekte şebeke yapısına sahip olan bir güç sisteminde sistemin korunması ardışık oluşacak etkiyi azaltabilecek işleyişe sahip olmalı ve sistemin oluşacak dengesizliğinden etkilenmemek için zamanında şebeke parçalarının ayrılmasının sağlanmalıdır. Ayrıca yüksek hızlı kademeli olayları, sistem operatörünün sistemi güvenlik şartlarına geri götürmesini engelleyebilir. Eğer sistem operatörü sistem çökmesini durdurmak istiyorsa, ön koşul zamanında veya kararlı hal durumunda birkaç önlem almak zorundadır (Lu et al., 2006; Bompard et al., 2013).

- 2003 Kuzeydoğu Amerika ve Kanada sistem çökmesi sırasında, 1 saatlik kararlı hal devamlılığı sonucunda yaklaşık 5 dakika yüksek hızlı kademeli olaylar meydana gelmiştir.
- 2003 İtalya sistem çökmesinde 20 dakikalık kararlı hal devamlılığı 2,5 dakikalık yüksek hızlı kademeli olaylara öncülük etmiştir.
- 1996 Amerika sistem çökmesinde 1 saat 38 dakikalık kararlı hal tahriki sonucu yaklaşık 7 dakika yüksek hızlı kademeli olaylar devam etmiştir.
- 1996 Yunanistan sistem çökmesinde de 13 dakikalık kararlı hal devamlılığı 2 dakikalık yüksek hızlı kademeli olayları meydana getirmiştir.

Sistem çökmelerini önlemek için öncelikle meydana gelen sistem çökmelerini incelemek, nedenleri üzerinde çalışmak ve oluşum mekanizmasını anlamak gerekmektedir. Bunları yaptıktan sonra ikinci aşama olarak sistem çökmelerini nasıl önlenir, bu konuda çalışılmalıdır. Şekil 3.'de ardışık olaylar sonrası oluşan sistem çökmelerine göre genel yapısı üzerine bir değerlendirmenin sonucu sunulmuştur (Makarov et al., 2005).



Şekil 3. Ardışık Olaylar Sonrası Oluşan Sistem Çökmelerine Göre Genel Yapısı

Son yıllarda dünya çapında güç sistemlerinde birçok sistem çökmesi meydana gelmiştir. 1996 Temmuz ve Ağustos aylarında Batı Amerika'da 11 eyaletin sisteminin devre dışı kaldığı ve 4 milyondan fazla insanın etkilendiği sistem çökmesi yaşanmıştır. Yine 2003 Ağustos ayında 50 milyon insanı etkileyen Kanada ve Amerika sistem çökmesi gerçekleşmiş ve bu Amerika'da yaşanan en büyük sistem çökmesi olarak literatüre geçmiştir. Bunlara ilave olarak 2003 yaz ve sonbahar zamanlarında dünyada birkaç önemli sistem çökmesi daha yaşanmıştır. Bunlar İtalya, İsveç-Danimarka ve Londra'da meydana gelmiştir(Lu et al., 2006; Bompard et al., 2013). Yine 2012 Hindistan yaşanan yaklaşık 600 milyon ve 2015 Türkiye'de yaşanan sistem çökmesi ile 70 milyonun üzerinde insan elektriksiz kalmıştır (CERC, 2012; ENTSO-E & TEİAŞ, 2015). Bu sorunların merkezinde genellikle, parça bozulmalarının başlattığı bir dizi parça hatalarıdır. Bu hızlı yayılan kademeli hataların neticesinde güç şebekesi çökmektedir.

Sistem Çökmeleri (1999-2015)

Çalışma içerisinde incelenen 1999 yılından sonraki yaklaşık 15 yıllık yaşanan sistem çökmeleri dikkate alınarak, etki eden çeşitli tetikleyici olaylar bağlamında incelenmiş yıllara ve olaylara göre sıralanışı Tablo 1.'de gösterilmiştir. Buna göre bu süreçte meydana gelen sistem çökmeleri içerisinde eskiden ya da yıpranan donanımdan kaynaklanan sistem çökmeleri 5 taneyken, kısa devre sorunlarından kaynaklanan sistem çökmesinin sayısı 7 tanedir. Aşırı yüklenme nedenine baktığımızda ise yine kısa devre sorunuyla benzer olduğunu görmekteyiz. Önüne geçmekte zorlanılan ve önemli bir sebep haline gelen doğal nedenler (deprem, fırtına, yangın, vs.) ise 9 tanedir. Bu süreçten çok karşılaşılan neden ise teknik problemler olarak karşımıza çıkmaktadır. Tablo 1.'de incelediğinde bir olayı tetikleyen birden fazla nedenin olduğunu görebilmekteyiz. Bu olaylar doğrudan sistem çökmesine neden olabileceği gibi sistemin gerilemesine neden olarak dolaylı yoldan sistem çökmesine neden olabilmektedirler(Lu et al., 2006; Bompard et al., 2013; CERC, 2012; ENTSO-E & TEİAŞ, 2015)

Ağustos 2003 yılında meydana gelen sistem çökmesinde Amerika'da 8 eyalette yaklaşık 50 milyon insan ve Kanada'da 2 eyalet etki altında kalmış ve 63 GW'lık yük kaybı yaşanmıştır. Güney Hırvatistan'da sistem çökmesi sırasında yaklaşık olarak 1270 MW'lık enerji dağıtımını yapılamamıştır. 55 milyon insanın etkilendiği 2003 Avrupa sistem çökmesinin ekonomiye maliyeti ise, yaklaşık 139 milyon USD olmuştur. 2009'da Brezilya'da yaşanan sistem çökmesinde ise Rio de Janeiro, Sao Paulo ve Belo Horizonte gibi büyük şehirler ve yaklaşık 60 milyon insan bu olaydan etkilenmiştir. Tüm bunlar, sistem çökmesi etkilerinin insanlar ve ülkelerin ekonomilerinde ne kadar önemli olduğunu göstermektedir. İncelenen süreçte yaşanan sistem çökmelerinin yıl içindeki dağılımına ve mevsimsel şartlarına bakıldığında yazın en sıcak ve kışın en soğuk olduğu zamanlarda sistem çökmesi olaylarının daha sık karşılaşıldığını göstermektedir.

Tablo 1.Bazı Sistem Çökmeleri ve Tetikleyici Olaylar

Sistem Çökmeleri		Sistem Çökmelerini Tetikleyici Olaylar				
		Eskiye Donanımlar	Kısa Devre	Aşırı Yüklenme	Doğal Etkenler	Teknik Problemler
Şubat 1999	Arjantin					+
Ağustos 1999	Türkiye				+	
Ağustos 2003	Amerika - Kanada		+	+	+	
Ocak 2003	Hırvatistan Bosna Hersek	+	+	+	+	
Ağustos 2003	Londra			+		
Eylül 2003	Avrupa			+	+	
Eylül 2003	İtalya				+	
Eylül 2003	İsveç Danimarka	+	+	+		+
Temmuz 2004	Yunanistan	+		+		+
Mayıs 2005	Moskova		+			+
Ocak 2005	Finlandiya				+	
Ekim 2006	Maui (Havai)				+	
Kasım 2006	Avrupa		+	+		+
Şubat 2008	Florida					+
Ocak 2009	Victoria(Malezya)		+			+
Kasım 2009	Brezilya		+			+
Aralık 2009	Tanzanya	+				+
Aralık 2009	Kenya	+				+
Ocak 2010	Hindistan				+	
Ocak 2010	Avustralya				+	+
Temmuz 2012	Hindistan			+		+
Ocak 2015	Pakistan					+
Mart 2015	Türkiye			+		+

Ağustos 1999 Türkiye

17 Ağustos 1999 günü sabah saat 3.02’de Türkiye'nin kuzeybatısını bir deprem olmuştur. Deprem, literatürde “Marmara Depremi” olarak adlandırılmıştır ve Marmara Bölgesi'ndeki kentlerde ağır hasara yol açmıştır. Deprem bölgesi, Türkiye'nin en önemli sanayi bölgesi ve aynı zamanda elektrik tüketimi konusunda da ön sıralarda yer aldı. Bununla beraber deprem zamanında deprem bölgesinden ülkenin diğer bölgelere üretim doğan bir enerji akışı vardı. Ani talep kaybının sonucu olarak, güç sisteminde bozulmalar oluştu, enterkonnekte sistem bundan etkilenmiş ve ardışık olaylar sonucunda güç sistemi çökmüştür (Oral & Dönmez, 2010).

Mart 2015 Türkiye

31 Mart 2015 tarihinde, 400 kV iletim hattının aşırı yüklenme sebebiyle servis dışı kalması, Türkiye elektrik sisteminin ENTSO-E Avrupa Kıtası sistemiyle bağlantısının kopmasına yol açıp sistem çökmesine neden olmuş, ciddi bir dizi olayın etkisine maruz kalmıştır. Kesinti öncesinde dört adet 400 kV uzun iletim hattı, Türkiye 400 kV Doğu – Batı iletim koridoru merkez kısmında servis dışıdır. Serviste olan paralel çok uzun mesafeli hatlar 4700 MW taşımaktadır. İlk önce 1127 MW/1237 MVA taşıyan Osmanca – Kurşunlu hattı aşırı yükten servis dışı kalmıştır. Bu durum, Türkiye elektrik sisteminde Doğu – Batı alt sistemleri arasında 1,9 saniye içerisinde hızlı, ardışık arızalar nedeniyle senkronizasyonun kaybolmasına, hat mesafe koruma röleleri tarafından paralel hatların servis dışı kalmasına neden olmuştur. Sonuç olarak Türkiye elektrik sisteminin Doğu ve Batı alt sistemleri birbirinden ayrılmıştır (ENTSO-E & TEİAŞ, 2015).

Sonuç Ve Değerlendirme

Çalışma içerisinde incelenen 1999’dan 2015 yılına yaşanan olaylar dikkate alındığında, sistem çökmesine etki eden çeşitli tetikleyici olayların olduğu görülmektedir. Bu tetikleyici olaylar:

- Eskiyen donanımlar,
- Kısa devre,
- Aşırı yükleme,
- Doğal nedenler,
- Teknik problemler olarak karşımıza çıkmaktadır.

1999 Arjantin ve 2008 Florida sistem çökmeleri teknik problemler, 1999 Türkiye (deprem), 2006 Finlandiya (kar fırtınası), 2006 Maui (deprem) ve 2010 Hindistan (soğuk hava şartları) sistem çökmelerinde doğal nedenler tek bir neden sonrası oluşan ardışık olayları ile oluşmuştur. Tek bir nedenden ötürü sistem çökmeleri yaşanabildiği gibi birkaç nedenin birleşmesi neticesinde de sistem çökmeleri yaşanabilmektedir.

- 2003 Amerika-Kanada sistem çökmesi kısa devre- aşırı yükleme – doğal nedenler,
- 2003 Hırvatistan sistem çökmesi eskiyen donanım- kısa devre- aşırı yükleme- doğal nedenler,
- 2003 Avrupa sistem çökmesi aşırı yükleme- doğal nedenler,
- 2003 İsveç Danimarka, 2004 Yunanistan, 2006 Avrupa sistem çökmeleri kısa devre- aşırı yükleme- teknik problemler,
- 2005 Moskova sistem çökmesi kısa devre- teknik problemler,
- 2009 Victoria ve 2010 Brezilya sistem çökmeleri kısa devre- teknik problemler,
- 2009 Tanzanya ve Kenya sistem çökmeleri eskiyen donanım- teknik problemler
- 2010 Avusturya sistem çökmesi ise doğal nedenler ve teknik problemlerin birleşmesinin neticesinde meydana gelmiştir.

Enterkonnekte şebeke yapıları güç sisteminde önemli avantajlar sağlamakla birlikte şebekenin bir bölümünde olan kesinti, arıza, kısa devre, aşırı gerilim, aşırı yük, arz talep dengesizlikleri gibi olaylar sonrasında hatanın olduğu bölgenin zamanın ayrılmaması sonucunda ardışık olayların etkisi ile enterkonnekte şebekenin tümünü veya büyük bölümünü etkileyebilmektedir. Bu yapıda en önemli sorumluluk sistem operatörüne düşmekle beraber, şebeke alt yapısının yeterliği ve koruma düzenekleri de önem arz etmektedir.

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ANDROİD İŞLETİM SİSTEMİ İZİNLERİ VE RİSKLERİ

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Özet: Günümüzde akıllı telefonlar günlük hayatın oldukça önemli bir parçası haline gelmiştir. Bu cihazlar için hazırlanmış birçok işletim sistemi olmakla birlikte, Google firmasının Android işletim sistemi toplam pazar payının açık ara en yüksek kullanım oranına sahiptir. Buna bağlı olarak da bu platform için hazırlanmış ve kategorilere ayrılmış milyonlarca uygulama sunulmaktadır. Kullanıcılar bu uygulamaları resmi veya resmi olmayan uygulama indirme noktalarından indirmekte ve kullanmaktadırlar. Bununla birlikte nereden indirilmiş olmuştusa olsun, indirilen her uygulama faydası yanında bazı risk ve tehlikeleri beraberinde getirmektedir. Bu durumda uygulamaların indirilen cihazda yetkilerini belirleyen izinler oldukça önem arz etmektedir. Önceki Android sürümlerinde uygulama indirildiği veya güncellendiği zaman uygulama izinleri kullanıcılardan talep edilmekteydi, Android 6.0 sürümünden itibaren yetki izni, uygulamanın kullanımı sırasında talep edilmektedir. Her iki durumda da kullanıcıların büyük çoğunluğu kendi cihazları için anlamlarını tam olarak bilmedikleri yetkileri uygulamaya verip uygulamayı kullanmaya başlamak veya devam etmek eğilimindedirler. Bu durum ise ciddi gizlilik ihlallerine neden olabilmektedir. Bu çalışmada Android işletim sistemine yüklenen uygulamalara verilen izinler ve olası riskleri kısaca tartışılmaktadır.

Anahtar Kelimeler: Android, Uygulama İzinleri, Gizlilik İhlali

PERMISSIONS AND RISKS OF ANDROID OPERATING SYSTEM

Abstract: Nowadays, smartphones have become an essential part of daily life. Although plenty of operating systems have been existed for smartphones, Google's Android operating system has clearly the highest usage rate of the total market share. Depends on that, there are millions of apps divided into categories, prepared for this platform. Users download and use these apps from official or unofficial app download platforms. However, regardless of downloaded site, every downloaded app is possessed of some risks and hazards besides its benefits. In that case, the permissions determining authorizations of the applications on the downloaded device are very crucial. In previous versions of Android, application permissions were being requested from users when the app is downloaded or updated, but after from Android 6.0, permissions is requested during the use of the app. In both cases, the vast majority of users tend to start or continue to use the apps by giving the permission that they do not know clearly, what they mean for their devices, to these apps. This might be lead to serious breaches of privacy. This study briefly discusses the permissions and possible risks of applications installed on the Android operating system.

Keywords: Android, Application Permissions, Privacy Breach

Giriş

Akıllı telefonlar bugünlerde insanların hayatında eğlenceden iş hayatına, sağlık takibinden sosyal hayata kadar çok geniş bir yelpazede vazgeçilmez kişisel sayısal asistanlar haline gelmiştir. Pazar araştırmalarına göre dünya genelinde yaklaşık 2,5 milyar kişinin akıllı telefon kullandığı tahmin edilmektedir (EMarketer, 2016). Bu cihazlarda birçok farklı işletim sistemi çalıştırılabilmekle birlikte, Mayıs 2018 itibarı ile bu cihazların %75,66'sında Google firmasının Android işletim sisteminin çalıştığı bilinmektedir (StatCounter, 2018).

Android, 2008 yılında piyasaya sürülmesinin ardından kullanılabilirliği, düşük maliyeti ve açık kaynak platformu olması nedeniyle giderek artan oranlarda kullanılmaya başlanmıştır. 2018 yılı itibarı ile bu platforma yönelik yaklaşık 3,5 milyon uygulama Google Play Store isimli resmi sitede bulunmaktadır (EMarketer, 2018b). Resmi sitenin haricinde kurumsal (Amazon vb.) ve kurumsal olmayan binlerce siteden de milyonlarca farklı Android uygulamaları indirilip kullanılabilmektedir.

Kullanıcı ve uygulama sayılarının bu kadar büyük rakamlara ulaşması, platformun güvenliği hususunu oldukça önemli hale getirmektedir. Kullanıcılarına daha güvenli bir ortam oluşturmak amacıyla Google resmi sitesi olan Play Store 'da yayınlanan uygulamalar için güvenlik politikası uygulamaktadır. Örneğin Google 2017 yılında çeşitli nedenlerle politikasını ihlal eden 700.000 uygulamayı internet sitesinden kaldırmıştır (Google, 2018a). Google bu yöntemi ile tanınmış uygulamaları taklit eden "copycat" uygulamaları, aşırı şiddet, nefret ve illegal aktiviteleri içeren uygunsuz içerik uygulamaları ile SMS sahteciliği, trojan ve phishing gibi potansiyel zararlı uygulamaları makine öğrenmesi modelleriyle tespit ederek resmi sitesinden kaldırmakta ve bu uygulamaları siteye yükleyenleri de engellemeye çalışmaktadır. Google'ın resmi sitesi haricindeki diğer uygulama indirme sitelerinde ise kurumsallığa bağlı olarak Google'un politikaları ile benzerlik gösteren politikalar bulunmakla birlikte (Amazon, 2018) kurumsal olmayan siteler için ise sistematik bir yaklaşım bulunmamaktadır ve bu sitelerden indirilen uygulamalar kullanıcı cihazlarına çok ciddi tehditler oluşturmaktadır. Google, indirme kaynağından bağımsız olarak bu tehditleri yok etmek amacıyla Google Play Protect isimli bir sistem kullanmakta ve periyodik olarak cihazları tarayarak zararlı olabilecek yazılımları kullanıcıya bildirmektedir (Google, 2018e).

Bunlarla birlikte bir uygulamanın Google'ın politikalarına uygun olması ve Google Play Protect sistemi açısından tehlike arz etmemesi, o uygulamanın güvenli olduğu anlamına gelmemektedir. Uygulamalar kullanıcıdan belirli işlemler için izin istemektedir ve bu izinlerin neden olabilecekleri hususlar başlı başına önemli bir güvenlik problemidir. Android eski sürümlerinde uygulama indirilip kurulurken uygulamanın hangi yetkileri talep ettiği kullanıcıya bildirilir ve kullanıcı cevabına göre işleme devam edilmektedir. Bu toptan yetki verme yaklaşımındaki riskler nedeniyle Google, 2015 yılında yayınladığı Android 6.0 (Marshmallow olarak bilinmekte) sürümünden itibaren, bu toptancı anlayışı terk etmiş ve uygulama çalışması esnasında uygulamanın talep ettiği an yetkinin kullanıcıya sorulması uygulamasına geçmiştir. Bununla birlikte Android 6.0 ve daha yüksek sürümlerinin Şubat 2018 itibarı ile kullanım oranı %57,7'dir (EMarketer, 2018a).

Android işletim sisteminin yeni sürümlerinin, cihazlarda çalışan yazılımların yetkilerini kontrol etme hususunda kullanıcılara daha fazla güç verdiği aşikârdır. Bununla birlikte izinlere ilişkin temel risk devam etmektedir (Jha & Lee, 2017). Hangi izin yönetimi kullanılırsa kullanılsın, yetki verilmesi hususuna cihaz kullanıcıları karar vermek zorundadır. Bununla birlikte cihaz kullanıcılarının bu konudaki yetkinliklerini tespiti yönelik yapılmış çalışmalar oldukça vahim sonuçlar göstermektedir. Yapılan bir araştırmaya göre, araştırmaya katılanların yalnızca %17'si kurulum sonrasında izinlere dikkat etmekte ve sadece %3'ü talep edilen izinleri anladığını gösteren soruları cevaplayabilmektedir (Felt et al., 2012). Kullanıcıların Android izinlerini anlayıp anlamadığı ve nasıl davrandıklarını inceleyen başka bir çalışmada, uygulamanın istediği izinleri ne seviyede dikkatle okudukları sorusuna 0-5 aralığında cevaplamaları sorulduğunda %23'ünün 5 (çok dikkatlice) okuduğu belirlenmiş ve bu "çok dikkatlice" okuyanlar ile kendisini bilişim uzmanları olarak ifade eden kişiler arasında önemli bir korelasyon olduğu gözlemlenmiştir (Ramachandran et al., 2017).

Cihaz kullanıcılarının talep edilen izinleri okumaması veya anlamaması kullanıcıların bilgisizliğini ve umursamazlığını akla getirmektedir. Umursamazlığın da aslında uygulamaların istemiş olduğu yetkilerin gerçekte neler yapabileceğinin bilinmemesinden kaynaklandığı düşüncesinden hareketle, bu çalışmada farkındalığı arttırmak amacıyla, ilişkisiz gibi görünen izinlerin nasıl veri gizliliği ihlallerine neden olabileceğine dair örnekler sunulmuştur.

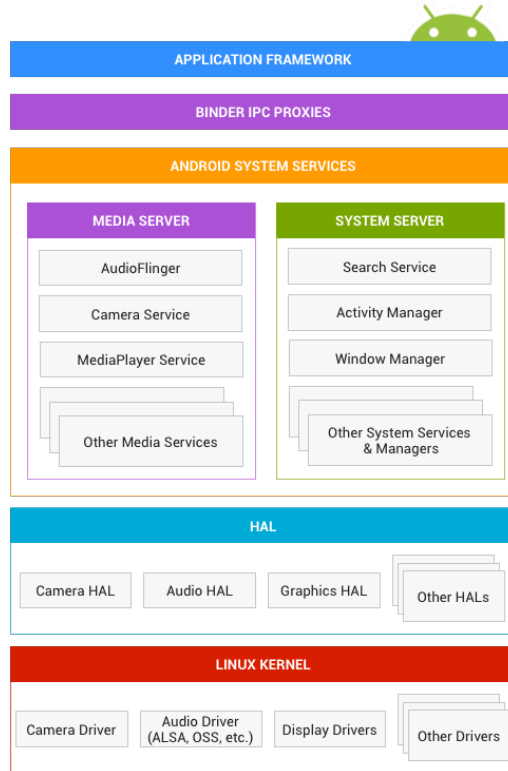
Bu çalışma 4 bölümden oluşmakta ve izleyen bölümde Android işletim sisteminin yazılım güvenliği mekanizması ve izin modeli, sonraki bölümde izin grupları ve olası riskleri sunulmakta ve çalışma sonuç bölümü ile sonlanmaktadır.

Android İşletim Sisteminin Yazılım Güvenliği Mekanizması Ve İzin Modeli

Android akıllı telefonlar, tabletler, saatler, otomobiller ve akıllı televizyonlar gibi cihazlarda kullanılan Linux tabanlı açık-kaynak bir mobil işletim sistemidir. Şekil 1 Android işletim sisteminin 5 temel katmanını göstermektedir. Bu yapıda en üstteki katman olan Application Framework (Uygulama Platform) katmanı; uygulama geliştiriciler tarafından kullanılan katmandır ve uygulamalara Java sınıfları biçiminde yüksek seviye hizmetleri sağlar. İkinci katman Binder IPC (Binder Inter-Process Communication - Bağlayıcı Süreçler Arası İletişim) mekanizması Application Framework'unun Android Sistem Servislerine iletişimini sağlar. Üçüncü katman Sistem Services (Sistem Hizmetleri); üst katmanlardaki yazılım ile alt katmanlardaki donanım arasında Medya (Medya kayıt ve yürütme hizmetleri) ve Sistem (Window Manager, Activity Manager vb.) iletişimi sağlar. Dördüncü Katman olan HAL (Hardware Abstraction Layer – Donanım Soyutlama Katmanı) üst katmanlardaki hizmetlerin, alt seviye sürücü hususlarından bağımsız olarak cihazdaki donanıma erişimini sağlar. En alt katmanda ise bazı özel eklentilerin olduğu bir Linux Kernel (Linux Çekirdeği) çalışmaktadır. Bu katman temel donanım sürücülerini ağ bileşenlerini içermektedir (Google, 2017).

Android işletim sisteminde, Kernel katmanı tarafından yürütülen Linux kullanıcı-temelli sistem güvenlik mekanizması ve Application Framework katmanı tarafından yürütülen Android izin-temelli güvenlik mekanizması olmak üzere iki ana güvenlik mekanizması bulunmaktadır (Google, 2018c).

Sistem seviyesindeki güvenlik Linux Kernel'in bir parçası olup, uygulamaların diğer uygulamalara, işletim sistemine ve cihaza zarar vermesini engellemek için tasarlanmıştır. Linux Kernel kullanıcı-temelli izin modeli, süreç izolasyonu, güvenli IPC mekanizması ve çekirdeğin bazı bölümlerine erişimi engelleyerek; kullanıcıların birbirlerinin dosyalarına, hafıza bölgelerine, CPU kaynaklarına ve yetkili olduğu donanım bileşenlerine erişimini sınırlar. Android bu izolasyonu gerçekleştirebilmek için her bir kullanıcının her bir uygulamasına tekil bir UID (user ID) tanımlar ve uygulama ayırık bir işlem olarak çalışır. Bu ayırık işlemin yürütüldüğü bölge Application Sandbox (Uygulama Kum Havuzu) olarak isimlendirilir ve bu mekanizma sayesinde varsayılan olarak uygulamalar diğer uygulamalar ile etkileşime giremez ve işletim sistemine sınırlı erişime sahiptir. Eğer bir uygulama kendisine tanımlanmış yetkinin dışında bir işlem yapmak isterse (örneğin başka bir uygulamanın verilerini okumaya çalışmak veya bir numara çevirmek gibi) işletim sistemi bunu engeller. Bununla birlikte Android 4.3 sürümünden itibaren açıkça izin verilen yetkilerin haricindeki her şeyi engelleyen ve her süreç ve nesneyi kullanıcı:rol:tip:seviye şeklinde etiketleyerek Application Sandbox'unun sınırlarını daha iyi tanımlayan SELinux (Security-Enhanced Linux – Arttırılmış Güvenlikli Linux) uygulamasına geçilmiştir (Google, 2018c).



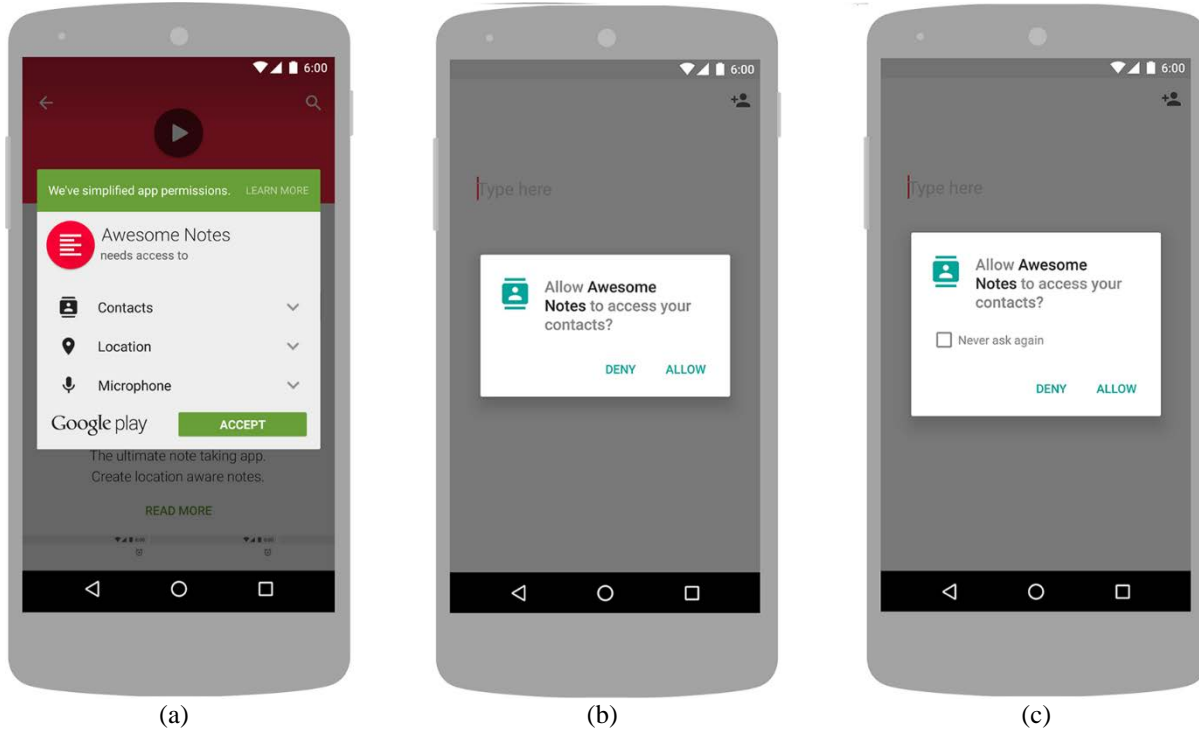
Şekil 1. Android İşletim Sisteminin Katmansal Yapısı (Google, 2017)

İzin temelli güvenlik mekanizması, uygulamaların hangi sistem kaynaklarına erişip erişemeyeceğini düzenleyen mekanizmadır. İzinler talep edilen sistem kaynağının özelliğine göre normal, tehlikeli, imza ve özel izinler olarak seviyelendirilmiştir. Normal izin seviyesi en düşük izin seviyesidir ve uygulamanın, kullanıcı gizliliğinde veya

diğer uygulamaların çalışmasında çok düşük risk arz eden Sandbox dışı kaynak ve veriye erişimini ifade etmektedir. Herhangi bir uygulama buna ihtiyaç duyduğunu ifade ettiğinde sistem otomatik olarak bu izni uygulamaya vermekte ve kullanıcıya herhangi bir onay ekranı göstermemektedir. Bir üst seviye izin tehlikeli izin olarak tanımlanmakta ve bu izinler uygulamanın erişmeye çalıştığı kaynak ve verinin, kullanıcının özel bilgilerini, diğer uygulamaların çalışmasını ve depoladığı verileri potansiyel olarak etkileyebileceğini ifade etmektedir. Herhangi bir uygulama bu izinleri istediğinde bu talep kullanıcıya sunulur ve kullanıcı onayı olmaksızın izin verilmez. İmza izin, riskli izin grubuna girmektedir ve güvenilir sertifikaya sahip uygulamalara kurulum sırasında verilen izindir. Bununla birlikte imza gruptaki bazı izinler hiçbir üçüncü-parti uygulamaya verilmemekte ve Google ile bazı cihaz üreticilerine verilmektedir. Diğer gruplara girmeyen birkaç izin özel izin olarak isimlendirilmekte ve sistem bu izinler için ayrıntılı bir yönetim ekranı sunarak izni kullanıcının onayına sunmaktadır (Google, 2018b). Ayrıca üçüncü parti uygulamalar tarafından, ilgili uygulamanın kaynak ve yeteneklerini diğer uygulamalar ile paylaşmak amacıyla özel izinler tanımlamakta ve sistem ile diğer uygulamalara sunmaktadır (Elenkov, 2014; Google, 2018d).

Tehlikeli izinler izin kullanıcı onay süreci Android 6.0 (API level 23) öncesinde ve sonrasında olmak üzere iki farklı şekilde uygulanmaktadır. Android 5.1.1 (API level 22) ve önceki sürümlerde, uygulama yüklenmesi öncesinde sistem tehlikeli izinlerin onayını bir ekran vasıtasıyla kullanıcıya sunar. Kurulum zamanı izni olarak adlandırılan bu izinlere örnek bir ekran görüntüsü Şekil 2a'da verilmiştir. Eğer kullanıcı "Kabul (Accept)" seçeneğini seçerse uygulamanın talep etmiş olduğu tüm izinler uygulamaya verilir. Kullanıcının ret cevabında ise sistem uygulamanın kurulumunu iptal eder. Uygulamaya daha sonra bir güncellenme yüklenmesi durumunda varsa güncellenmenin talep ettiği ek izinler için kullanıcıya yeniden sorulur. Kullanıcının onayı durumunda güncelleme yüklenir aksi halde yüklenmez. Uygulama cihazda yüklü olduğu sürece bu izinlere sahiptir ve herhangi bir değişiklik yapılamaz. Uygulama cihazdan kaldırıldığında izinler yok edilir ve aynı uygulama yeniden yüklenmek istenirse aynı izin süreci uygulanır.

Android 6.0 ve üst sürümlerinde kurulum aşamasında kullanıcıdan onay talep edilmez. Onay süreci, tehlikeli izinlerin kullanımı sırasında gerçekleştirilir. Bir uygulama tehlikeli sayılan bir işlem gerçekleştirmek istediğinde bunun gerçekleştirip gerçekleştirilemeyeceği kullanıcıya çalışma zamanında bir diyalog kutusu aracılığı ile sorulur (Şekil 2b). Kullanıcının kabul onayı ile izin uygulamaya verilir. Kullanıcının reddetmesi durumunda, uygulama aynı izni bir kez daha talep ettiğinde kullanıcıya ilgili izni kalıcı olarak kabul edip etmediğini soran bir diyalog kutusu sunulur (Şekil 2c). Bununla birlikte verilmiş kalıcı izin ayarı sistem ayarlarından değiştirilebilmektedir (Google, 2018b).



Şekil 2. Uygulama İzin Talebi Ekran Görüntüleri (Google, 2018b). (a) Android 5.1.1 ve Öncesi (b) Android 6.0 ve Sonrası İlk Kez İzin Talebi (c) Android 6.0 ve Sonrası Tekrar İzin Talebi.

Android işletim sisteminde API çalıştırmak için gerekli izinler, özellikleri veya cihaz kabiliyetleri ile ilişkili izin grupları altında tanımlanır ve izin istekleri grup seviyesinde yönetilir. Örneğin SMS izin grubu hem READ_SMS iznini hem de SEND_SMS iznini içerir (Google, 2018b).

İzinlerin izin gruplarına bağlantı mantığı eski ve yeni Android sürümlerinde farklılık arz etmektedir. Android 5.1 ve önceki sürümlerde, yukarıda anlatıldığı gibi sistem kurulum aşamasında, listesi Tablo 1’de görülen tehlikeli olabilecek izinleri kullanıcıya sorulur. Burada sistem verilen tekil izni değil, iznin grubunu kullanıcıya sorar. Örneğin uygulama READ_CALENDAR iznini istediğinde sistem izin grubu olarak CALENDAR grubunu kullanıcıya gösterir. Bununla birlikte kullanıcının onayı halinde sadece READ_CALENDAR izni uygulamaya verilir.

Tablo 1: Tehlikeli İzinler ve İzin Grupları

İZİN GRUBU	İZİNLER	İZİN GRUBU	İZİNLER
CAMERA	CAMERA	SENSORS	BODY_SENSORS
CONTACTS	READ_CONTACTS	SMS	SEND_SMS
	WRITE_CONTACTS		RECEIVE_SMS
	GET_ACCOUNTS		READ_SMS
PHONE	READ_PHONE_STATE		RECEIVE_WAP_PUSH
	READ_PHONE_NUMBERS		RECEIVE_MMS
	CALL_PHONE	STORAGE	READ_EXTERNAL_STORAGE
	ANSWER_PHONE_CALLS		WRITE_EXTERNAL_STORAGE
	READ_CALL_LOG	LOCATION	ACCESS_FINE_LOCATION
	WRITE_CALL_LOG		ACCESS_COARSE_LOCATION
	ADD_VOICEMAIL	MICROPHONE	RECORD_AUDIO
	USE_SIP	CALENDAR	READ_CALENDAR
	PROCESS_OUTGOING_CALLS		WRITE_CALENDAR
	ANSWER_PHONE_CALLS		

Android 6.0 ve üst sürümleri için sistem davranışı daha farklıdır. Buna göre, yukarıda anlatıldığı gibi kullanım zamanında, bir uygulama tehlikeli olabilecek bir izni talep ettiğinde, eğer uygulamanın ilgili tehlikeli izinle aynı gruptan başka bir izne yetkisi varsa kullanıcıya sorulmadan istenen izin uygulamaya verilir. Örneğin bir uygulamanın daha önceden alınmış READ_CONTACTS izni varsa ve bu uygulama WRITE_CONTACTS izni istiyor ise sistem herhangi bir diyalog kutusu göstermeden bu izni uygulamaya verir. Diğer taraftan bir uygulama tehlikeli olabilecek bir izni talep ettiğinde, eğer uygulamanın ilgili tehlikeli izinle aynı gruptan başka bir izne yetkisi yok ise sistem izin grubunu (tekil izni değil) gösteren bir diyalog kutusu açarak kullanıcı iznini sorar (Google, 2018b).

Google’ın izinleri bu şekilde gruplamanın kullanıcıların daha anlamlı ve bilgilendirilmiş tercih yapacağını iddia etmesine rağmen (Google, 2018b), bir kaynağı okuma yetkisi vermekle yazma/değiştirme yetkisi vermek arasındaki fark çok önemlidir. Bir uygulamaya verilen izinlerin uygulamanın amacından daha farklı noktalara ulaşabilecek veri ihlallerine neden olabilmesi bile mümkün iken, Android ’in yeni sürümlerindeki bu sistem davranışının tehlikeli sonuçlar doğurabileceği ve bu farkın tahmin edilemeyecek kadar büyük zararlara neden olabileceği düşünülmektedir.

Android İzinleri ve Olası Riskleri

Akıllı cihazlarda metin, görsel (resimler ve videolar) ve akıcı (streaming) veri halinde kullanıcılarına ait çok miktarda kişisel veri bulunmaktadır. Bu veriler takvim verileri, iletişim verileri, rehber verileri, kullanım verileri, konum verileri, depolanmış dijital veriler, tanımlama verileri ve sensör verileri olarak sınıflandırılabilir (Mylonas, Theoharidou, & Gritzalis, 2014). Bu veriler ile kişilerin adresi, konumu, cinsiyeti, ilişkileri, telefon numarası, sağlık bilgileri, inancı ve işi gibi özel bilgiler ifşa edilebilir ve kötü amaçlarla kullanılabilir.

Tablo 2’de uygulamalara verilen standart Android izinlerinin, hangi verinin gizliliğini ihlal edebileceği gösterilmiştir. Tablo 2’de verilen izinler aracılığıyla doğrudan ele geçirilebilecek veriler gösterilmiştir. Buna göre ACCESS_COARSE_LOCATION ve/veya ACCESS_FINE_LOCATION iznini bir uygulamaya vermek, Konum

Verilerini ilgili uygulamaya vermek (Google, 2018f) ve aynı zamanda Konum Verilerinin ihlali riskini kabul etmek anlamına gelmektedir.

Tablo 2. Tehlikeli İzin Gurubu İzinleri Aracılığı ile Ele Geçirilebilecek Veriler

İzin Adı	Verilen Yetki	Ele Geçirilebilecek Veri
ACCESS_COARSE_LOCATION	Yaklaşık Konumu Tespit	Konum Verileri
ACCESS_FINE_LOCATION	Tam Konumu Tespit	
READ_CALENDAR	Takvim Kayıtlarını Okuma	Takvim Verileri
READ_CALL_LOG	Arama Geçmişi	İletişim Verileri
READ_PHONE_STATE	Aramaların Durumu	
READ_SMS	Gelen SMS Okuma	
RECEIVE_SMS	SMS Alma	
RECEIVE_MMS	MMS Alma	
READ_CONTACTS	Rehber Kişiler Okuma	İrtibat Verileri
READ_EXTERNAL_STORAGE	SD Kart İçindeki Verileri Okuma	Depolama Verileri
GET_ACCOUNTS	Cihazdaki Hesapların Verilerini Okuma	Tanımlama Verileri
READ_PHONE_STATE	Telefon Durum Verilerini Okuma	
READ_PHONE_NUMBERS	Cihaz Telefon Numaralarını Okuma	
CAMERA	Kamera Erişim	Sensör Verileri
RECORD_AUDIO	Ses Kayıt	
BODY_SENSORS	Vücut Sensörlerine Erişim	

Bununla birlikte; bu iki iznin verilmemesi Konum Verilerinin ihlal riskini ortadan kaldırmamaktadır. Bu izinler kullanılmadan da farklı yöntemlerle konum tespiti yapılması ve bu verinin ihlali (izinsiz uzak noktalardaki üçüncü şahıslara gönderilmesi) mümkündür. Uzak noktalara gönderimin uygulamaların sahip olabileceği INTERNET veya SEND_SMS izinleri vasıtasıyla yapıldığı düşünülerek aşağıda konum verisi elde edebilmek için kullanılabilecek bazı yöntemler sıralanmıştır:

1. İlgili cihazın çekmiş olduğu fotoğraflarda aksi ayarlanmamış ise, fotoğrafın çekildiği konumun GPS konumu metadata olarak bulunmaktadır (Geek, 2017). READ_EXTERNAL_STORAGE izni aracılığı ile bu fotoğrafın cihazda elde edilmesi ile kullanıcının konum bilgileri elde edilebilir.
2. Kullanıcı tarafından resim çekilmeden, CAMERA iznine sahip bir uygulama kendi kendine resim çekerek ve bu resmin bilgilerini kullanarak kullanıcının konum bilgilerini elde edebilir.
3. Resimlerden GPS verileri olmadan da yer tespiti mümkündür. Resmin çekildiği bölgeyi bilen bir insan tarafından resmin çekilme konumu tahmin edilmesi mümkün iken, Konvolüsyonel Yapay Sinir Ağları kullanılarak görüntü eşleştirme yoluyla bir resmin nerede çekildiği bulunabilmektedir (Weyand, Kostikov, & Philbin, 2016).
4. RECORD_AUDIO yetkisi ile mikrofon iznine sahip bir uygulama vasıtasıyla ortam dinlemesi yapıp, bu sayede konum tespiti yapmak mümkündür.
5. ACCESS_WIFI_STATE komutu vasıtasıyla cihazın bağlı olduğu Access Point tespit edilerek kullanıcının yaklaşık konumu tespit edilebilir (Acharya, Cunque, Roca, & Francillon, 2014).
6. BLUETOOTH_ADMIN ve BLUETOOTH Android izinleri ile müsaade edilen Bluetooth sinyalleri ile kapalı alanlarda konum tespiti başarılı bir şekilde gerçekleştirilebilmektedir (Wang, Yang, Zhao, Liu, & Cuthbert, 2013).
7. READ_CALENDAR izni olan bir uygulama Takvime eklenmiş etkinliklerin konumları belirlenmiş ise kullanıcının ne zaman nerede olacağını tespit edebilir (Mylonas et al., 2014).
8. SEND_SMS, RECEIVE_SMS ve READ_SMS izinleri aracılığı ile bir uygulama kullanıcının bilgisi olmadan servis operatörlerine kısa mesaj yazıp gelen cevap mesajından kullanıcının konumunu rahatlıkla bulabilmektedir (Türkcell, 2018).
9. INTERNET iznine sahip olan ve Android Facebook SDK için yetkilendirilmiş bir uygulama Facebook'da kullanıcının katılacağı etkinliklerin okunması ile kişinin ne zaman nerede olabileceği belirlenebilir (Facebook, 2018).
10. Akıllı cihazlardaki email uygulamaları imza izin seviyesi gerektirdiğinden yüksek derecede güvenlidir. Bununla birlikte email ekleri için aynı hususları söylemek mümkün değildir. Örneğin Gmail uygulaması mail ekinin başka bir doküman görüntüleyici ile açılabilmesine imkân vermektedir. Bu durum Acrobat gibi programların dokümanın hemen bir kopyasının SD karta kopyalanmasına neden olur. Sonuçta READ_EXTERNAL_STORAGE yetkisi olan bir uygulamanın bir email ekinde gönderilmiş bir davetten

kullanıcının hangi zamanda nerede olacağı hususunda fikir sahibi olabilmesi mümkündür (May & Bhargavan, 2013).

Olası tüm Konum Verisi elde etme yöntemleri ve diğer verilerin alternatif elde etme yöntemleri bu çalışmanın kapsamını ve boyutlarını aşmakta olup, burada sadece izinler ve riskleri arasında bire-bir ilişkiden daha fazlası olduğu gösterilmesi amacıyla yukarıdaki örnekler verilmiştir.

Sonuç

Bu çalışmada Android işletim sisteminin güvenlik mekanizması irdelenerek, uygulama izinleri ve bu izinlerin işletim sistemi çerçevesinde işleyişi anlatılmıştır. Tehlikeli izinler ve bu izinlerin grupları belirtilip, cihazdaki verilere ve cihaz kullanıcısının gizliliğine yönelik izinler kısaca sunulmuştur. Bunlarla birlikte çalışmada, izinler ve bu izinlere bağlı olarak erişilebilecek veriler arasında bire-bir ilişki olmadığı hususu vurgulanmış ve bunu göstermek amacıyla, konum izinlerinden farklı izinlerin kullanılması ile konum verisine nasıl erişilebileceği hakkında örnekler verilmiştir.

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APPLICATION OF SEQUENTIAL EXTRACTION PROCEDURE FOR DETERMINATION OF HEAVY METALS IN DUST DEPOSITIONS

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Abstract: In this study, suspended dust samples were collected once in a month in different regions of selected sampling sites of Sakarya city center, Turkey, from April to October. The extracted metals (Pb, Fe, Zn, Cr, Cu and Mn) of dust samples were analyzed by FAAS. The mobility sequence based on the sum of the BCR sequential extraction stages was: Pb (99.85%) > Mn (88.72%) > Zn (81.42%) > Fe (60.51%) > Cu (42.17%) > Cr (10.60%). Validation of the analytical results was carried out by using a Certified Reference Material (BCR 701). The results showed a good agreement between the determined and the certified values for the metals analyzed. All mean recoveries were acceptable and in the range of 92.92% and 101.90%. Consequently, the results showed that the content of heavy metals was observed higher in some places with heavy traffic, crossroad points and traffic lamps.

Key words: Dust, Heavy metal, Turkey, FAAS.

Introduction

Dust is normally considered as house or street dust (Dundar and Altundag, 2002) which are important environmental indicator to monitor the level of heavy metal ions (Al-Rajhi et al., 1996; Dong et al., 1984; Thornton, 1988; Dundar and Altundag, 2012). Childhood exposure to lead-based paint, metals derived from vehicular traffic and local industrial sources (Rasmussen et al., 2006; Gulson et al., 1995; Dundar and Altundag, 2007; Mielke and Reagan, 1998; Altundag et al., 2013) are regarded as the key pathway familiar to having a dust and/or soil. Wood and wood wastes; agricultural crops and their waste; municipal solid waste; animal wastes; food processing waste; and aquatic plants and algae are examples of biomass resources Altundag and Dundar 2009. Heavy metals analysis in urban dusts and determination of its sources are important to reduce the pollution from dust which contains elevated concentrations of a range of toxic elements, and concerns have been about the consequences for both environmental quality and human health especially of young children Altundag and Tuzen, 2011; Akyuz et al., 2013).

The main sources of street dust and metals can be soil and thus the metals may fall into two groups Akhter and Madany 1993; Ozcan and Altundag (2013). Those are soil based and from pollution sources such as heavy traffic, industrial fumes and pollutants, car parts wear and tear, etc. One of the most important pollution parameter in street dust is lead and that is caused by motor vehicles causes wear and tear of tire such as Zn and Cd (Ferguson and Kim, 1991). Lead compounds are emitted into the atmosphere from vehicle exhaust gases using leaded petroleum products. However, the consumption of unleaded petrol is increasing day by day and its concentration from petrol is decreasing.

The BCR sequential extraction procedure (BCR 701, 2001) is a widely used extraction technique of heavy metals in dust and soil samples Vieira, 2009; Tokalıoğlu et al., 2003). In BCR sequential extraction technique, extractants are placed in order of increasing reactivity so that the sequential fractions match to metal association forms with lesser mobility (Arain et al., 2008). BCR sequential extraction procedure includes first, second, and third extraction steps and that are exchangeable (soluble and bound to carbonate), reducible (associated with Fe-Mn oxides) and oxidizable (bound to organic matter and sulfides) steps, respectively (Tessier et al., 1978). The sum of the heavy metal concentrations obtained by the three extraction steps are defined as labile heavy metals in this paper.

The Sakarya city center is situated in the northwest part of Anatolia, Turkey, which is close to the biggest and highly industrialized city of Turkey, Istanbul. The weather conditions of the city are characterized as hot and humid summers and mild and rainy winters. Temperature typically ranges between -5 and 37 °C (Dundar and Altundag, 2012)

The purpose of this study is to determine some heavy metals in street dust (Pb, Fe, Zn, Cr, Cu, Mn) samples of Sakarya city center by using the BCR technique. In this investigation, heavy metal pollution levels from a total of 56 street dust samples were collected from eight different regions of selected sampling points.

Materials and methods

Calibration and precision

Before starting each analysis, the instrument was calibrated according to manufacturer's recommendations. Stock standard solutions (1000 mg/L) of Pb, Zn, Cd, Ni, Cu, and Cr metals were spectroscopic grade and obtained from Merck (Darmstadt, Germany). Five different mixtures of standard solutions in the range of 0.05-0.80 µg/mL for lead, copper, chromium and manganese, 0.01-0.16 µg/mL for zinc, and 0.1-1.60 µg/mL for iron in 5% (v/v) HNO₃ solution were used for calibration purposes. Standard solutions of metals were aspirated into the flame atomic absorption spectrometer for metal concentrations.

Reagents and solutions

All materials of metal determinations were kept at least 24 hours in 10 % HNO₃, rinsing five times with distilled deionized Ultra High Quality (UHQ, chemical resistivity: 18 MΩ.cm) water before analysis. These solutions were made up to the required volume with UHQ water. Analytical reagent grade chemicals purchased from Merck (Darmstadt, Germany) were used throughout the experiments. BCR701 Certified Reference Material was used to support the experimental results obtained and to interpret the reliability of the method used.

Instrumentation

Deuterium lamp was used for background correction measurements and hollow-cathode lamps (Koto, Japan) were used for metals operated at various currents. Quantitative determinations of Pb, Fe, Zn, Cr, Cu and Mn metals were made by using a Shimadzu AA 6701F model flame AAS. The pH of solutions was controlled by using HCl or NaOH solutions and checked with a Schott CG 840 pH-meter. A centrifuge (Nuve NF 400) for complete separation of the extracts from the residue, a Clifton shaker was used throughout the experiments.

Sample collection and preparation

Sakarya city center was divided into 8 sampling sites and a total of 56 suspended dust samples were collected as once a month intervals from Yeşiltepe, Erenler, Ozanlar, Serdivan, Kampüs, Çark Cad., Ankara Cad., Ataturk Bulvarı. In the laboratory, all samples were first air-dried, and then grounded and passed through a sieve having a 230 mesh size (63 µm). They were stored in a desiccator until the analysis. Precautions were taken to avoid contamination during sampling, drying, grinding, sieving and storage. The Control sample that was not affected from pollution sources was collected from outside of the Sakarya city center.

Step 1: Acetic acid (40 mL) was poured over 1.0 g of dust sample. The mixture was shaken overnight and then centrifuged at 3000 rpm for 10 min to separate the extract from the solid residue.

Step 2: Hydroxyl ammonium chloride (40 mL) adjusted to pH 1.5 was poured over the residue obtained from Step 1. The extraction procedure from Step 1 was then repeated.

Step 3: The residue from Step 2 was treated twice with 8.8 mol/L hydrogen peroxide and evaporated nearly dryness. Then 50 mL ammonium acetate adjusted to pH 2 was added into the container and the extraction process of Step 1 was repeated.

After each step, the filtered supernatant was transferred into a 100 mL beaker and acidified with 1 mL 65% nitric acid. UHQ water was then added into the beaker until the volume reached to 100 mL. The transferred solution was poured into a 100 mL polyethylene bottle and stored at +4 °C until analysis.

Results and discussion

The present study provides data on metal concentrations of street dust samples in Sakarya city center, Turkey. The mobility sequence based on the sum of the BCR sequential extraction stages was: Pb (99.85%) > Mn (88.72%) > Zn (81.42%) > Fe (60.51%) > Cu (42.17%) > Cr (10.60%). This procedure provides measurements of extractable metals from media such as CH₃COOH (0.11 mol/L), NH₂OH·HCl (0.1 mol/L) and H₂O₂ (8.8 mol/L) plus CH₃COONH₄ (1 mol/L) and aqua regia stages of the sequential extraction procedure which was applied to the dust samples.

Quality Control

To validate the BCR sequential extraction procedure, we quantified the recovery of total metals to the extracts obtained from the BCR procedure. The range of each metal concentration with their mean values

and relative standard deviations (RSD %) for various areas are also reported. The sum of the three sequential extraction steps including the residual was in line with the total content. The results showed a good agreement between the obtained and the certified values for the metals analyzed. All mean recoveries were acceptable, and in the range of 92.92% and 101.90 %.

Evaluation of Analysis Results

In Yeşiltepe region, percentages of metal concentrations in mobile phases of Street dusts (F1, F2, F3) for Pb, Mn, Zn elements $\geq 50\%$, percentages of non-mobile phase (F4) of Fe, Cu, Cr metals $\geq 50\%$. High levels of Pb, Mn, Zn from soil levels is explained by heavy traffic density. In addition, Wearing of vehicles, accidents, other kinds of metal originated machines could be source of heavy metal contamination of dusts. In Erenler region, percentages of metal concentrations in mobile phases of Street dusts (F1, F2, F3) $Pb > Mn > Zn > Fe > Cu > Cr$ metals $\geq 50\%$. In the first fraction acid soluble the mobility of elements was found Manganese 49.21 %, in the second fraction, which is called as reducible 36.47%. The high percentages of Zn can be extracted for the second extraction step (50.77%). It was observed that the majority of the metals Cu (58.84%) and Cr (96.75%) were predominant in the residual phases. The highest level of fraction was observed for Fe in reducible fraction (42.08%).

In Ozanlar region, percentages of metal concentrations in mobile phases of Street dusts (F1, F2, F3) for Pb, Mn, Zn metals $\geq 50\%$, percentages of non-mobile phase (F4) of Fe, Cu, Cr metals $\geq 50\%$. Pb is partitioned 0.11% in bound to exchangeable and carbonates, 91.97% in the reducible fraction and 7.92% in the oxidizable fraction. The highest level of fraction was observed for Mn in exchangeable fraction (52.02%). The high percentages of Zn can be extracted for the second extraction step (51.38%). For Cu (66.21%), Cr (94.46%) and Fe (52.97%) elements, the highest levels were observed in residual stage.

In Serdivan region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) $Pb > Mn > Zn > Fe > Cu > Cr$. The high percentages of Fe can be extracted for the second extraction step (51.38%). In Serdivan region for Cu (59.23%) and Cr (82.07%) metals, the highest levels were observed in residual stage. The high percentages of Zn can be extracted for the second extraction step (53.20%). The source of zinc powder accumulated in the roadside engine alloys and zinc compounds are used as additives in tire making.

In Kampus region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) for Pb, Mn, Fe, Cu and Zn metals $\geq 50\%$, percentages of non-mobile phase (F4) of Cr elements $\geq 50\%$. In region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) $Pb > Mn > Fe > Cu > Zn > Cr$. The high percentages of Pb, Mn, Fe, Cu and Zn can be extracted for the second extraction step, respectively, 94.25%, 56.95%, 76.95%, 83.22% and 64.50%. The highest level of fraction was observed for Fe in residual stage (62.78%).

In Çark Street region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) for Pb, Mn, Zn and Fe metals $\geq 50\%$, percentages of non-mobile phase (F4) of Cu and Cr metals $\geq 50\%$. In region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) $Pb > Mn > Zn > Fe > Cu > Cr$. The high percentages of Pb, Zn, and Fe can be extracted for the second extraction step, respectively, 90.08%, 61.18% and 55.43%. The high percentages of acid-reducible and reducible fractions of Mn (48.95% and 38.95%, respectively) determined that the affinity for this metal in the acid-reducible and reducible fractions of the surface dust samples was high. For Cu (63.15%) and Cr (90.39%) elements, the highest levels were observed in residual stage.

In Ankara Street region, percentages of metal concentrations in mobile phases of street dusts are (F1, F2, F3) $Pb > Mn > Zn > Fe > Cu > Cr$. The highest mean concentrations 5.29%, 63.85% and 30.86% (based on the sum of the first three fractions) were found for Pb. The highest level of fraction was observed for Mn in exchangeable fraction (40.03%). Here, the extracted metals are due to be changed, and carbonates, this form are usually the most active metals and metal powders that can be easily known. The high percentages of Zn can be extracted for the second extraction step (49.42%). The total Cr and for Cu (77.92%) elements, the highest levels were observed in residual stage.

In Atatürk Bulvarı region, percentages of metal concentrations in mobile phases of Street dusts (F1, F2, F3) for Pb, Mn, Zn and Fe elements $\geq 50\%$, percentages of non-mobile phase (F4) of Cu and Cr elements $\geq 50\%$. Thus, In Atatürk Bulvarı region percentages of metal concentrations in mobile phases of Street dusts (F1, F2, F3) $Pb > Mn > Zn > Fe > Cu > Cr$. Mn is partitioned 43.65% in bound to exchangeable and carbonates, 40.52% in the reducible fraction 23.94%. The total Cr and for Cu (71.05 %) elements, the highest levels were observed in residual stage. The high percentages of Pb, Fe and Zn can be extracted for the second extraction step, respectively, (90.53%, 56.12%, 52.48%).

Conclusions

One of the main reasons of heavy metal pollution in Sakarya city center is traffic based pollution. Looking at regions of high values of heavy metals in city center where heavy traffic seen, the junction points and the locations of traffic lights that have been identified. The lead metal caused by exhaust emissions from motor vehicles can make negative effect either human beings or plants. Agricultural activities should not be carried out in heavy-traffic areas, roads should be built in arid and mountainous regions instead of agricultural lands. Especially in polluted areas less heavy metal accumulating plants should be included in sowing. The purpose of the study was to determine heavy metals (Cr, Cu, Fe, Mn, Pb and Zn) in dust samples of Sakarya city center by using a BCR technique. Therefore, the effects of pollution will be shown on dust samples picked up from different parts of city. The applicability of the BCR method for the environmental monitoring purpose is easy, reasonably rapid, reliable, inexpensive and useful determination of heavy metals in dust samples. The method was found to be both repeatable and sufficiently reproducible for environmental monitoring purposes. On the other hand, when any element has a high concentration (total or extractable), there will be a danger of contamination. The BCR method is of importance in obtaining comparable results in speciation studies of dusts.

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APPLICATION OF THE FMEA FOR ANALYZING DEPENDABILITY OF POWER TRANSFORMER AT HASSI R'MEL GAS FIELD

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Abstract: Transformers are essential elements in electrical network. These equipments are classically constructed out of copper, steel, paper and insulating oil. Transformers have been used worldwide for many years and their availability and reliability is a major concern for all electricity users. This paper describes the use of the failure modes analysis and their effects (FMEA) for analyzing the dependability of power Transformer in boosting station at Hassi R'Mel gas field in Algeria..

Keywords: Transformer, Dependability, Power, FMEA, failure, Availability

Introduction

The south Algeria has natural resources, among which the hydrocarbon reserves, hence the presence of a wide range of products related to oil and gas fields. For the separation of these products and their derivatives, Algeria has acquired and installed the large treatment complexes, such as the Hassi R'mel complex. The overall plan for gas installations located on the Hassi R'mel field is designed to allow a rational exploitation of the deposit and recover the maximum of liquid. In the installations implemented, three boosting stations were installed . In the central zone, we find SBC. This is a gas discharge unit; it increases the pressure and maintains the deposit flow of the modules supply. The SBC complex is powered by two arrivals and a generator in emergencies. All energy distribution is made using substations in the complex. The Boosting unit is considered the strategic point of the HASSI R'MEL region. Therefore, it must be always available and reliable. The transformer 30 / 5,5KV,10MVA is the essential element in it electrical network of this Boosting station and it's reliability is more important. Analyzing the dependability parameters of industrial systems such transformer can be done with different methods. The famous method has been used; the failure modes analysis and their effects (FMEA).The FMEA is an inductive technique, it adds to identify the failure modes of an item, the causes of each mode and the effects on the function of the item. The results of FMEA are generally represented into a table.

Materials and Methods

Failure modes and effects analysis (FMEA) is a procedure by which each potential failure mode in a system is analyzed to determine the results or effects there of on the system and to classify each potential failure mode according to its severity. It has been used firstly on 1960 in aeronautic for analyzing air plans security, A.Villemeur (1988).

First and in order to make the rest of the paper clear, we take these definitions:

failure: Termination of the ability of an item to perform its required functions.

failure cause: The circumstances during design, manufacture, or use which have led to failure; syn: root cause.

failure mode: The manner in which failure occurs; generally categorized as electrical, mechanical, thermal, and contamination.

Before applying the FMEA to our system, we will describe the different constraints that may occur during operation.

Constraints and associated defects:

-constraint: Each transformer is sized to take a number of nominal constraints (mechanical, dielectric, thermal) due to disturbances (lightning strike, short circuit, etc .) , which partially reflect the operating conditions. Some of these constraints may cause defects, or impact the life of a transformer.

- Failure: Accidental change affecting normal operation. In this work a defect will be seen as an internal physical problem visually identifiable by an expert, during access to the active part, which can stop or having stopped the normal operation of the device.

-Symptom: Sign indicative of a material situation. In our case, a given internal defect will generate one or more symptoms. Symptoms may be highlighted following analysis of available information.

In this work, a defect is the result of a constraint that could not be contained. Any defect will manifest itself by symptoms that one will try to qualify by different information and means of measurement.

The transformer being a complex object located in a tank, its internal access is not obvious and the visual confirmation of these internal defects is not so either, especially the removal of transformer windings operation is never innocuous, and relatively expensive.

In the worst case, it is sometimes possible to go to the explosion of the transformer.

The différents constraints of a transformateur, J.Sanchez (2011) are :Dielectrics stress and overvoltage , Electrodynamic and overcurrent constraints; Electrical constraints; Thermal constraints (overloads, hot spots and aging); Contraintes électromagnétiques et courants de Foucault ; Contraintes mécaniques (vibrations, fuites et transport ions, fuites et transport). All these constraints can therefore be the cause of various defects within a transformer.

Results and Discussion

Table 1,2 and 3 represent the synthesis of FMEA applied to our transformer using the results published by B.William 2000. It is noted that a large part of the failures of the elements of these tables have a direct impact on the insulators which themselves affect the availability transformer availability.

In transformers and more particularly in power transformers, insulating solids provide several functions. They are used to mechanically maintain the windings and to materialize the coolant circulation channels . By their dielectric nature, the papers isolate electrically the coils between them. In addition, their porosity allows them to be impregnated by the insulating liquid and coolant circulating in the transformer.

The dielectric stress characterizes the voltage withstand of the various transformer elements. This dielectric strength within the transformer is related to the paper insulator (to insulate the conductors) , dielectric oil(immerses the whole of transformer active and bushing.

For Normal constraints(stress), the transformer must normally withstand its nominal AC voltage .

For abnormal stress, the two most important normalized dielectric stresses are lightning strikes (1452KV in 200µs) and shocks (1050 kV in 200 µs), which are very brief high voltage phenomena.

The dielectric stress can cause several faults; priming and partial discharges.

If the characteristics of the insulators degrade too much, due to excessive internal humidity for example, or are forced beyond their limits then it can develop;

Priming devices under voltage:

- Between them: as between windings or between turns.
- With the mass: as the initiation of a crossing or a winding to the tank or to the magnetic circuit.

Partial discharges: Inside an insulation, classically solid in transformers. These are micro local dumps that tend to spread over time.

All these defects create carbon, which is conductive, thus impacting the dielectric strength locally. This phenomenon being irreversible, it is impossible to find a normal operation following a dielectric priming.

Table 1: Application of the FMEA to transformer elements 1 and 2:

N°	Element	Function	Failure mode	Cause	Effect
1	Tank	Protection	- heating	- Foucault Current	losses of electrical power
		of active part of transformer	degradation of the tank coating	-Corrosion -Rust	-Oil leak -Explosion and heating of tank
			vibration	- Bad tightening of the support	- Components displacement
			Heating of the tank sheet	rising of atmospheric temperature	Insulators Breakdown Increase of gas bubbles
			Cooling of the tank sheet	decreasing of atmospheric temperature	Bad oil circulation
2	Bushings	Control of the magnetic field	-crushing of bushings joints	-Mecanical shock -Joints aging	-Leak of joints -Direct contact of oil with outside.
		shape and magnetic field	-Crack of porcelain bushing	-False maneuver - Mecanical shock	-Electric arc between line and tank
		intensity	Loss of joints elasticity	-Overheating -Aging	- oil Leak - Risk of joints fissures
			Partial discharges	-Electric field value exceeds that of dielectric resistance of insulating material	-Increase of gas bubbles -Breakdown of oil

Table 2: contains the analysis of failure modes and effects analysis applied to transformer elements 3,4 ,5

N°	Element	Function	Failure mode	Cause	Effect
3	Windings	Support of electric circuit	-Paper aging	-Overload	Short circuit between windings coils - Winding overheating -Pressure rise - Variation of the transformation ratio
			-Coils deformation	- Shorts circuits -mechanical shocks	- increase of Shorts circuits -variation of the distance between primary and secondary
			Winding displacement	Incrising of temperature	-Paper degradation -Power loss
			Hots points		
			Increasing of winding temperature	-Overload -Shorts circuits	-Slow insulation destruction - Decreasing of rigidity -Risk of materiel damage
4	Connetions Windings	Amplification of magnetic field	-Short circuits	-Transitory phenomenon	-Overcurrent (generate the overheating and electrodynamic effect at winding) -winding heating - insulation breakdown
		- connection between windings and tap changer	-increase of Iron losses and Joule losses	-Unbalanced regime	
			-Winding overheating	-Losses Joule	-Oil overheating -Energy dissipation in the breakdown form

		-Association of windings connections	-short Circuit between winding and connections	-Insulation aging (liquid,solid)	-Liquids breakdown -appearance of gas bubbles
			-direct contact with tank		-Single phase short circuit ,phase/ground
			-Overheating	Bad tightening	Variation of connection resistance -Overheating of oils
5	Insulation	Cooling of internal components	-Viscosity decrease	-Variation of internal temperature	-Difficult of oil circulation between coils,-Malfunction of the cooling function
			- Change of oil color	-Impurities	-Poor detection of oil state.
			-Inflammation of hydrocarbon constituents	Overheating -Arc of pre-breakdown	-Changement of oil color, -Changement of oil characteristics
			-Gravitational settling	-Presence of solid particles	-Reduction of rigidity voltage of dielectric -Breakdown oil
			-Overheating of oil	Presence of leakage current	Dielectric losses

Table 3: contains the analysis of failure modes and effects analysis applied to insulation (element 5)

N	Element	Function	Failure mode	Cause	Effect
5	Insulation	Isolation	-Electric arc	-Presence of humidity in paper	-Carbonization -Internal destruction of transformer - Variation of output voltage at secondary -Reduction of breakdown voltage
			-Variation of oil dielectric capacitance	-Presence of humidity in oil	
			-Deterioration of paper	-Increasing acidity	-Increasing of impurities -Oil breakdown
			presence of ions	Chemical reaction between the copper of windings and oil	Increasing of value of oil dielectric capacitance
			contamination of oil by humidity	chemical reactions between molecules	Increasing of partial discharges -Increasing of breakdown number

Conclusion

Using the FMEA for analyzing the dependability parameters is very important, it permit to find the critical points of the considered system. This method is a contribution to the study of the dependability of the power transformer, it's allowed us to perform the functional analysis of our system namely the transformer. The identification of the modes, causes and effects of the failures of each element is important information for transformer diagnostics.

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ARSENIC ACCUMULATION IN COMMON VETCH (*VICIA SATIVA L.*) IRRIGATED WITH CONTAMINATED WATER

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Abstract

Because arsenic is a common pollutant of the environment, it presents in a various amount in all rocks, soils, waters, air and biological tissues. Arsenic is also released into the environment from anthropogenic sources and transferred into the human, plants, and animals by food and waters. When the plants are irrigated with arsenic-contaminated water, the level of arsenic in plants is increase and also arsenic concentration is elevated in the soil.

Due to the Turkish livestock total population (cattle, sheep, and goats) between years of 2001 and 2017 increased from 44.542.000 to 60.255.894, feed requirements for expanding livestock necessitate the introduction of forage legumes into crop rotations. Common vetch (*Vicia sativa L.*) is one of the most important annual forage legumes in Mediterranean-type environments because of its multiple uses, high nutritional value, and ability to grow over a wide range of climatic and soil conditions.

In this experimental study, the accumulation of As in shoots as well as growth of common vetch plants at various As contaminated waters (control, 0.5–1.0–1.5–2.0–2.5–3.0–4.0–6.0–8.0 mg/L) was evaluated. Dry weight of common vetch plants which were irrigated with As–contaminated water were higher than the control pots. As accumulation in the shoots of common vetch increase from about 3.9 mg/kg to 34.2 mg/Kg with increasing As concentrations from zero to 8.0 mg As/L in the irrigation waters.

Assistant Bed Construction

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Abstract. Hospitals, rehabilitation homes and retirement homes around the world are dependent upon a quality medical staff to maximize safety of people. Staff professionalism, facility quality and the condition of equipment are all key components in medical care which must be considered when designing hospitals and especially beds. Particularly, hospital beds are of recent concern around the world. All around Europe, there is a particular need for improving and modernizing hospital beds. But, high price in bed cost is passed down to the patients further increasing the cost for quality healthcare and thus resulting in only the upper echelon of people being able to utilize technologically advanced hospital beds and hospital care.

In this paper, we give existing models of hospital beds and analyze the components and functions of them by the overview of some authors. We try to determine some features that could be useful in a modern hospital bed. We hope to see designing and manufacturing a reliable, reproducible and marketable bed for all patient, especially living independently.

Keywords: assistant bed, performance -service, living conditions

Introduction

Today's technology presents many different bed designs available for purchase by a medical care facility. These beds are produced by a wide range of companies in many countries. Each bed is designed for a specific use and the functions. It is divided the notion of the bed is to two parts that are "living" bed and "service" bed (Tianyi, Z. 2012; Wong, 2006; Rittweger at all. 2004; Ishizaki at all. 2002). Tianyi noted that the living panel is separated to "head zone", "upper zone", "lower zone"; the upper and lower part are separated to small parts to meet the ergonomics needs better. For mechanical move functions, these parts are connected the main part which presents good actions in using of this bad (Figure 1).



Figure 1. Assistant bad designed with a special protective layer
(www.ewlclublondon.com/anti-dekubitus-matratzen/anti-dekubitus)

Design

The assistant bed is generally involved of main 2 parts that living part and service part (Tianyi, Z., 2012; Yousefi at all. 2011; Sakakibara at all, 2011). Tianyi (2012) stayed that the elementary role of service part is for WC (toilet function) and about supplementary personal service to do some simple everyday actions. He explained that: "this panel is divided to upper part, hip part and lower part; there locates a device works as a toilet and in upper part provides smart tablet entertainment for users. The basic function of living unit is for sleeping, relaxing as bed, sitting as chair and taking exercises. The living panel is divided to head part, upper part, lower part to meet the ergonomics needs better. The upper and lower part are divided to more semi-parts. In-between two adjacent parts, pivot connects the two parts to offer rotational flexibility" (figure 2).

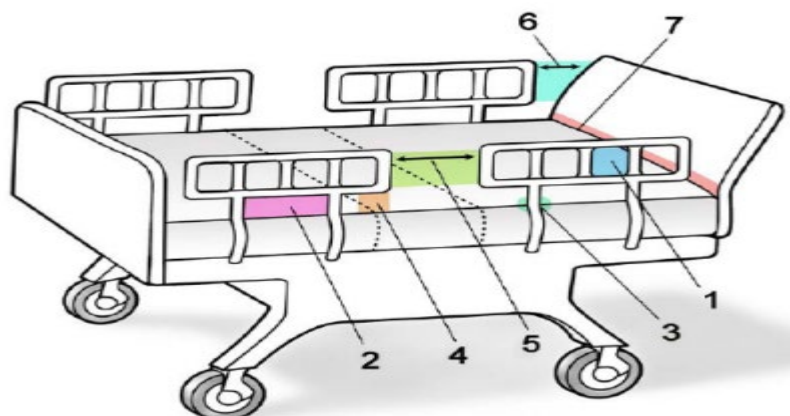


Figure 2. Basic parts of Assistant Bed
(www.wpi.edu/Pubs/E-project/Available/E-project)

- Section 1 is the area of spacing within the rail
- Section 2 is representative of the area in the railing, between the rail ropes
- Section 3 is the area between the rail and the bed
- Section 4 distinguishes the area under the rail, at the last point of the rail
- Section 5 is defined as the area between split bed rails
- Section 6 between the last point of the rail and the cross lines of foot panel
- Section 7 clarifies the area between the foot panel and the bed last position (Rachlin, 2006).

Tianyi (2012) explained some detailed information about the layer of the assistant bed: “a prefabricated platform is assembled in the room in advance. It is consisted of one strong central pivot which is fixed onto the wall and two strong arms. The so called arms are used for supporting and lifting the two panels just like human arms”.

In the pivot method, it is used a singular spool, that is fixed by a mechanical material to attach connected elements. The mean of this configuration that the amount of exercise is best for the patient. In the hydraulic method, at least five or six jacks are used under the unit (Tianyi, 2012; Ostaddabas at all. 2011; Wei at all. 2007).

Result

In this paper, we try to explain the design and modification of some kinds of assistant beds and point out the ability of living self-sufficiently as order human. We can shortly say that the assistant bed is an original and powerful designed device to use for the assistant persons of patient as nursing staff or civil person with because of its easy operated functions.

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ATIKLARDAN ALÜMİNA ESASLI AEROJEL TOZU ÜRETİMİ

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Özet: Aerojeller düşük termal iletkenliğe, düşük yoğunluğa, yüksek yüzey alanına ve yüksek gözenekliliğe sahip olduklarından günümüzde önem kazanmış ve birçok alanda değerlendirilmeye başlanmıştır. Çevre dostu olmaları ve yüksek dayanımları sebebiyle aerojeller üzerine yapılan çalışmalar artmış olup, geliştirilebilmeleri için farklı yollar araştırılmaktadır. Mevcut çalışmada, ikincil alüminyum üretiminde cüruf olarak oluşan atık kullanılarak alümina esaslı aerojel tozu üretimi amaçlanmıştır. Bu sayede çevre için zararlı olan atık, katma değeri çok daha yüksek nano gözenekli toza dönüştürülerek alüminyum üretici firmalarının bertaraf etmek için çözüm yolları aradığı atığa yeni bir uygulama alanı kazandırılacaktır. Atık malzeme NaOH çözeltisi içerisinde 70°C’de 3 saat karıştırılmış, HCl asit ile pH=7 olacak şekilde titrasyon sonrası 3 hafta yaşlandırma işlemine tabi tutulmuştur. Hazırlanan jeller, sırasıyla saf su, Etanol (EtOH)+su ve EtOH çözeltilerinde 24’er saat bekletilip süzölmüştür. Süzülen jel n-heptan içerisinde 2 gün 50°C’de ve oda sıcaklığında bekletilerek yaşlandırma aşaması tamamlanmıştır. Alümina esaslı aerojel tozları atmosferik şartlarda etüvde 50°C, 90°C ve 120°C’lerde 48 saat boyunca kurutularak elde edilmiştir. Hazırlanan alümina esaslı aerojel tozlarının karakterizasyonu, FT-IR, SEM ve FESEM-EDS analizleri ile gerçekleştirilmiştir. Faz yapıları XRD analizi ile yoğunluk değerleri ise hacmi belli bir kap kullanılarak yoğunluk formülü ile belirlenmiştir.

Anahtar Kelimeler: Alümina Aerojel, İkincil Alüminyum Cürufu, sol-jel metodu

Abstract: Aerogels have gained importance and have begun to be utilized in many areas because of they have low thermal conductivity, low density, high surface area and high porosity. Due to aerogel’s environmentally friendliness and high strengths, number of studies on aerogels are on rise and alternative ways for their improvement are being researched. By turning the slag which is harmful to the environment valuable nano porous powder, aluminium producing plants will gain a new recycling method to get rid of their slag. In this study, it was aimed to produce alumina based aerogel powder using waste alumina which is formed as slag in secondary aluminium production. The slag was stirred in NaOH solution at 70°C for 3 hours and aged for 3 weeks after titration with HCl acid until Ph value is 7. The prepared gels respectively kept in distilled water, EtOH+water EtOH solutions for 24 hours each, then filtered. The aging step was completed by the filtered gel sat in n-heptane for 2 days at 50°C and room temperature. Alumina based aerogel powders were obtained at atmospheric conditions by drying at 50°C, 90°C and 120°C for 48 hours. Characterization of prepared alumina based aerogel powders were performed by FT-IR, SEM and FESEM-EDS analyzes. Phase structure of powders were determined with XRD analysis. The density values were determined by density formula using a specific container.

Keywords: Alumina aerogel, Secondary aluminium slag, sol-gel method

Giriş

Aerojeller sahip oldukları eşsiz fiziksel özellikler sayesinde ilaç taşıyıcı sistemlerinde, nükleer atık depolamada, dedektörlerde, termal ve akustik yalıtım gerektiren yerlerde uygulama alanı bulan oldukça hafif malzemelerdir. Aerojellerin kullanımı malzeme bilimi alanında önemli ilerlemeler sağladığından ve birçok problemi çözmede yardımcı olduğundan bu konu üzerine çalışmalar yıldan yıla artmaktadır (Wu, 2010). Aerojel uygulamalarının çeşitli versiyonları da bulunmaktadır. Özellikle kimyasal işlemlerde gaz katalizör olarak kullanılmak üzere düşünülen aerojeller genellikle hidro karbonların yanması ile ve metanol ile fenolün alkillenmesiyle oluşturulmaktadır (Walendziewski, 1999). Aerojel sentezi üç kademede gerçekleşir;

1. Jelin Hazırlanması

Üretilen malzemenin jel hali sol-jel yöntemi ile elde edilir. Sol 1-1000 nm boyut aralığında değişen içinde geniş moleküllerin ve katıların dağıldığı sıvı karakterli kolloidal sistemdir. Jel ise kolloidal sistemin bol miktarda su içeren gözenekli katı halidir.

2. Jelin Yaşlandırılması

Bu işlem alkol/su karışımının jele emdirilmesini içerir. Jel omurgasını güçlendirerek kurutma aşamasında jelin büzülmesinin minimuma indirgenmesine olanak sağlamaktadır. Çapraz bağlı ıslak alkojel oluştuktan sonraki son adım, reaksiyon ortamı olarak kullanılan sıvı çözücünün hava ile yer değiştirerek uzaklaştırılmasıdır.

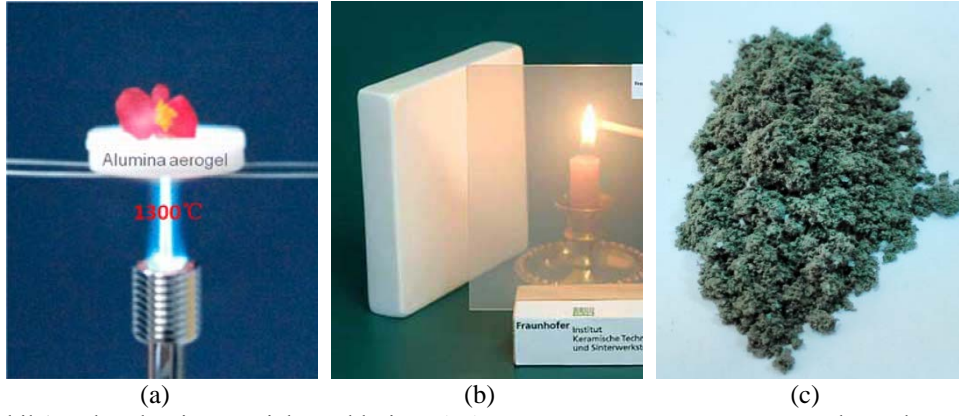
3. Jelin Kurutulması

Kurutma işleminin yapılmasındaki amaç jel yapısının yığılmasına engel olmak, jelin iskelet yapısını korumak ve büzülmeyi en aza indirmektir. Bu amaçla çözücüyü jelden uzaklaştırmak gerekir. Kurutma, atmosfer basıncında yapılan kurutma, süper kritik kurutma (yüksek sıcaklık süper kritik kurutma ve düşük sıcaklık süper kritik kurutma) ve dondurarak kurutma olmak üzere üç farklı şekilde gerçekleştirilir (Bozoğlu, 2014; Öz, 2018).

Alümina esaslı seramikler yüksek mukavemetlerine nispeten, termal ve kimyasal kararlılıklarıyla da dikkat çekmektedirler. Alüminanın bu özellikleri düşük yoğunluklu aerogel materyallerde de uygulama alanı sağlamıştır. Alümina esaslı aerogellerin kullanımı yüksek sıcaklıktaki katalizörler ve depolama sistemleridir. Yüksek sıcaklıklarda yaygın olarak kullanılan silika aerogellerine göre daha iyi ısı yalıtımı özelliklerine sahiptirler. Bu özellikleri sayesinde geliştirilmiş yüksek sıcaklık alaşımlarını ergitme proseslerinde kullanılabilir (Öz, 2018; Poco, 2001). Alümina esaslı monolitik aerogellerle ilgili çalışmalarda en yüksek gözenekli olarak üretilen alümina aerogel için BET yüzey alanı 376 m²/g olarak belirlenmiştir. Alümina aerogellerin sol-jel yöntemiyle üretimi ile ilgili çalışmalarda alüminyum hidroksit kompleks çözelti kimyasının jelin yapısal oluşumunu karmaşıktırdığı bulunmuştur. Alüminyum alkoksit türevli jellerde ise olası birkaç yapısal değişiklik bulunmaktadır. Literatürde yapılan çalışmalarda, jelin nihai yapısını etkileyen değişkenlerden bazıları; kullanılan alkoksit türü, alkoksidin suya oranı, hidroliz oranı, kurutma sıcaklığı, kullanılan katalizörün türü, çözeltinin pH'ı ve reaksiyonların meydana geldiği sıcaklık olduğu bilinmektedir (Öz, 2018).

Alüminyum cüruf atıkları beyaz ve siyah cüruf olarak adlandırılan birincil ve ikincil alüminyum üretim sonucu oluşan tehlikeli atıklardır. Beyaz cürufun içerdiği metalik alüminyum miktarı %15-70 arasında değişmektedir. Kara cüruf ise %12 ila 18 arasında alüminyum metali ve daha çok alümina ihtiva etmektedir. Kara cüruf ikincil alüminyum üretimi sonucu atık olarak çıktığı için cürufun içerisinde yüksek miktarda (%40'dan daha fazla) tuz bileşenleri bulunmaktadır. Tehlikeli atık olarak kabul edilen alüminyum cüruflarının yaklaşık %95'i gömülmek suretiyle bertaraf edilmektedir. Atıklar içerisinde bulunan tuzlar (azot, flor, klor vs.) ciddi çevre problemi oluşturmaktadır (Petavratzi 2007; Tsakiridis, 2012). 2010 yılında dünyada üretilen 56 milyon ton alüminyumun 18 milyon tonu hurda alüminyum kullanılarak üretilmiştir. 2020 yılında dünyadaki alüminyum ihtiyacı 97 milyon ton olacağı öngörülmektedir. Bunun 37 milyon tonu ise hurdadan üretilen olacaktır. Bugün ise Avrupa'da alüminyum üretiminin %50'sinden fazlası hurda alüminyumun geri dönüşümünden elde edilmektedir. Boksitten bir ton alüminyum üretimi için yaklaşık 17.000 kWh enerji gerekirken, geri dönüşümle aynı miktar alüminyum için 750 kWh enerji harcanmaktadır. İkincil alüminyum üretimi birincil üretim ile karşılaştırılırsa; boksit cevherinden üretilen enerji harcamasının yaklaşık % 5'i kadar enerji harcanmakta ve sadece sera gazının % 5'i kadarı çevreye atılmaktadır. Atığın gömülmek suretiyle bertaraf edilmesi, yerine bu atıkların katma değeri yüksek ürünlere dönüştürülmesi sağlanmalıdır (Petavratzi, 2007; Yücel, 2015).

Alüminyum üretimi yapan firmaların atığı olan alüminyum cürufunun çevreye zarar vermesini önlemek amacıyla mevcut çalışmada bu atık alümina kaynağı olarak kullanılmış ve alümina esaslı aerogel tozu üretilmiştir. Bu sayede çevreye zararlı alümina oranı yüksek olan bu atık katma değeri çok yüksek mezo gözenekli aerogel tozuna dönüştürülmüştür. Hazırlanan alümina esaslı aerogel tozlarının yapısal analizleri FT-IR tekniği ile, toz tane morfolojileri SEM ve FESEM-EDS analizleri ile, faz yapıları XRD analizi ile yoğunluk değerleri ise hacmi belli bir kap kullanılarak yoğunluk formülü ile belirlenmiştir. Şekil 1 a ve b'de alümina aerogel ürünler c.'de ise mevcut çalışmada alümina kaynağı olarak değerlendirilen öğütülmüş atık cüruf görülmektedir.



Şekil 1. a. b. Alümina aerjel örnekleri (Anissimov, 2018; Zu, 2013) ve c. öğütülen atık cüruf

Deneyisel Çalışmalar

Kullanılan Malzemeler

Deneyisel çalışmalarda kullanılan atık alümina 3A Alüminyum A.Ş. firmasından tedarik edilmiş olup; Tablo 1’de ikincil alüminyum üretiminde oluşan cürufun (mevcut çalışmada atık alümina olarak nitelendirilmiştir) kimyasal analizi görülmektedir. Şekil 1c’de ise kullanılan atık alüminanın makro görüntüsü verilmiştir. Bu çalışmada atık alümina dışında Merck marka %99’luk sodyum hidroksit (NaOH), %37’lik hidroklorik asit (HCl), %99’luk n-heptan, J.T Baker marka %99.5’luk etanol (EtOH), siyah filtre kağıdı, pH kağıdı, manyetik balık, deiyonize su kullanılmıştır.

Tablo 1. Atık alüminanın XRF analizi

Element	Al ₂ O ₃	Cl	Na ₂ O	K ₂ O	Fe ₂ O ₃	MgO	CaO	SiO ₂	TiO ₂	BaO	SO ₃	CuO
ağ.%	69.87	9.454	6.24	4.587	3.050	2.74	1.78	0.852	0.444	0.356	0.270	0.132

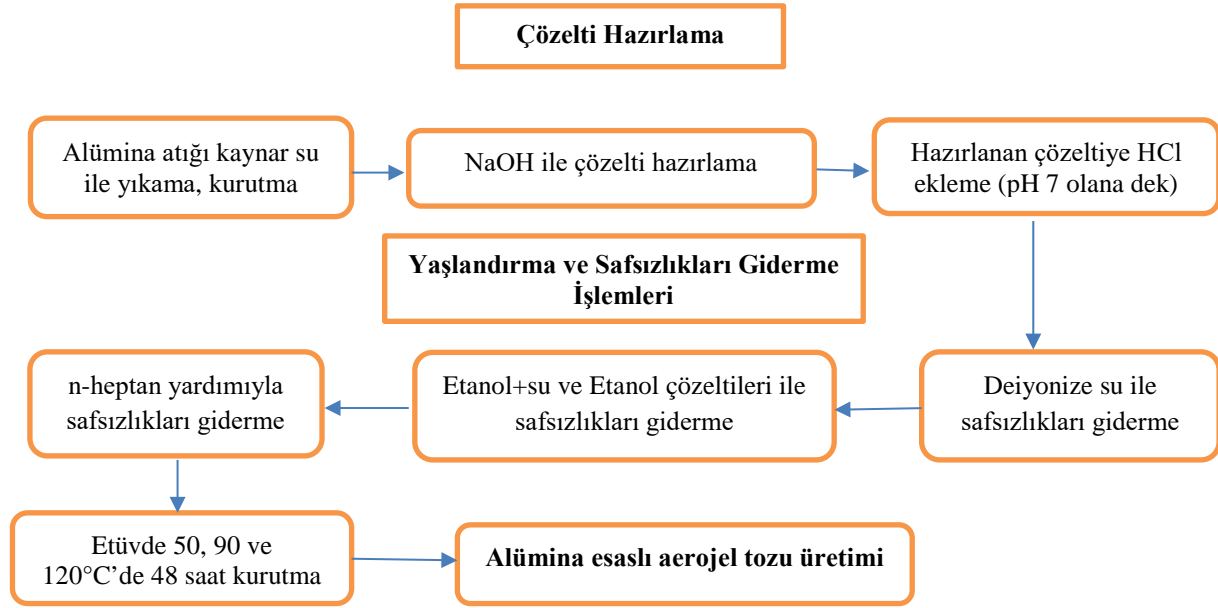
Alümina Esaslı Aerojel Tozunun Üretimi

Çözelti Hazırlama

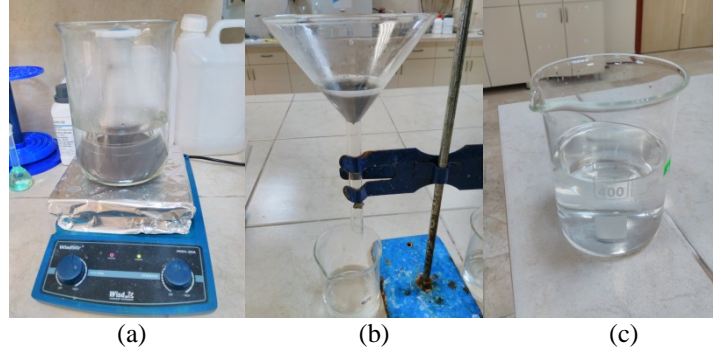
Şekil 2’de atık alüminadan alümina esaslı aerojel tozu üretim akım şeması özetlenmiştir. 20 gr atık alümina 1M’lık 250 ml’lik NaOH çözeltisi içerisinde 70°C’de, 500 rpm hızla 3 saat balık kullanılarak ısıtıcı karıştırıcıda karıştırılmıştır. Sonrasında karışım siyah filtre kağıdı ile süzülerek alüminaca zengin sıvı çözelti toplanmıştır. Şekil 3.a’da atık malzemenin NaOH ile çözeltiye alınıp homojen karıştırılması, b.’de çözeltinin siyah filtre kağıdı yardımı ile süzülmesi ve c.’de ise alüminaca zengin çözeltinin elde edilmesi aşamaları görülmektedir.

Çözeltinin Jelleşmesi

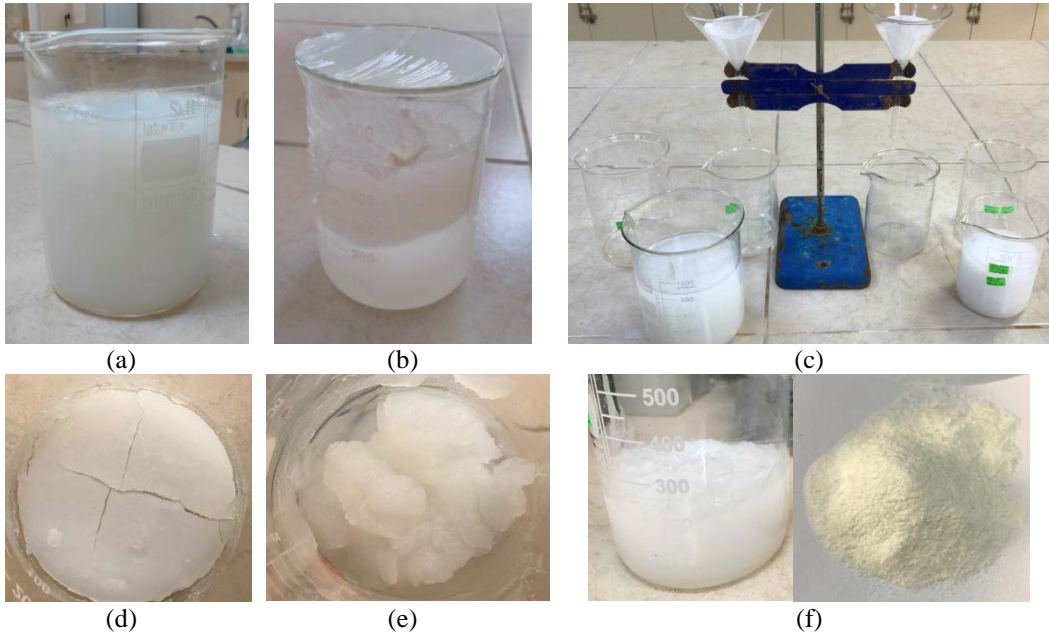
Elde edilen alüminalı çözeltiye 1M’lık 250 ml’lik HCl asit çözeltisi eklenerek çözeltinin pH’ı ölçülerek titrasyon işlemiyle pH 7’ye ayarlanmıştır. Yaşlandırılmak üzere üzeri streç film ile kaplanan çözelti oda sıcaklığında 3 hafta bekletilmiştir. Şekil 4’te çözeltiye alınan atık malzemeye HCl ilavesinden sonraki jelleşme aşaması ile birlikte alümina esaslı aerojel tozu üretim aşamaları sırası ile görülmektedir. Jelleşme aşaması oda sıcaklığında beklenerek sağlanmış olup; mevcut çalışmada bu işlemin kısa sürede gerçekleştiği gözlenmiştir.



Şekil 2. Alüminyum atıktan alümina esaslı aerojel tozu üretim akım şeması



Şekil 3. Çözeltinin a. karıştırılması b. filtre edilmesi ve c. elde edilen Alüminalı çözelti



Şekil 4. a. Çözeltinin jelleşmesi (HCl ilavesi ile), b. oda sıcaklığında 3 hafta yaşlandırma sonrası ve c. saf su, etanol ve n-heptan ile yıkama ve süzme işlemleri d. n-heptanda 50°C'de etüvdeki jel, e. n-heptan ile oda sıcaklığında bekletilmiş jel ve f. kurutma öncesi ve sonrası

Yaşlandırma işlemi

Yaşlandırma işlemi atmosferik koşullarda oda sıcaklığında 3 hafta bekletilerek yapılmıştır. Bu süreç sonrasında sırasıyla saf su, etanol+saf su, etanol ve n-heptan ile içerisindeki safsızlıklar giderilmiştir. Şekil 4.c.'de yaşlandırma işlemi sonucunda oluşan jel, içerisindeki sıvılardan arındırılması için filtre kağıdı ile süzümüştür. Şekil 4.d.'de jeldeki çözeltiye alma, yaşlandırma ve yıkama işlemlerindeki safsızlıkların giderilmesi için n-heptanla 50°C'de etüvde bekletme sonrası ve e.'de ise oda sıcaklığında bekletme sonrası elde edilen jelin makro görüntüleri verilmiştir.

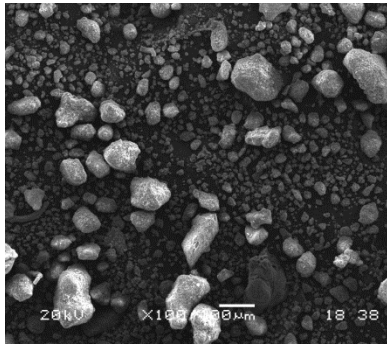
Jelin kurutulması

Mevcut çalışmada atmosferik şartlarda kurutma yöntemi kullanılmış olup; yaşlandırılmış jel sırasıyla 50, 90 ve 120°C'de 48 saat boyunca etüvde kurutulmuştur. Üretilen alümina esaslı aerojel tozu SEM, FESEM, FT-IR, XRD ve yoğunluk ölçümlerine tabii tutulmuştur. Şekil 4.f.'de atmosferik şartlarda kurutma yöntemi ile etüvde kurutulan alümina esaslı aerojel tozunun makro görüntüsü verilmiştir.

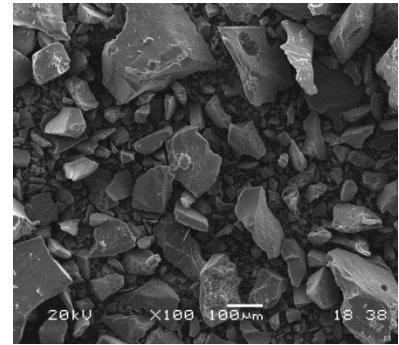
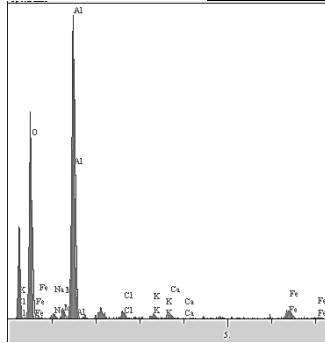
Alümina esaslı aerojel tozlarının karakterizasyonu

Mevcut çalışmada üretilen alümina esaslı tozların mikroyapısal özellikleri Jeol 6060 LV model taramalı elektron mikroskobu (SEM) ve FESEM-EDS ile, bağ yapıları FTIR cihazı (Perkin Elmer FT-IR Spectrometer Spectrum Two) ile, faz yapıları Rigaku D/MAX/2200/PC marka X-ışınları difraksiyon (XRD) cihazı ile ve tozların yoğunluğu ise hacmi belli bir kap yardımı ile $d=m/V$ formülünden hesaplanmıştır.

Sonuçlar ve Tartışmalar

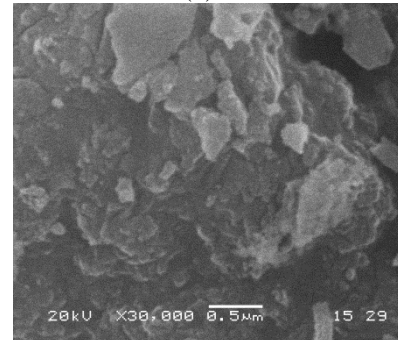
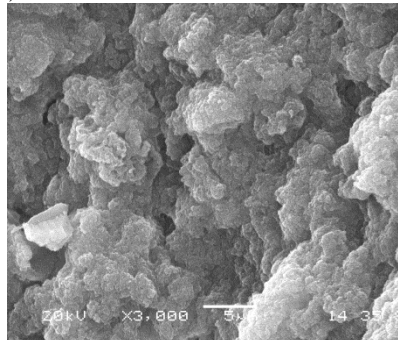
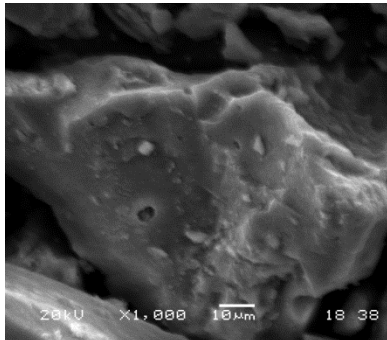


Bileşen	ağ. %
O	48.577
Na	1.016
Mg	1.332
Al	42.160
Cl	1.352
K	0.756
Ca	0.775
Fe	4.031



(a)

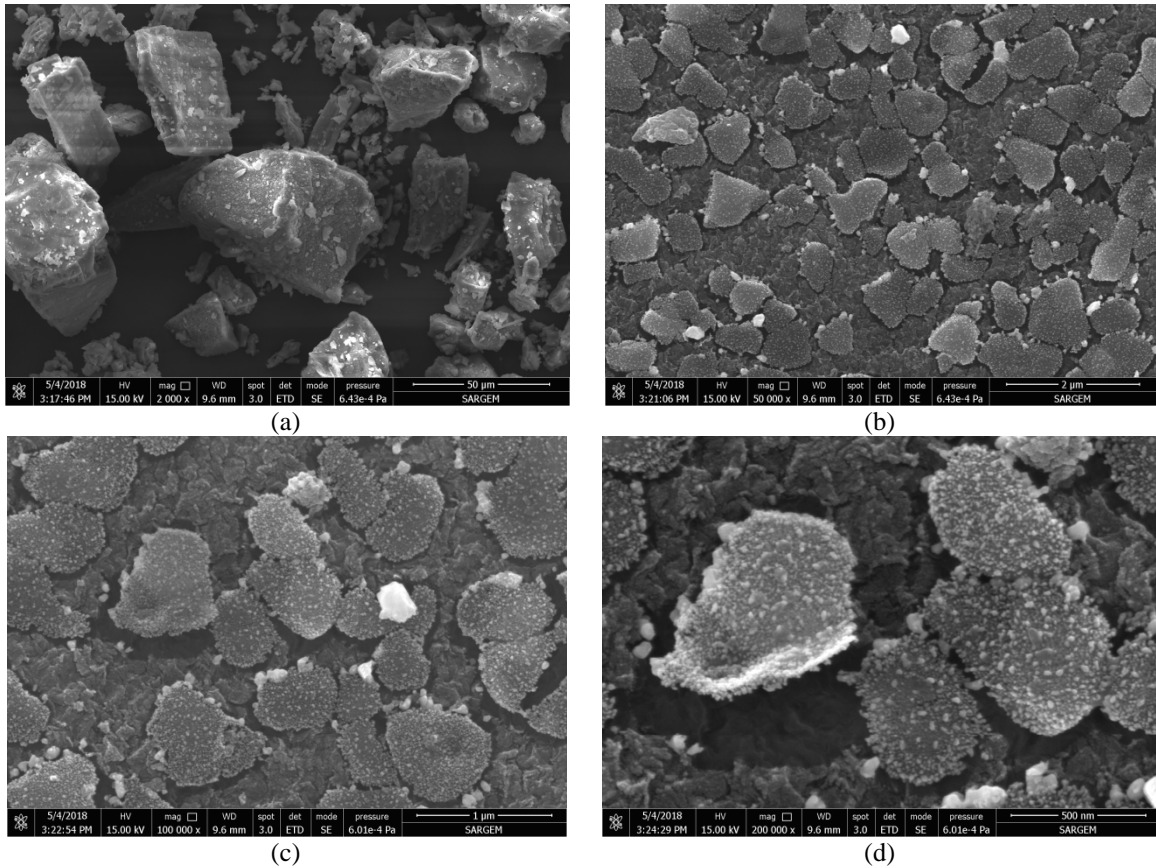
(b)

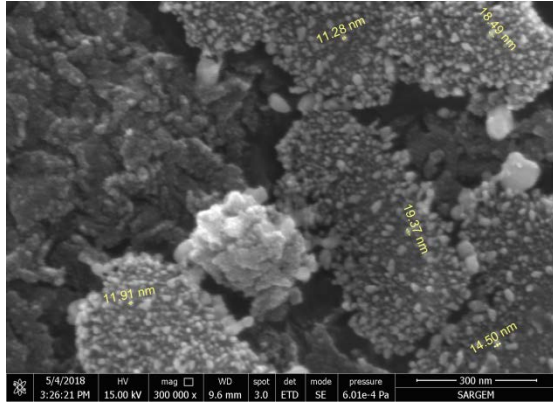


(c) (d) (e)
Şekil 5. a. atık alümina tozunun SEM görüntüsü ve EDS analizi, b-e. Üretilen alümina aerojel tozunun a. x100, b. X1000, c. X3000 ve d. X30.000 büyültmelerdeki SEM görüntüleri

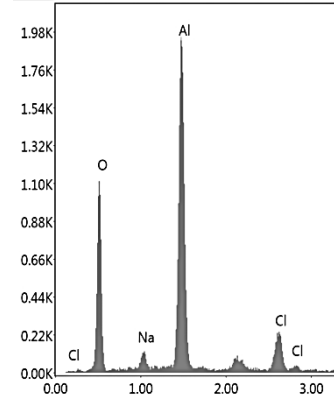
Mikroyapı İncelemeleri

Alümina esaslı aerojel tozu üretiminde kullanılan atık alümina tozunun ve üretilen alümina esaslı aerojel tozunun SEM mikroyapı görüntüleri Şekil 5'te verilmiştir. Mikroyapılar incelendiğinde başlangıç tozu olarak kullanılan atık alüminanın; geniş toz boyut aralığında, küresele yakın ve düzensiz şekle sahip olduğu; EDS analizinde ise alüminayı oluşturan Al ve O piklerinin yanı sıra safsızlık olarak Na, Mg, K, Fe ve Cl elementlerini de ihtiva ettiği tespit edilmiştir. Kaynar su ile 4 defa yıkanan atıkta % 1.352 oranında Cl tuzunun varlığı yıkama sayısının artırılması gerektiğini göstermiştir. Üretilen toz ise düşük büyültmelerde (X100) keskin köşeli mekanik olarak öğütülmüş toz morfolojisi görünümü sergilese de; büyültme miktarı artırıldığında tozlarda aglomerasyonlaşmanın mevcut olduğu tespit edilmiştir. SEM analizinde X30.000 büyültmenin üzerinde görüntü netliğinin bozulması ve toz tane boyutunun tespit edilememesi nedeniyle mikroyapı incelemelerine FESEM analizi ile devam edilmiştir. Üretilen alümina esaslı aerojel tozunun FESEM görüntüleri ve EDS analizi Şekil 6'da verilmiştir. Şekilde FESEM ile mikroyapı incelemelerinde X300.000 büyültmelere kadar çıkılabilmektedir. Görüntü kalitesinin bozulması üzerine daha yüksek büyültmelere çıkılamamıştır. X300.000 büyültmedeki görüntü incelemesinde toz tane boyutunun nanometre mertebelerinde olduğu ve üretilen tozun mezo gözenekli malzeme grup aralığında olduğu belirtilebilir (Ishizaki, 2013). Şekil 6. f'de hazırlanan aerojel tozunun FESEM-EDS analizinde yapının yüksek oranda Al ve O elementlerinden oluştuğu görülmektedir. Ayrıca %9.12 mertebelerinde tespit edilen Cl elementi hem hammaddeden hem de jelleşme aşamasında kullanılan HCl'in yıkama işlemleri ile çözeltiden uzaklaştırılamamasından kaynaklandığı düşünülmektedir.





Element	ağ. %
O	45.30
Na	1.62
Al	43.96
Cl	9.12



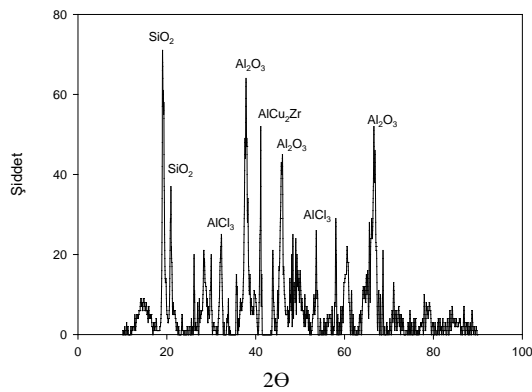
(e)

(f)

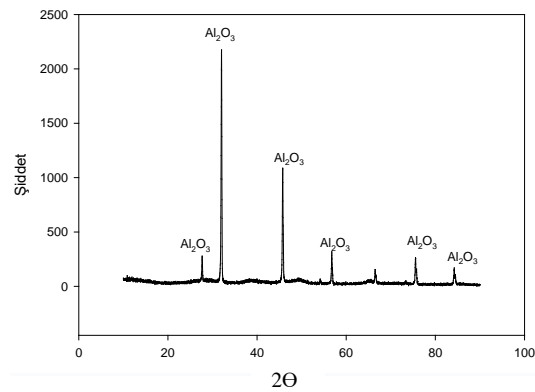
Şekil 6. Üretilen alümina esaslı aerojel tozunun a. X2000, b. X50.000, c. X100.000, d. X200.000 ve e. X300.000 büyütmelemlerdeki FESEM görüntüleri ve f. genel EDS analizi

Faz Analiz Sonuçları

Şekil 7 a.'da ikincil alüminyum cürufu kaynar su ile 4 defa yıkanarak flaks olarak kullanılan tuzlarından arındırılması sağlandıktan sonra kurutulmuş, deneysel çalışmalarda ve analizlerde bu toz alümina kaynağı olarak kullanılmıştır. Yıkama işlemlerine rağmen faz yapısında alüminyum klorürlerin varlığı görülmektedir. Atık malzemede silika, alümina fazlarının yanı sıra tuz ihtiva eden fazlara da rastlanmıştır. Şekil 7.b'de ise üretilen aerojel tozunun Al_2O_3 pikleri ile az da olsa amorf yapıya sahip olduğu görülmektedir.



(a)



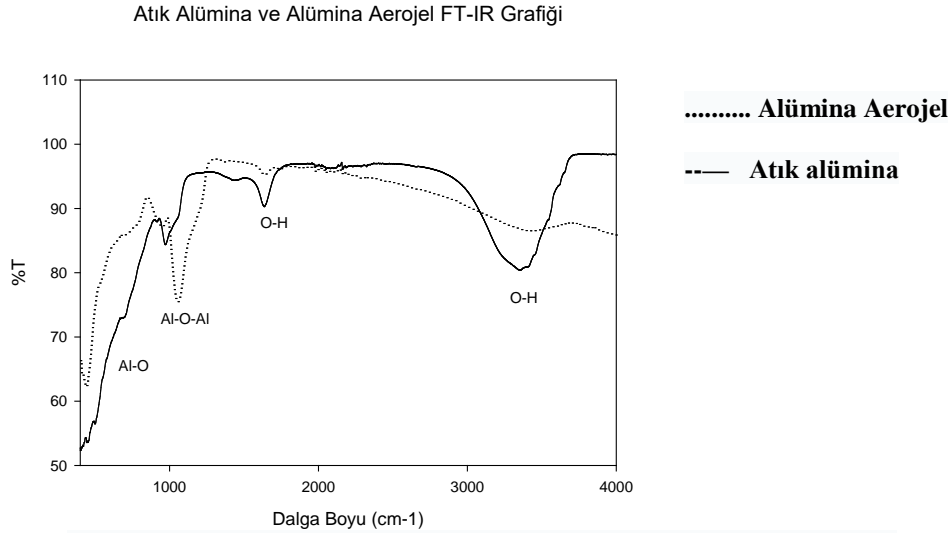
(b)

Şekil 7 a. Atık alümina ve b. üretilen alümina esaslı aerojel tozlarına ait XRD analizleri

FT-IR Analizi

Numunelerin FT-IR spektrofotometresi ile spektrumları alınmış olup, elde edilen spektrumlardan her bir farklı koşul için hazırlanan numunelerde yapısal değişimin olup olmadığı, fonksiyonel grupların verdiği pikler yardımıyla belirlenmiştir. Şekil 8'de üretilen alümina esaslı aerojel tozunun ve atık alümina tozunun FT-IR analizi

verilmiştir. Bu grafikte yapıda kalan nem O-H bağları olarak görülür. Atık alümina tozunda 3000 ile 4000 cm^{-1} dalga boyunda belirgin pik veren O-H bağları, üretilen alümina esaslı arojel tozunda yeterli kurutmadan dolayı azaldığı gözlenmiştir. Bao ve arkadaşları şeyl külünden hidrofobik alümina arojel ürettikleri çalışmalarında Al-O-Al bağlarını 1045 cm^{-1} dalga boyunda, Al-O bağlarını 585 cm^{-1} dalga boyunda tespit etmişlerdir (Bao, 2013).



Yoğunluk Testi

Kurutulmuş ve toz haline getirilmiş arojellerin yoğunlukları, doğrudan kütlenin hacme oranına göre Eşitlik 1 yardımıyla hesaplanmıştır. Aerojellerin yoğunluk tespiti için gerçekleştirilen iki ölçümün aritmetik ortalaması alınarak sonuçlar verilmiştir.

$$\rho = m/v$$

Burada; ρ , m ve v alümina esaslı arojelin sırasıyla yoğunluğu (g/cm^3), kütlesi (g) ve hacmidir (cm^3).

$$\rho = 5,106/12,5 = 0,40848 \text{ g/cm}^3$$

Genel Sonuçlar

Mevcut çalışmada ikincil Alüminyum üretiminde oluşan cüruf alümina esaslı arojel tozu üretiminde hammadde olarak kullanılmıştır. Sol-jel yöntemi ile atıktan mezo gözenekli yapıya sahip alümina tozu üretilmiştir. Faz analizinde atık malzeme silika, alümina ve tuzlardan oluşan karmaşık faz yapısına sahip iken; üretilen tozda alümina fazı ile birlikte az da olsa amorflaşma belirtileri faz analizindeki titreşimlerden anlaşılmaktadır. FT-IR analizinde sol-jel yöntemi ile üretilen tozda Al-O bağlarının başarı ile oluşturulduğu (1056 cm^{-1}) tespit edilmiştir.

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BASİT BİR UYGULAMA ÜZERİNDE HTML, PHP, JAVASCRIPT, ASP. NET DİLLERİNİN VE ACCESS, MYSQL, MONGO, ORACLE, MICROSOFT SQL VERİTABANLARININ KARŞILAŞTIRILMASI

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Özet

İnternet programlamada, genelde bir dil ve bir veritabanı ile çalışılmakta, diğer dil ve veritabanları ile çalışma istenmemektedir. Bu dillerin, basit bir uygulama üzerinde çalışmaları karşılaştırmalı olarak incelenmektedir. Ayrıca, basit bir php, asp, uygulamaları üzerinde; Access, Mysql, Mongo, Oracle, Microsoft sql veritabanlarının bağlantı işlemleri yine karşılaştırmalı olarak incelenmiştir.

Anahtar kelimeler : İnternet programlama, asp.net, veritabanı, php

Giriş

İnternet programlamada kullandığımız diller, birbirine çok benzer ve web sayfasının üzerinde bulunduğu server işletim sistemi veya elimizde bulunan dil lisansına göre tercih edebiliriz. javascript veya php kodlamasını html ile aynı dosya içerisinde, Visual Studio .net Aspx'de ise, uzantısı cs olan başka bir dosya içerisinde yaparız. Ayrıca Php programlama dil lisansı ile Mysql veritabanı ücretsizdir.

Bir Web Uygulama Üzerinde Php, Aspx, Javascript Kodlarının Karşılaştırılması

Php, web sayfası isteminde bulunan kullanıcılara, istenilen dosya içerisinde Php ile ilgili satırları işleyerek dosya içeriğini kullanıcının Browser 'ının anlayabileceği html formatında sunan bir programlama dilidir diyebiliriz. Bu genel anlamda Server-Side (Server-Tarafı) Dil olarak anılır. ASP, ASPX ile performans ve fiyat açısından açık farkları vardır. Fiyat konusu haricinde (Php ücretsiz dağıtılmaktadır) hız faktörüdür. Php 'nin açık kaynak kodlu oluşu, hataların veya yeni özelliklerin güncellenmesi gibi olaylarda büyük avantajlar sağlamaktadır. (Otaner, 2002:13)

Aspx ise, (Active Server Pages/Aktif Sunucu Sayfaları) kullanıcı tarafına etkileşimli, dinamik Web sayfaları göndermek için kullanılır. Aspx, Web programcılarının html, scripting ve kullanıcıdan bağımsız veritabanı uygulamalarını özgürce kullanma fırsatı verir. Programlama ortamının özgür olmasının sebebi tüm derleme işleminin sunucu tarafında bitmesi ve kullanıcının sadece sonuçta oluşan html sayfalarını görmesidir. Derlemeden sonra yeni bir içeriği görünmez dll dosyası oluşur. Web sayfası çalışırken açık kodlu dosya değil, oluşan dll dosyası kullanılır. Yapılan kodlamalar gizlenmiş olur. (Şentürk, 2009:19)

Uzantısı php veya aspx veya htm olan web sayfası içerisinde javascript ile kodlama yapabiliriz. Bu yapılan kodlamalar client pc ,notebook browser üzerinden veya web serverda html dosyalar üzerinde aynen görebiliriz. Veritabanı ile bağlantılı dinamik çalışmalarda php veya aspx'de daha iyi uygulamalar yapabiliriz.

a) Standart html ile , ekranda 5 kez paris yazılması

“Kaç satır yazılması gerekli ise, satır satır yazılır. İster web server üzerinde, isterse client pc,notebook browserlar üzerinde, html kodları aynen görülür”

```
<html>
<head>
<title>ISTEC 2018</title>
</head>

<body bgcolor=lightyellow>

<font face="monotype corsiva" size=5 color=green>
International Science and Technology Conference </font><br><br>
<br><br>
```

```

<font color=blue face=arial size=4>Paris </font> 1 <br>
<font color=blue face=arial size=4>Paris </font> 2 <br>
<font color=blue face=arial size=4>Paris </font> 3 <br>
<font color=blue face=arial size=4>Paris </font> 4 <br>
<font color=blue face=arial size=4>Paris </font> 5 <br>
  
```

```

</body>
</html> ( Öcal,2000:5)
  
```

b) Javascript ile , ekranda 5 kez paris yazılması

“Javascript bölüm içerisinde bir döngü kullanarak, javascript kodlama ile istenildiği kadar satır yazdırabilir. İster web server üzerinde, isterse client pc,notebook gib browserlar üzerinden, javascript kodları aynen görülür. ”

```

<script language="javascript">
for(kk=1;kk<=5;++kk)
{
document.writeln(
"<font face=arial color=blue size=4> Paris </font> " + kk + "<br>")
}
</script>
  
```

c) Php ile , ekranda 5 kez paris yazılması

“ Php bölüm içerisinde bir döngü kullanarak, istenildiği kadar satır yazdırılabilir. Web server üzerinde , php kodları aynen görebilir. Client pc,notebook gibi browserlar üzerinden ise, php kodları değil, html koda dönüşerek client’a gönderilen , html kodları görebiliriz. Microsoft İşletim sistemlerinde çalışan IIS gibi web serverlarda çalışmasına rağmen , unix veya linux gibi işletim sistemlerinde daha çok tercih edilir. ”

```

<?php
for ( $a=1;$a<=5;$a++)
{
print "<font face=arial color=blue size=4>Paris </font>" . $a. "<br>";
}
?>
  
```

d) aspx ile , ekranda 5 kez paris yazılması

“Uzantısı cs olan dosya içerisinde bir döngü kullanarak, aspx kodlama ile istenildiği kadar satır yazdırabilir. Aspx dosya içerisinde kullanılan codebehind parametresi ile, iki dosya arasında bağlantı sağlanmış olur. Aspx dosya, çalışma esnasında uzantısı cs olan açık kodlu dosya kullanılmaz , derleme esnasında üretilmiş olan, dll dosyası kullanılır. Cs kodlu dosyayı web servera kopyalama yapmayız. Bu durum ile, web serverda bulunan aspx programlama kodlarının gözükmemesini sağlamış oluruz. Client pc,notebook gibi browserlar üzerinde ise aspx kod olarak değil, html koda dönüşmüş olarak görülür. Kısaca yaptığımız kodlamalar hem client hemde web üzerinde görülmesini engellemiş oluruz. Aspx web uygulamaları, Unix veya Linux gibi işletim sistemlerinde değil, Microsoft işletim sistemlerinde kullanılır. ”

Dosya adı :deniz.aspx

```

<%@ Page Language="C#" AutoEventWireup="true" Debug="true" CodeBehind="deniz.aspx.cs"
Inherits="pamuk.islem" %>
<html>
<head>
<title>ISTEC 2018</title>
</head>
  
```

```
<body bgcolor=lightyellow>
<font face="monotype corsiva" size=5 color=green>
International Science and Technology Conference </font><br><br>

<br><br>

</body>

</html>
```

Dosya adi: deniz.aspx.cs

```
using System;
using System.Collections;
using System.Configuration;
using System.Data;
using System.Linq;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.HtmlControls;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Xml.Linq;
namespace pamuk
{
    public partial class islem : System.Web.UI.Page
    {
        protected void Page_Load(object sender, EventArgs e)
        {
            for (int k=1 ; k<=5 ; k++)
            {
                Response.Write("<font color=blue size=5 > Paris </font> "+k+"<br>");
            }
        }
    }
} ( MacDonald , 2006 )
```

Mongo, Oracle, Microsoft Sql, Mysql, Access Veritabanlarının Web Programlarında Kullanılması İle İlgili Küçük Uygulamalar

ASP.NET ile Microsoft şirketi tarafından geliştirilen ücretli bir platformdur. ASP.NET ortamında geliştirme genelde, Microsoft üretimi olan Microsoft SQL ve Access veritabanları kullanılır. Çünkü birçok hazır kütüphane ile kısa sürede kod geliştirebiliriz. PHP ile ağırlıklı olarak MySQL veritabanı kullanılıyor, çünkü MySQL ile PHP arasında iletişimi hızlandıran birçok fonksiyon vardır. PHP'yi büyük yazılım şirketleri tercih etmiştir. Örneğin FaceBook tamamen PHP ve MySQL ile yazılmıştır. Türkiye'deki bankaların web siteleri ise, ağırlıklı olarak ASP.net, C#, Oracle teknolojileri kullanılarak geliştirilmiştir. (Taş, 2014:<http://www.oguzhantas.com/web-tasarim/9-hangisi-acaba-php-mi-aspnet-mi.html>)

a) Php'de mysql veritabanı kullanılması ile ilgili, küçük bir uygulama

```
<?php
if($_SERVER['REQUEST_METHOD'] == "POST")
{
    $adtext=$_POST['ad'];
    $sifretext=$_POST['sifre'];
```



```

$sunucu = "www.abc.com.tr/gen";
$kullanici = "volkan";
$parola = "Ab32K156";
$veritabani = "egitim";

$baglanti = mysql_connect($sunucu, $kullanici, $parola);

if(!$baglanti) die("Sunucuyla bağlantıda sorun var");

mysql_select_db($veritabani, $baglanti) or die ("veritabanında sorun var");

$bir="SELECT * FROM kullanıcı WHERE ad='$adtext' and sifre='$sifretext'";

$oku=mysql_query($bir) or die(mysql_error());

$say=mysql_num_rows($oku);
if($say==1)
{
    session_start();
    $_SESSION['ad'] = $adtext;
    $_SESSION['sifre'] =$sifretext;
    header("Refresh: 2; url=per2.php");
}
else
{
    echo "<br> kullanıcı adı ve şifreyi <font face=arial size=5 color=red> Tekrar </font>";
    print (" giriniz"); }
}
?>

```

b) Php 'de mongo veritabanı kullanılması ile ilgili, küçük bir uygulama

```

<?php
if($_SERVER['REQUEST_METHOD'] == "POST")
{
    $adtext=$_POST['ad'];
    $sifretext=$_POST['sifre'];

    $sunucu= ' www.abc.com.tr/gen';
    $veritabani = 'egitim'; // veritabanı
    $kullanici = 'volkan';
    $parola = ' Ab32K156';

    // Bağlantı kullanıcı isimsiz
    //$m = new Mongo("mongodb://$sunucu") ;

    // Bağlantı kullanıcı isim ile
    $m = new Mongo("mongodb://{ $kullanici }:{ $parola }@{ $sunucu }/{ $veritabani }");

    $db = $m->$veritabani;

    // tablo ismi
    $collection = $db->kullanici;

    $qry = array("ad" => "$adtext", "sifre" => "$sifretext");

    $say = $collection->find($qry)->count();

    if($say==1)

```

```

    {
        session_start();
        $_SESSION['ad'] = $adtext;
        $_SESSION['sifre'] = $sifretext;
        header("Refresh: 2; url=per2.php");
    }
    else
    {
        echo "<br> kullanıcı adı ve şifreyi <font face=arial size=5 color=red> Tekrar </font>";
        print (" giriniz"); }
    }
?>

```

c) Aspx'de access veritabanı kullanılması ile ilgili, küçük bir uygulama

```

using System;
using System.Collections;
using System.Configuration;
using System.Data;
using System.Linq;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.HtmlControls;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Xml.Linq;
using System.Data.OleDb;

namespace pamuk2
{
    public partial class islem2 : System.Web.UI.Page
    {

        public System.Web.UI.WebControls.TextBox TextBox1, TextBox2;

        protected void Page_Load(object sender, EventArgs e)
        {

            string ad2, sifre2;

            ad2 = (string)(Session["ad"]);
            sifre2 = (string)(Session["sifre"]);

            OleDbConnection con = new OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0; Data Source = "+
                Server.MapPath("~/egitim.accdb")+" ");
            con.Open();

            string thesql= "select ad,sifre from kullanici where ad='"+ad2+"' and sifre='"+sifre2+"'";
            OleDbCommand cmd = new OleDbCommand(thesql, con);

            OleDbDataReader reader = cmd.ExecuteReader();

            if (!reader.Read())
            {
                Response.Redirect("bitis.htm");
            }

```

```

reader.Close();
con.Close();

    }
  }
}

```

d) aspx ile Microsoft sql veritabanı kullanılması ile ilgili, küçük bir uygulama

```

using System;
using System.Collections;
using System.Configuration;
using System.Data;
using System.Linq;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.HtmlControls;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Xml.Linq;
using System.Data.SqlClient;

namespace pamuk
{
    public partial class islem : System.Web.UI.Page
    {
        public System.Web.UI.WebControls.Label Label3;
        public System.Web.UI.WebControls.TextBox TextBox1, TextBox2;

        protected void Page_Load(object sender, EventArgs e)
        {
            Label3.Text = null;
        }

        protected void Button1_Click(object sender, EventArgs e)
        {
            string connectionString = "Data Source=VMERFXA\\SQLEXPRESS;User ID=volkan; Password=
            Ab32K156; Initial Catalog=egitim";

            SqlConnection con = new SqlConnection(connectionString);
            con.Open();

            string thesql= "select ad,sifre from kullanici where ad='"+TextBox1.Text+"' and
            sifre='"+TextBox2.Text+"'";

            SqlCommand cmd = new SqlCommand(thesql, con);
            SqlDataReader reader = cmd.ExecuteReader();

            if (reader.Read())
            {
                Session["ad"] = TextBox1.Text;
                Session["sifre"] = TextBox2.Text;
                Response.Redirect("yeni.aspx");
            }
        }
    }
}

```

```

        else
        {
            Label3.Text = "Sifre yanlış....";
        }
        reader.Close();
        con.Close();
    }
}

```

e) aspx'de Oracle veritabanı kullanılması ile ilgili, küçük bir uygulama

```

using System;
using System.Collections;
using System.Configuration;
using System.Data;
using System.Linq;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.HtmlControls;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Xml.Linq;
using System.Data.OleDb;

namespace pamuk
{
    public partial class islem : System.Web.UI.Page
    {
        public System.Web.UI.WebControls.Label Label3;
        public System.Web.UI.WebControls.TextBox TextBox1, TextBox2;

        protected void Page_Load(object sender, EventArgs e)
        {
            Label3.Text = null;
        }

        protected void Button1_Click(object sender, EventArgs e)
        {
            string connectionString = "Provider=MSDAORA;Data Source= www.abc.com.tr/gen;User
                                     ID=volkan;password= Ab32K156";

            OleDbConnection con = new OleDbConnection(connectionString);
            con.Open();

            string thesql= "select ad,sifre from kullanıcı where ad='"+TextBox1.Text+"' and
                           sifre='"+TextBox2.Text+"'";

            OleDbCommand cmd = new OleDbCommand(thesql, con);
            OleDbDataReader reader = cmd.ExecuteReader();

            if (reader.Read())
            {
                Session["ad"] = TextBox1.Text;
                Session["sifre"] = TextBox2.Text;
                Response.Redirect("oyeni.aspx");
            }
        }
    }
}

```

```
else
{
    Label3.Text = "Sifre yanlış....";
}
reader.Close();
con.Close();
}
} ( Demirkol, 2006:351 )
```

Sonuç

Sadece html ve içerisinde kullandığımız javascript kodlar web Server veya Pc,notebook gibi client browserlarda aynı görüntülenebilir. Yani kodların gizliliği yoktur. Php ile kodlamada kodların yorumlanması Web server’da gerçekleşir ve html kodlara çevrim yapılarak, client’lar sayfaya girdiği zaman gönderilir. Kısaca web server üzerinde kodlar görüntülenebilir, clientlarda ise php kodlar görüntülenemez. ASPX kodlamada ise, derleme yapıldıktan sonra uzantısı cs olan kod dosyasından uzantısı dll olan dosya üretilir. Aspx kodlar, web server üzerinde veya client browserlar üzerinde görüntülenemez yani kod güvenliği vardır. Client browserlarda ise, php ‘de olduğu gibi html’e dönüşmüş kodlar görüntülenir.

Web sayfalarında, html kodların yanında javascript,php,aspx kodlama kullanabiliriz. Ayrıntılı incelediğimiz zaman bunlar arasında kodlamada büyük farklılık yoktur. Birisi ile kodlama yapmayı bildikten sonra, diğerleri ile çok rahat kodlama yapabiliriz. Unix ,linux işletim sistemli web server’larda php, javascript, Microsoft işletim sistemli web serverlarda ise, javascript,asp,aspx kullanırız.

Aynı şekilde veritabanları kodlamasında birbirine çok benzemektedir. Microsoft işletim sistemli server’larda microsoft SQL, Access, Oracle , Unix, linux İşletim sistemli server’larda ise, oracle, Mysql, Mongo veritabanını tercih ederiz. Ayrıca mysql veritabanının ücretsiz olması veya diğer veritabanlarının ücretine göre kullanım tercihimiz değişir.

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BIOCHEMICAL PROPERTIES OF POLYPHENOL OXIDASE FROM *DAUCUS CAROTA*

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Abstract

Polyphenol oxidase (PPO) is a very important enzyme that is responsible for the enzymatic browning of vegetables and fruits, which is undesired process and need to be prevented in food technology. In this study, PPO from *Daucus carota* pell (carrot) was extracted and some of its biochemical properties were investigated. The optimum temperature and pH of PPO were found to be 40 °C and 8.0, respectively. The Lineweaver – Burk plot analysis of the PPO was carried out and the Km and Vmax values were determined for the substrate catechol. We also found that some inhibitors such as SDS and sodium azide inhibit the enzyme activity. This is the first study on characterisation of PPO from *Daucus carota* bark that may provide new insight into how to overcome the enzymatic browning.

Keywords: Polyphenol oxidase, *Daucus carota*, inhibition, characterisation.

1.Introduction

Polyphenol oxidases (PPO; EC 1.14.18.1) belong to a set of copper containing metalloenzymes that are members of oxidoreductases, which catalyze the oxidation of a wide range of phenolic compounds by utilizing molecular oxygen (Queiroz, et al. 2008).

Polyphenol oxidases are widely spread in nature. They can be found in almost all living organisms including animals, plants, bacteria and fungi. PPO is important because it is responsible for skin, eye, inner ear and hair melanization, as well as browning in fruits and vegetables (Marín-Zamora et al., 2005). Particularly, when a plant gets a bruise, cut or damage, the enzyme leads to the oxidation of some phenolic compounds to form a polymer structure, resulting in protection of the plant against insects or microorganisms (VanGelder, et al., 1997). This process causing enzymatic browning of fruits and vegetables is undesirable in food technology as it results in loss of quality. In plant tissues, the browning pigments lead to organoleptic and nutritional modifications, thus depreciating the quality of the food product (Friedman, 1996; Sanchez-Ferrer et al., 1995).

Carrots (*Daucus carota*), one of the important root vegetables, are known for their nutrient contents β -carotene besides appreciable amount of vitamins and minerals (Walde et al. 1992). Phenolics in carrots are present throughout the roots but are highly concentrated in the periderm tissue (Mercier et al. 1994) Therefore, the higher level of phenolics and antioxidant properties in carrot peel treated as the waste in the processing industry could be considered for value-added utilization (Oviasogie et al.2009).

The inhibition of PPO activity and thus inhibition of browning is a big challenge for fruit and vegetable industry (Mayer, 2006). The purification and characterisation of this enzyme in many plants would lead to biotechnological control of its activity.

PPO characteristics have been studied in a wide variety of plants such as apple (Aydin et al., 2015), banana (Ünal, 2007), potato (Lourenço et al., 1992), broccoli (Gawlik-Dziki et al., 2007), ispir sugar bean (Sakiroglu et al., 2013), and Ataulfo mango (Cheema & Sommerhalter, 2015).

This is the first report on the purification and characterisation of PPO from *Daucus carota* in order to understand how the enzymatic browning can be prevented in food technology. In the present study, PPO from *Daucus carota* was extracted and the kinetic parameters for catechol substrate was determined.

2. Material And Methods

2.1. Materials and reagents

The *Daucus carota* used in this study was purchased from a local market in Diyarbakir City, Turkey and frozen at -25 °C until used. Catechol was purchased from Merck (Darmstadt, Germany) Co. All chemicals used in this study were of analytical grade.

2.2. Preparation and extraction of PPO from *Daucus carota*

Five grams of *Daucus carota* bark were homogenized in the extraction solution (100 ml of 0.1 M phosphate buffer containing 4% PEG at pH 6.5 and 10 mM ascorbic acid) by using a blender for 5 min. The crude extract samples were centrifuged at 15000 g for 20 min at 4°C. The homogenate was then filtered.

2.3. Enzyme activity

PPO activity was determined using a spectrophotometric method based on the initial rate of increase in absorbance at 420 nm. Enzyme activity was assayed in 3 ml of reaction mixture consisting of 0.1 ml substrate (0.1 M catechol) and 0.1 ml enzyme preparation in 0.1 M phosphate buffer (pH 6.5). PPO activity was determined by measuring the absorbance at 420 nm using a spectrometer. The blank consisted of 2.9 ml buffer and 0.1 ml substrate. PPO activity was assayed in triplicate and one enzyme unit was defined as the amount of enzyme that produces a rise of 0.001 absorbance in one minute at 420 nm.

2.4. Effect of pH and temperature on PPO activity

The effect of pH on PPO activity was determined using 0.1 mL of enzyme preparation, 0.1 mL of 0.1 M catechol and finally topped-up to 3 mL with 0.1 M sodium acetate buffer (pH 2-5) or 0.1 M sodium phosphate buffer (pH 6.0-9.0). Enzyme activity was measured spectrophotometrically in this buffering range according to the procedure described for the PPO activity assay. The optimum pH corresponding to the highest PPO activity was used for the study in order to determine the effect of inhibitors and temperature on enzyme activity. PPO activity was determined at different reaction temperatures in the range of 20-70°C using catechol as substrate. Analyses were performed in triplicate under the standard mixing conditions.

2.5. The Effect of Buffer Concentration

The effect of buffer concentration on the PPO enzyme was studied using 0.1-0.4 M concentrations of phosphate buffer using catechol as substrate at an optimum pH.

2.6. Enzyme kinetics and substrate specificity

Michaelis-Menten constant (K_m) and maximum velocity (V_{max}) values of PPO were calculated using the substrates catechol (1-10 mM), under the optimized pH and temperature conditions. K_m and V_{max} values of PPO for substrate were obtained from a plot of $1/V$ versus $1/[S]$ by the method of Lineweaver and Burk (1934). Measurements were carried out in triplicate.

2.7. Effects of inhibitors

The effects of several inhibitors (EDTA, sodium azide, SDS) on PPO activity were studied. PPO activities were measured at (0.5 mM) inhibitor concentrations with substrate concentration of 3.3 mM.

3. Results And Discussion

3.1. Activity of Enzyme

The activity of crude enzyme of *Daucus carota* was 40 units/ml. Sanni (2016) found result with two species of African mango obtaining the activity of crude enzyme values of 86.4 and 100 units/ml.

3.2. Effect of pH and temperature

As shown in Figures 1 and 2, optimum pH and temperature values were found to be pH 8.0 and 40 °C, respectively using the catechol as substrate. The previous studies also reported that optimum pH values were 7.0 for parsley (Lin et al., 2016), pH 5.5 for ispir sugar bean (Sakiroglu et al., 2013) using catechol as a substrate. It had been previously shown that different plant types exhibited different and similar optimum temperatures, such as 40 °C for artichoke (Doğan et al., 2005), and for corn tassel (Gul Guven et al., 2015) using catechol as the substrate.

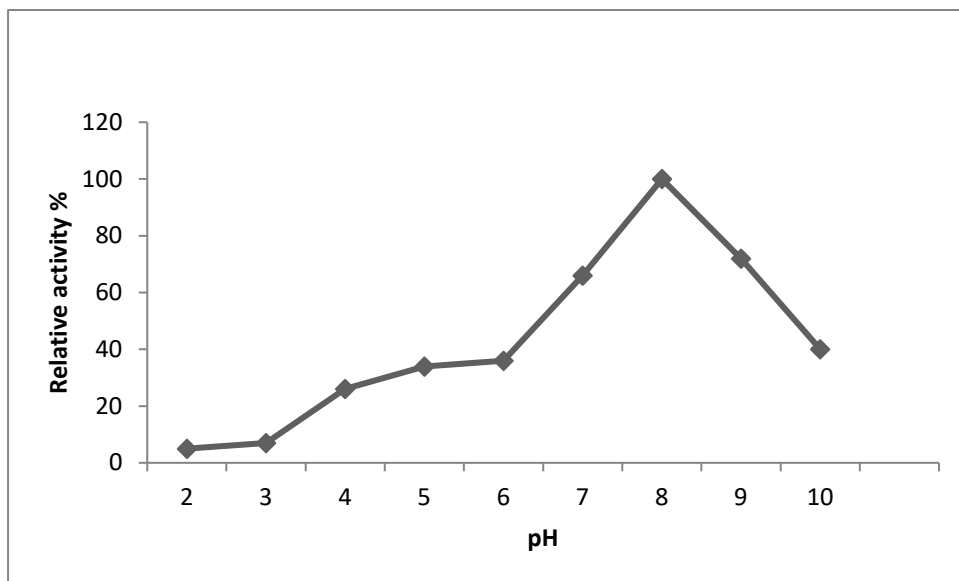


Figure 1. Effect of pH on PPO activity

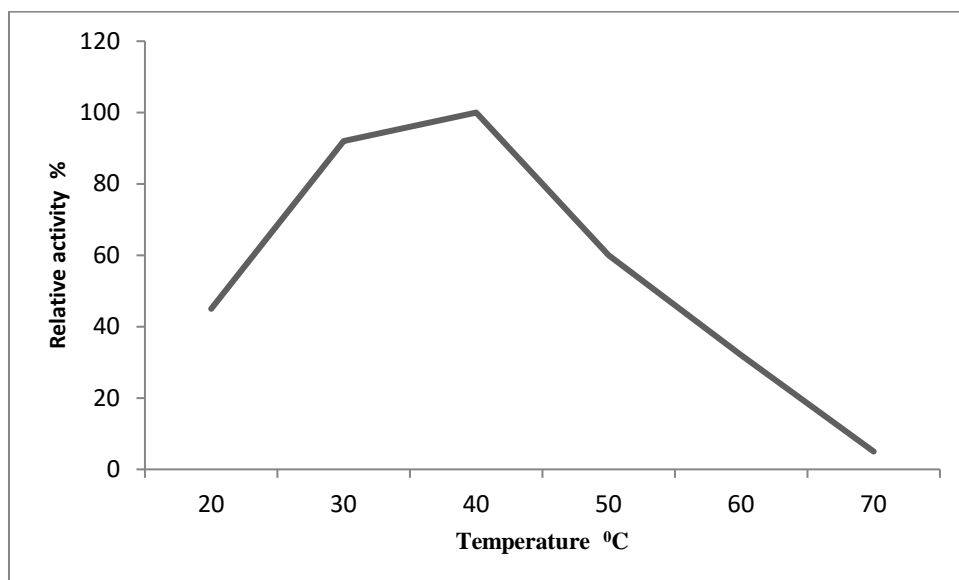


Figure 2. Effect of temperature on PPO activity

3.3. Determination of Ionic Strength

The effect of ionic strength on the PPO enzyme was studied using 0.1-0.4 M concentrations of phosphate buffer using catechol as substrate at an optimum pH. PPO enzyme at a buffer concentration 0.1 M was determined.

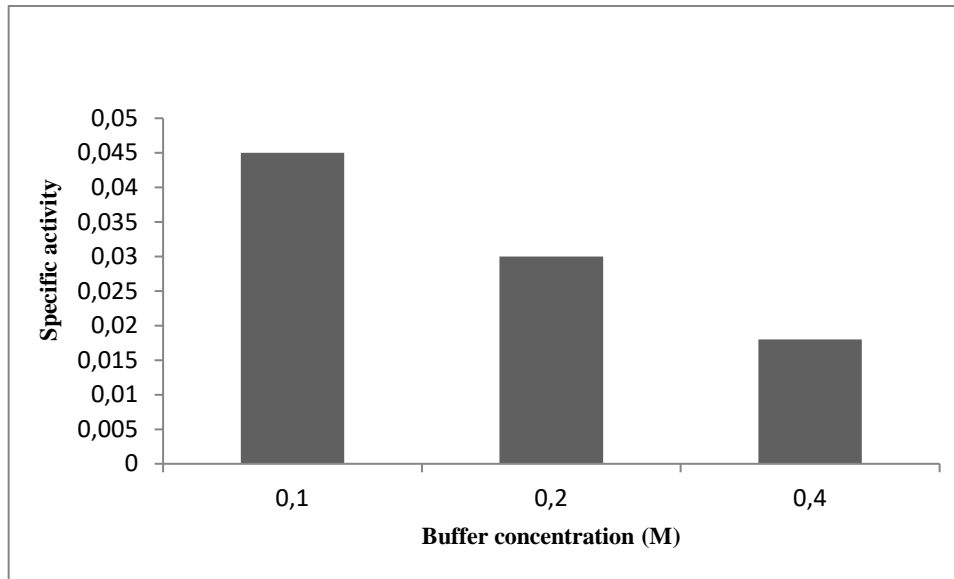


Figure 3: The effect of buffer concentration

3.4. Kinetic characteristics of PPO

The variation in the *Daucus carota* PPO activity was determined as a function of substrate (catechol) concentration. For the determination of Michaelis-Menten constant (K_m) and maximum velocity (V_{max}) values of the enzyme, PPO activities were measured using the concentrations of catechol (1-10 mM) as substrates under optimized pH and temperature conditions. A plot of $1/V$ versus $1/[S]$ was drawn by the method of Lineweaver and Burk (1934) to calculate K_m and V_{max} values of purslane PPO for each substrate. Substrate specificity (V_{max}/K_m) was also calculated by using the data obtained on the Lineweaver-Burk plot. The K_m and V_{max} values obtained from the plot analysis of PPO were found as 21 mM and 1701 abs/min. for catechol.

There have been many studies reported on the kinetics of PPO in different plant species, using catechol as substrate. The K_m value is a measure of the affinity of the enzyme for the substrate. A smaller K_m value means higher affinity of the enzyme with the substrate and vice versa. K_m values were found to vary in Hemşin apple (Aydin et al., 2015), mamey (Palma- Orozco et al., 2014) and Chinese Toon (Wang et al., 2013) as 6.8 mM, 44 mM and 10.059 mM, respectively.

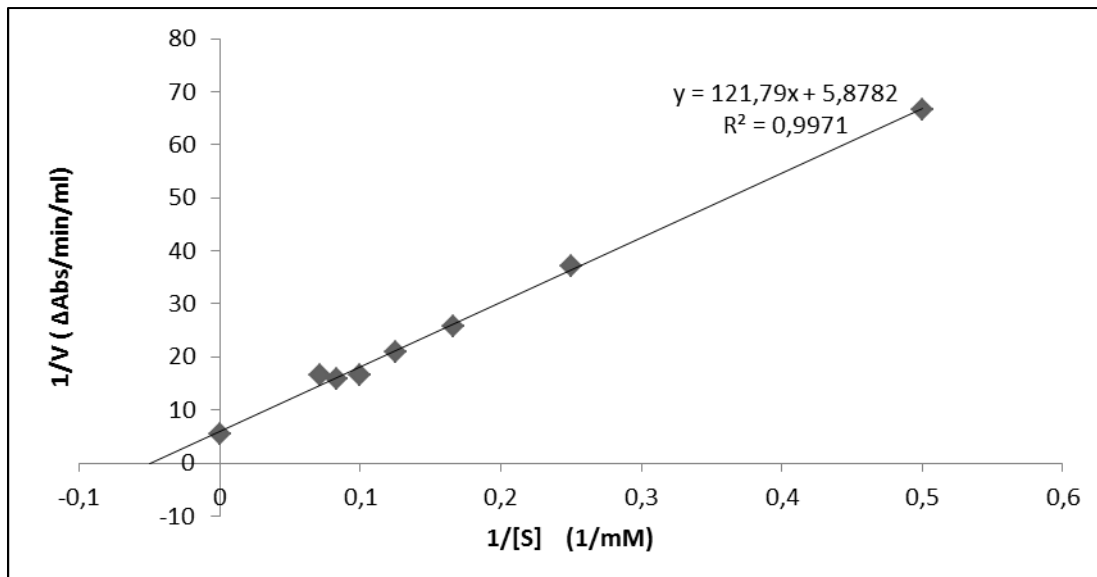


Figure 4: Lineweaver-Burk plots for PPO activity with catechol as substrate

3.5. Effect of inhibitor

The present study is the first report on the inhibition of PPO activity in *Daucus carota*. The effects of several inhibitors (SDS, EDTA, sodium azide) on PPO activities were measured at 0.5 mM inhibitor concentration with 4 mM concentration of catechol.

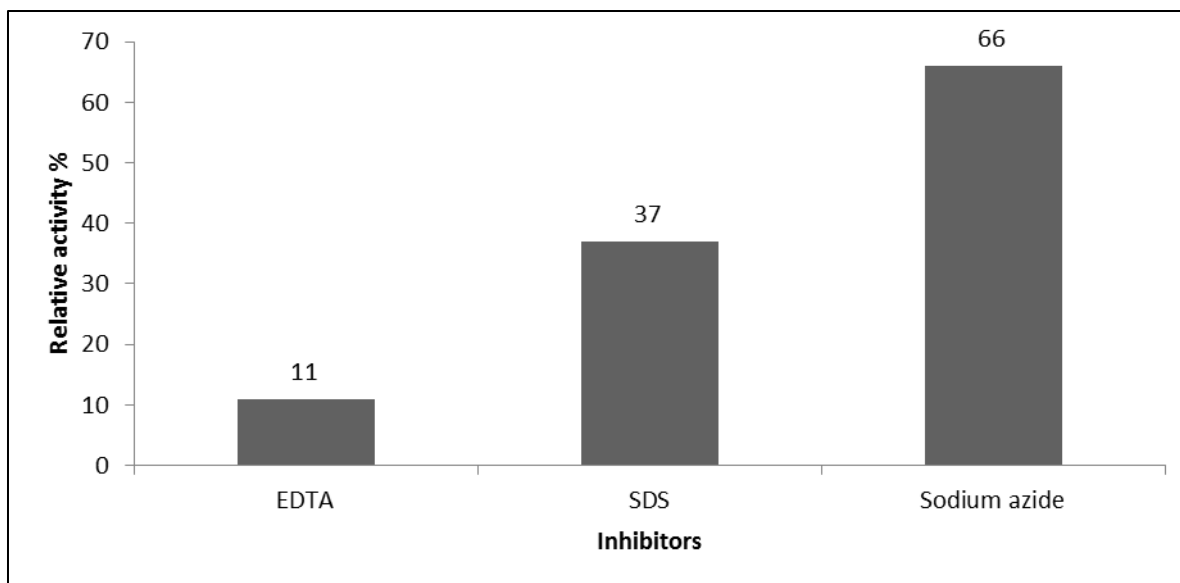


Figure 5: The inhibition of PPO

Conclusions

In conclusion, PPO is a very important enzyme that is responsible for the enzymatic browning of vegetables and fruits, which is undesired process and need to be prevented in food technology. This work reports the extraction and characterization of PPO from *Daucus carota* the first time. The pH and temperature optima were found to be 8.0 and 40 °C for catechol. In this work, sodium azide, SDS and EDTA were found to inhibit the enzyme activity by 66 %, 37 % and 11 %, respectively. A buffer concentration of 0.1 M at was determined for PPO activity. The Km and Vmax values obtained from the plot analysis of PPO were found as 21 mM and 1701 abs/min. for catechol, respectively.

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BIOLOGICAL ACTIVITIES OF TWIN-FLOWERED DAPHNE

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Abstract: Daphne genus belongs to Thymelaeaceae family which is comprised of approximately 500 plant species. Daphne species have been preferred in traditional public health for different purposes according to ethno-pharmacological studies. In this study, we aimed to analyze antimicrobial and DNA protection activities of twin-flowered daphne (*Daphne pontica*) extracts. Leaf, root and stem extracts of twin-flowered daphne were dissolved in methanol. Antimicrobial activity tests were performed by micro-well dilution assay. Minimal inhibition concentration (MIC) and minimal bactericidal concentration (MBC) values were determined for 12 different test bacteria. pUC19 DNA was used for DNA protection activity test. According to the results, methanol extracts of leaf and stem samples belonging to twin-flowered daphne were effective on all studied test bacteria for low concentrations (125 µg/ml). However, 125 µg/ml concentration of root extracts were inhibited only *Staphylococcus aureus* ATCC 25923, *Proteus vulgaris* and *Enterobacter aerogenes* ATCC 13048 species. In addition, there were no DNA protection activity for leaf, root or stem extracts of twin-flowered daphne. This study provides new insights into the antimicrobial activity of twin-flowered daphne extracts and their usage as an antimicrobial agent.

Keywords: *Daphne pontica*, Antimicrobial activity, DNA protection, Methanol extract

Acknowledgement: This work was supported by the Kastamonu University, Scientific Research Project Coordinatorship with the project code of KU-BAP01/2018-6.

BİR ÜNİVERSİTE KAMPÜSÜNDEKİ UÇUCU ORGANİK BİLEŞİKLERİN SEVİYELERİ

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Öz: Bu çalışmada, Pasifik Örnekleme yöntemiyle Gebze Teknik Üniversitesi Çevre Mühendisliği Bölümü'nde Uçucu Organik Bileşikler (VOC) toplanmış ve toplanan örnekler Gaz Kromatografisi Alev İyonizasyon Dedektörü (GC-FID) ile analiz edilmiştir. Çalışma kapsamında 2 derslik, 4 dış mekan, 3 ofis, 4 koridor ve 8 laboratuvar olmak üzere toplam 21 noktaya pasif örnekleme tüpleri yerleştirilmiştir. Çalışma sırasında iki kampanya gerçekleştirilmiştir. İlk (yani kış) kampanya, 27 Şubat - 3 Mart 2016 tarihleri arasında ve ikinci (yani yaz) kampanyası ise, 8 Mayıs - 12 Mayıs 2016 tarihleri arasında gerçekleştirilmiştir. Ölçülen kirletici konsantrasyonları, yaz döneminde $0.10 \mu\text{g m}^{-3}$ (izopropilbenzen) ile $2182 \mu\text{g m}^{-3}$ (heksan) arasında, kış döneminde ise $0.10 \mu\text{g m}^{-3}$ (3-metilheksan) ile $1954 \mu\text{g m}^{-3}$ (heksan) arasında bulunmuştur. Çalışmada, heksan, hem yaz (% 77) hem de kış (% 33) kampanyası için toplam UOB kütlesine en büyük katkıyı yapan kirletici olarak bulunmuştur. Hedef UOB'lerin yaz/kış oranlarına bakıldığında; benzen, sikloheksan, 2,2,4-trimetilpentan, n-heptan, metilsikloheksan, 2-metilheptan, etilbenzen, m, p-ksilen, n-propilbenzen ve n-undekan dışındaki kirleticiler için yaz/kış oranları "1" den daha yüksek bulunmuştur. Bu, binadaki laboratuvarlarda kullanılan ve depolanan kimyasal ve solventlerden kaynaklanan buharlaşmanın sıcaklıkla artmış gösterdiğini göstermektedir. Ayrıca en yüksek organik konsantrasyonları hem yaz hem de kış mevsimleri için laboratuvarlarda tespit edilmiştir. Bu nedenle, depolanan ve kullanılan solventlerin ve kimyasalların binanın iç mekan hava kalitesi için etkili ve önemli hale geldiği sonucuna varılabilir.

Anahtar Kelimeler: İç ortam havası, Pasif örnekleme, Üniversite binası, UOBler

LEVELS OF VOLATILE ORGANIC COMPOUNDS IN A UNIVERSITY BUILDING

Abstract: In this study, Volatile Organic Compounds (VOCs) were collected at Gebze Technical University Department of Environmental Engineering by passive sampling method and collected samples were analyzed by Gas Chromatography Flame Ionization Detector (GC-FID). In the study, passive sampling tubes were placed in 21 points including 2 classrooms, 4 outdoors, 3 offices, 4 corridors and 8 laboratories. Two campaigns were carried out during the study. The first (i.e. winter) campaign was conducted from February 27 to March 3, 2016 and the second (i.e. summer) campaign was conducted from May 8 to May 12, 2016. The measured pollutant concentrations ranged from $0.10 \mu\text{g m}^{-3}$ (isopropylbenzene) to $2182 \mu\text{g m}^{-3}$ (hexane) during the summer, while the concentrations of the organics were between $0.10 \mu\text{g m}^{-3}$ (3-methylhexane) and $1954 \mu\text{g m}^{-3}$ (hexane) during the winter. In the study, hexane was found to be pollutant which made the greatest contribution to the total VOC mass for both summer (77%) and winter (33%) campaigns. Since summer to winter ratios of the target VOCs were examined; ratios were found to be higher than "1" except benzene, cyclohexane, 2,2,4-trimethylpentane, n-heptane, methylcyclohexane, 2-methylheptane, ethylbenzene, m,p-xylene, n-propylbenzene and n-undecane. This may indicate that the evaporation from the chemicals and solvents which are used and stored in the laboratories in the building has increased with the temperature. Furthermore, the highest organic concentrations were also detected in the laboratories for both

summer and winter seasons. Therefore, it can be concluded that the stored and used solvents and chemicals become effective and important for the indoor air quality of the building.

Keywords: Indoor air, Passive sampling, Solvent usage, University building, VOCs

Giriş

Üniversite, ilköğretim okulu, hastane, restoran, banka, ofis, AVM gibi insanların, geçici bir süre de olsa birlikte bulunduğu yerlerdeki iç ortam hava kalitesi çok sayıda insanın sağlığını etkileyebilmektedir. Teknolojideki hızlı gelişime paralel olarak, iç ortamlarda bulunan tüketim malzemelerinin, kişisel bakım ürünlerinin, mobilyaların, duvar boyalarının, bina ve bina yalıtım malzemelerinin üretimi sırasında kullanılan kimyasalların hem sayısında hem de miktarında artış olmuştur. Böylece günlük hayatımıza giren kimyasal sayısı ve dolayısıyla maruz kalınan kirletici miktarı da her geçen gün artmaktadır. Bu kimyasallara gün içinde ne kadar maruz kaldığımız tam olarak kestirilemesede, günlük hayatta kullanılan kimyasalların sayısının artması, insanların iç ortamlarda geçirdikleri sürelerin uzaması ve enerji verimliliğini arttırmak için iç ortam havalandırmalarının azaltılmasından dolayı maruziyetin son yıllarda daha da çok arttığı kolayca tahmin edilebilmektedir. Maruz kalınan kirleticiler arasında özellikle uçucu organik bileşikler (UOB'ler), canlılar üzerindeki toksik ve kanserojenik etkileri nedeniyle ayrı bir öneme sahiptir. Üniversite yerleşkeleri çok sayıda öğrenci ve personel barındırmaları, bu kişilerin uzun süre iç ortamda bulunmaları ve ofislerde bulunan çeşitli ekipman, laboratuvar malzemesi ve kimyasaldan dolayı toksik kirleticilere maruziyet açısından önemli yerlerden biridir.

Bu çalışma kapsamında Gebze Teknik Üniversitesi Çevre Mühendisliği Bölümünde toplanan hava örneklerindeki Uçucu Organik Bileşikler (UOBler) pasif örnekleme yöntemiyle toplanacak ve Gaz Kromatografisi/ Alev İyonizasyon Dedektörü (GC-FID) ile analizi gerçekleştirilecektir. Çalışmada pasif örnekleme tüpleri 2 adet sınıf, 4 adet dış ortam, 3 adet ofis, 4 adet koridor ve 8 adet laboratuvar olmak üzere toplam 21 adet noktaya yerleştirilmiştir. Yapılan çalışma yaz ve kış olmak üzere iki kampanya halinde gerçekleştirilmiştir. Kış örnekleme 27 Şubat- 3 Mart, yaz örnekleme ise 8 Mayıs-12 Mayıs tarihleri arasında gerçekleştirilmiştir.

Materyal ve Metod

UOBlerin pasif örnekleme sırasında seçilen her bir noktaya organiklerin örnekleme için yaklaşık 300 mg Tenax TA 60/80 mesh ile doldurulmuş ¼" lik 6,35 mm dış çap, 8,89 cm uzunlukta GRADKO'dan temin edilen paslanmaz çelik tüpler yerleştirilmiş ve 1 haftalık pasif örnekleme yöntemiyle hava örnekleri toplanmıştır. Tüpler özel yapım şartlandırma (condition) fırınında 300 °C'de 100 ml/min yüksek saflıkta azot gazı geçirilerek dört saat boyunca şartlandırılmış ve tüplerin background kirlilikleri kontrol edilmiştir. Temizlenen tüpler içi silika jel ve aktif kömür ile doldurulmuş ağzı kapalı koruyucu cam tüplerde örnekleme süresine kadar -15 °C'de buzdolabında saklanmışlardır. Tüpler gerek arazi çalışmasında gerekse taşınırken kontaminasyona karşı cam tüplerin içerisinde ve buzlukta taşınmışlardır.

Bu çalışmada Gebze Teknik Üniversitesi Çevre Mühendisliği Bölümü iç ortamındaki UOBler pasif örnekleme ile örnekleştirilmiştir. Pasif örnekleme bir tutucuya yerleştirilmiş ve bölümdeki 2 adet sınıf, 4 adet dış ortam, 3 adet ofis, 4 adet koridor ve 8 adet laboratuvar olmak üzere toplam 21 adet noktaya yerleştirilmiştir. Bu çalışma iki farklı örnekleme kampanyası halinde gerçekleştirilmiştir. Kış örnekleme 27 Şubat- 3 Mart, yaz örnekleme ise 8 Mayıs-12 Mayıs tarihleri arasında gerçekleştirilmiştir. Çalışma süresince tüplerin açık olan uçlarına difüzyon kapakları yerleştirilmiş ve her bir örnekleme döneminde 5 adet şahit numune de kullanılmış ve bu tüpler de örnek tüpleri gibi şartlandırılmış, saklanmış veya/ araziye götürülmüş ve sonrasında da analiz edilmişlerdir. Böylece olası kontaminasyon belirlenmiş ve çalışmalarda şahit düzeltmesi yapılmış değerler kullanılmıştır.

Toplanan örnekler ODTÜ Çevre Mühendisliği Bölümünde bulunan Gaz Kromatografi (Agilent 6890 Model) ve Unity Isıl Desorpsiyon cihazında analiz edilmişlerdir. Her bir örnek üzerine toplanmış olan organikler 5 dakika boyunca 320 °C'de ısısal desorpsiyon cihazında çözülerek -15 °C'de olan soğuk bir kapan (Ozone precursor) üzerinde toplanması sağlanmış ve toplanma işleminin tamamlanmasından sonra soğuk kapan kısa bir süre içerisinde 300 °C'ye çıkarılarak toplanan kirleticilerin Gaz Kromatografi cihazına gitmesi sağlanmıştır. Çalışmada kullanılan GK/FID sisteminin 2 kolonu ve 2 dedektörü bulunmaktadır. Hidrokarbonların belirlenmesi için uygun olan kapilary kolon DB-1 (% 100 Dimetilpolisiloxane, Çalışma aralığı; 60 - 325 °C, Boyutları; 60m x 0.25 mm x 1µm film kalınlığı) ve hafif hidrokarbonların belirlenmesi için uygun olan alumina plot kolon HP-Al/S (HP-PLOT/Al2O3, Sodyum sülfat-deaktive edilmiş, Çalışma aralığı; -60 - 200 °C, Boyutları; 50m x 0.32 mm x 8µm film kalınlığı) kullanılmıştır. Çalışmada GK

cihazının fırın programı başlangıhta 40 °C'de 5 dakika bekleme ve 5 °C/dakika artış ile 195 °C fırın son sıcaklığında 10 dakika bekleme olarak seçilmiştir.

Daha öncede belirtildiği üzere çalışmada PAMS 55 adet UOB'in herbiri 100, 200, 300, 400 ve 500 ml kalibrasyon gazı KG-FID sistemine verilmiş ve 5 noktalı kalibrasyon eğrileri hazırlanmış ve bu eğrilerin eğimleri kullanılarak herbir örnek içerisindeki organik kirleticinin kütle miktarı ng olarak belirlenmiştir. UOBlerin konsantrasyonları aşağıda belirtilen Fick'in birinci yasası formülü ile hesaplanmıştır. Çalışmada 55 adet kirleticiyi içeren bir kalibrasyon gazı kullanılmasına rağmen, çalışmada pasif örnekleme yapıldığı için C5-C12 arası UOBlerin örnekleme söz konusu olduğundan bu çalışmada n-hegzan'dan sonraki 34 adet UOB çalışma süresince ölçülmüştür. Çalışmada kalibrasyon eğrileri için elde edilen R² değerleri 0.99901 (1,2,4-Trimethylbenzen) ile 0.99989 (ethan) arasında değişmiştir. Ayrıca en küçük tayin sınırları da hesaplanmış (MDL) ve bu değerlerin 0.09 µg m⁻³ (2,4-Dimethylpentan) ile 0.5 µg m⁻³ (o-Ethyltoluen) arasında olduğu hesaplanmıştır. Çalışmada 10 adet şahit için background konsantrasyonlar hesaplanmış ve sadece n-hegzan, benzen ve toluene şahit numunelerde rastlanmıştır. Ortalama örnek konsantrasyonları şahitlerdeki konsantrasyonlar ile karşılaştırıldığında taşıma/temizleme (condition etme) kaynaklı kirlenmenin oldukça düşük olduğu görülmüştür.

Bulgular

Her iki örnekleme döneminde en yüksek oranda gözlenen organik bileşik hegzan olmuştur (Tablo 1). Hegzan yaz ve kış mevsiminde ölçülen toplam UOB kütlesinin sırasıyla yaklaşık %77 ve %33'nü oluşturmıştır. Yani yaz mevsimindeki çalışma sırasında ölçülen hegzanın toplam UOB kütlesine katkısı kış mevsiminde ölçülen değerine kıyasla iki kattan daha fazla bulunmuştur. Buda yaz mevsiminde artan sıcaklıkla birlikte solvent kaynaklı buharlaşmaların toplam UOB yükü üzerinde ne kadar etkili olduğunu göstermektedir. Yaz mevsiminde, hegzanı sırasıyla %8.44, %3.17 ve % 1.5 ile 2,4-dimethylpentan, toluen ve siklohegzan takip etmektedir. Kış mevsiminde ise hegzanı, %19.5, %8.39 ve %7.35 ile 2,4-dimethylpentan, siklohegzan ve benzen takip etmektedir.

Ölçülen kirleticilerin Yaz/Kış (Y/K) oranları incelendiğinde kirleticilerin üç grup altında toplanabileceği görülmektedir. Hegzan, 2-metilhegzan, 3-metilhegzan, 2,3-dimetilpentan, n-oktan, stiren, nonan, p-dietilbenzen+1,4-dietilbenzen, izopropilbenzenin yer aldığı ilk grupta Y/K oranı 2'den büyük bulunmuştur. Hegzan bir solventtir aynı zamanda diğer çözücülerin (ör. petrol eteri) üretimi sırasında da kullanılmaktadır (Yuso vd., 2013). Örnekleme yapılan laboratuvarlarda da hegzan sıklıkla kullanılmaktadır. Ancak laboratuvarlardaki deneyler kesikli yapıldığından dolayı muhtemelen deneylere bağlı olarak hem hegzan tüketiminin yaz mevsiminde kış mevsimine kıyasla daha fazla olması hemde sıcaklıkla artan buharlaşmanın sonucunda bu kadar yüksek Y/K oranının oluştuğu düşünülmektedir. Bu gruptaki kirleticiler için artan sıcaklığa bağlı buharlaşmanın ölçülen toplam UOB yükü üzerinde etkili olduğu görülmektedir.

2,4-dimethylpentan, toluen, 1,3,5-trimetilbenzen, 1,2,3-trimetilbenzen, 1,2,4-trimetilbenzen, n-dekan, 3-metilheptan, o-ksilen, n-dodoken ve m-etiltoluen+3-etiltoluen'inin yer aldığı grupta ise Y/K oranları ise bir ile iki arasında bulunmuştur. Bu grupta yer alan kirleticilerin de yazın artan sıcaklığa bağlı olarak buharlaşma kaynaklı havadaki konsantrasyonlarının artış gösterdiği görülmektedir.

Benzen, siklohegzan, 2,2,4-trimetilpentan, n-heptan, metilsiklohegzan, 2-metilheptan, etilbenzen, m,p-ksilen, n-propilbenzen ve n-undekan'ın yer aldığı son grubun ise Y/K oranı ise birden daha düşük olarak bulunmuştur. Benzen iç ortamdaki taşıt egzozu kaynaklı emisyonların en önemli göstergesidir.

Çalışmada ölçüm yapılan örnekleme noktaları hem yaz hem de kış kampanya döneminde hemen hemen tüm kirleticilere bakıldığında en yüksek ortalama değerlerin laboratuvarlarda olduğu görülmüştür. Bu sonuçlar göz önüne alındığında kuvvetle muhtemel laboratuvarlarda gerçekleştirilen deneylerde aktif olarak kullanılan çeşitli solvent/kimyasal maddelerin, solvent hazırlama işlemleri sırasında oluşan buharlaşma kaynaklı uçucu organik bileşiklerin ve yine laboratuvarlarda saklanan kimyasallardan/soventlerden etrafa yayılan buharlaşma kaynaklı uçucu organiklerin diğer iç ve dış mekanlara kıyasla daha yüksek UOB değerlerin elde edilmesine sebep olduğu anlaşılmaktadır.

Tablo 1. Çalışma dönemlerine ait istatistiksel sonuçlar (değerler $\mu\text{g m}^{-3}$ olarak verilmektedir)

Bileşik	Yaz		Kış	
	Ortalama	Min-Max	Ortalama	Min-Max
n-Hexane	1102±1276	18.7-21182	217.6±456.9	1.71-1954
2,4-Dimethylpentane	220±469	3.91-2045	130±293	2.73-1257
Benzene	39.9±133	3.24-620	48.8±149	1.50-691
Cyclohexane	41.2±81.4	0.84-254	55.8±125.4	0.52-490
2-Methylhexane	21.3±65.4	0.24-301	7.7±19.8	0.45-66.1
2,3-Dimethylpentane	6.6±21.6	0.29-97.7	2.7±6.57	0.11-22.5
3-Methylhexane	16.3±48.4	0.67-225	6.4±14.1	0.10-51.2
n-Heptane	7.86±13.5	0.65-57.6	12.3±44.4	0.16-206
Methylcyclohexane	1.39±1.69	0.28-6.86	1.7±3.58	0.20-16.1
Toluene	82.6±111	13.04-464	45.2±65.6	1.5-303
2-Methylheptane	3.09±2.69	0.87-9.28	5.5±7.6	0.28-34.1
3-Methylheptane	1.15±1.14	0.21-4.17	1.01±1.50	0.12-6.90
n-Octane	4.66±2.65	1.61-13.0	2.3±0.98	0.17-4.93
Ethylbenzene	21.7±71.3	3.25-333	31.4±106.2	2.60-495
m,p-Xylene	16.3±30.7	6.58-150	17.4±34.39	1.88-168
Styrene	34.1±44	4.93-187	11.9±9.4	1.92-31.9
o-Xylene	13.1±17.9	5.45-89.5	11.4±22.1	0.20-108
Nonane	7.13±3.9	2.25-16.5	3.2±1.39	1.11-8.45
Isopropylbenzene	0.60±0.53	0.10-1.68	0.3±0.16	0.10-0.68
n-Propylbenzene	1.73±2.15	0.18-9.78	1.69±1.95	0.30-7.15
1,3,5-Trimethylbenzene	3.15±2.72	0.72-12.56	2.03±1.29	0.44-4.85
o-Ethyltoluene+2-Ethyltoluene	2.00±3.4	0.46-16.45	1.14±0.94	0.23-4.28
1,2,4-Trimethylbenzene	1.34±1.10	0.41-5.56	1.03±0.34	0.35-3.52
n-Decane	4.43±2.53	2.31-10.86	2.45±0.53	0.45-3.65
1,2,3-Trimethylbenzene	4.21±3.49	0.36-11.85	2.27±1.38	0.61-4.61
n-Undecane	9.11±4.68	4.25-19.49	14.1±16.5	1.14-62.1
n-Dodecane	27.5±10.9	12.1-47.3	20.8±21.3	5.45-106

I/D oranı iç ortamdaki kirleticilerin kaynakları ve taşınımı hakkında bilgi verir (Katiyar ve Khare, 2007). UOBlerin herhangi bir iç ortamdaki konsantrasyonu zamana (mevsimlere ve gün içerisindeki değişimlere), kaynağa yakınlığına ve konumuna bağlı olarak değişiklik gösterir. Bu yüzden kirleticiler çoğunlukla I/D oranları kullanılarak rapor edilirler. Buna göre, I/D oranı birden çok büyük ise iç ortamdaki lokal kaynakların etkisini; I/D oranı bire yakın ise, iç ve dış ortam kaynaklarının aynı seviyede etkili olduğunu; I/D oranı birden çok küçükse dış ortam kaynaklı kirleticilerin etkili olduğunu gösterir. Gelişmiş ülkelerde iç ortam konsantrasyonları dış ortam konsantrasyonlarına yakın olmakla birlikte, I/D oranı genellikle 0,7 ile 4 arasında değişmektedir (Zabiegala vd., 2006).

İç ortam ve dış ortam arasındaki ilişki oldukça karmaşık olmakla birlikte; meteorolojik faktörler, iç ortam kaynakları, kirleticilerin iç ortamdaki giderim mekanizması, filtrasyon ve iç ortamın havalandırılması bu ilişki üzerinde rol oynayan faktörlerdir. Ayrıca, iç ortam ve dış ortamdaki kirleticilerin kaynakları ve konsantrasyonları değişiklik göstermektedir (Katiyar vd., 2007).

Çalışmada ölçülen I/D oranı kış mevsimi için 0,07 ile 24,20 arasında değişirken, yazın bu değer 0,19 ile 32,62 arasında değişim göstermektedir. Her iki mevsim dikkate alındığında laboratuvarlarda ölçülen UOB'lerin neredeyse tamamının dış ortama kıyasla daha yüksek konsantrasyona ($I/D > 1$) sahip olduğu görülmektedir. Kış mevsiminde ölçülen I/D oranları yaz mevsimine kıyasla düşüş göstermekte ve ortalama I/D oranı 1,90'dan 1,74'e düşmektedir. Ancak ortalamanın çok da büyük farklılık göstermediği görülmektedir. Kaynak katkıları mevsimsel olarak değişim göstermese bile; kış mevsiminde güneşten gelen radyasyonun ve buna bağlı olarak fotokimyasal aktivitenin azalması ve atmosferde yanma kaynaklı kirletici yükünün artışıdan dolayı kış mevsiminde özellikle trafik kökenli UOB konsantrasyonu (benzen, etilbenzen, m,p-ksilen gibi) artış göstermektedir. Sonuçlarda I/D oranlarının çok fazla değişim göstermemesinin muhtemel nedeni laboratuvarlarda kullanılan ve saklanan çözültü, solvent ve kimyasal maddelerin miktarlarının muhtemelen aynı kalması ve artan sıcaklıkla birlikte buharlaşmanın artması sonucu laboratuvar havasında daha yüksek UOB konsantrasyonlarının kaydedilmesine ve muhtemelen de havalandırmanın mekanik olarak yapılması sonucu yazın dış ortama verilen kirli havasında daha yüksek UOB konsantrasyonuna sahip olması sonucu iç ortam kaynaklı kirliliğin dış ortamı da etkilediği düşünülmektedir. Özetlenecek olursa, bölüm, yaz mevsimi boyunca daha fazla iç ortam kaynaklı kirleticilerin etkisi altında kalmaktadır.

Ayrıca hem yaz hem kış mevsimi için farklı iç mekanlarda ve dış ortamda ölçülen UOBlerin ortalamaları Kruskal-Wallis Testi ile karşılaştırılmış ve istatistiksel olarak ($p < 0.05$) laboratuvarlardaki ölçümlerin diğer tüm mekanlarla farklılık gösterdiği buna karşın diğer tüm iç mekanların hem birbirleriyle hem de dış ortamla istatistiksel olarak anlamlı ($p > 0.05$) bir fark göstermediği görülmüştür. Bu durum bina içerisindeki laboratuvarların ne kadar önemli bir UOB kaynağı olduğunu açıkça göstermektedir.

Sonuçlar

Bu çalışmada Gebze Teknik Üniversitesi Çevre Mühendisliği Binasındaki UOBler kış ve yaz olmak üzere iki örnekleme kampanyası şeklinde gerçekleştirilen çalışma neticesinde belirlenmiştir. Organik bileşiklerin seviyelerinin belirlenebilmesi için 21 adet noktaya pasif örnekleme yerleştirilmiş ve bir çalışma haftası süresince sahada bırakılan örnekleme yerleri ile pasif örnekleme gerçekleştirilmiştir. Çalışma süresince ölçülen kirletici konsantrasyonları yaz mevsiminde $0,10 \mu\text{g m}^{-3}$ (isopropilbenzen) ile $21182 \mu\text{g m}^{-3}$ (hegzan) arasında değişirken, kış mevsiminde ölçülen kirletici konsantrasyonları $0,10 \mu\text{g m}^{-3}$ (3-metilhegzan) ile $1954 \mu\text{g m}^{-3}$ (hegzan) arasında değişim göstermiştir.

Bu çalışmada hem yaz hemde kış örneklemesinde toplam UOB kütlesine en yüksek katkıyı yapan kirletici hezan olarak bulunmuş ve bu katkı yaz ve kış mevsimleri için sırasıyla %77 ve %33 olarak bulunmuştur. Çalışmada yaz ve kış konsantrasyonlarının oranları kıyaslandığında benzen, sikloheksan, 2,2,4-trimetilpentan, n-heptan, metilsikloheksan, 2-metilheptan, etilbenzen, m,p-ksilen, n-propilbenzen ve n-undekan'ın yer aldığı grup hariç tüm kirleticilerin Y/K oranı ise birden daha büyük bulunmuştur. Bu durum binadaki laboratuvarlarda kullanılan ve saklanan kimyasal, solvent ve çözültülerden kaynaklı buharlaşmanın sıcaklıkla artış gösterdiğini bu durumda binadaki iç hava kalitesi üzerinde ne kadar etkili ve önemli bir kaynak oluşturduğunu göstermektedir. Binadaki en yüksek organik konsantrasyonlarının hem yaz hem de kış mevsiminde laboratuvarlarda kaydedilmiş olması bu düşüncüyü destekler niteliktedir.

Teşekkür

Bu çalışma Gebze Teknik Üniversitesi 2016-A-23 No'lu BAP projesi tarafından desteklenmiştir.

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BUHAR SIKIŞTIRMALI MEKANİK SOĞUTMA SİSTEMİNDE ALTERNATİF SOĞUTUCU AKIŞKANLARIN TERMODİNAMİK ANALİZİ

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Özet

Günümüzde ilerleyen teknolojik gelişmelere bağlı olarak soğutma alanında da büyük gelişmeler olmuştur. Bu gelişmeler sonucu soğutma sistemlerinde kullanılan soğutucu akışkanların hem ozon tabakasına zarar verdiği hem de küresel ısınmaya neden olduğu tespit edilmiştir. Bu kapsamda bu çalışmada buhar sıkıştırma mekanik soğutma sisteminde çevre dostu olan alternatif soğutucu akışkanların kullanıldığı kabul edilerek termodinamik analiz çalışması yapılmıştır. Soğutucu akışkan olarak NH₃, R-134a, R-404A, R-410A, R-407C, R-290, R-123, R-600 ve R-600a soğutucu akışkanları seçilmiştir. Teorik olarak analiz edilen soğutma çevrimlerinin performans katsayılarının karşılaştırılması yapılmıştır. Buhar sıkıştırma mekanik soğutma sistemlerinde ozon tabakasına olumsuz etki yapmayan ve küresel ısınmaya az neden olan akışkanların kullanılması önerilmektedir.

Anahtar Kelimeler: Mekanik soğutma sistemi, Soğutucu akışkanlar, Performans Analizi.

THERMODYNAMIC ANALYSIS OF ALTERNATIVE REFRIGERANT IN VAPOUR COMPRESSION MECHANICAL REFRIGERATION SYSTEM

Abstract

Due to the technological developments that have been going on today, great improvements have been made in the field of refrigeration. It has been determined that the refrigerants used in these advanced refrigeration systems are both damaging to the ozone layer and causing global warming. In this context, thermodynamic analysis study has been carried out assuming that environmentally friendly alternative refrigerants are used in vapour compression mechanical refrigeration system in this study. Refrigerants such as NH₃, R-134a, R-404A, R-410A, R-407C, R-290, R-123, R-600 and R-600a have been selected as the refrigerant. Theoretically, the performance coefficients of the analyzed refrigeration cycles have been compared. The refrigerants that do not adversely affect the ozone layer and cause less global warming is recommended in vapour compression mechanical refrigeration systems.

Keywords: Mechanical refrigeration systems, Refrigerants, Performance analysis.

Giriş Ve Amaç

Son yıllarda, buhar sıkıştırma mekanik soğutma sistemlerinde kullanılan soğutucu akışkanların, canlıları güneşin zararlı UV (morötesi) ışınlarından koruyan bir tabaka olan ozon (O₃) tabakası üzerinde, bölgesel olarak meydana gelen incelmeye ve parçalanmaların olduğunu ortaya çıkaran pek çok kanıt elde edilmiştir. CFC ve HCFC gazların zarar verdikleri anlaşılmış olup buna dayanarak (uluslararası anlaşmalarla) alternatif soğutucu akışkanların geliştirilmesi ile ilgili çalışmalar başlamıştır. Gelişmiş ülkeler 2000 yılından itibaren alternatif soğutucu akışkanlara geçişi tamamlamışlardır (Kırmacı ve Özdemir, 2006).

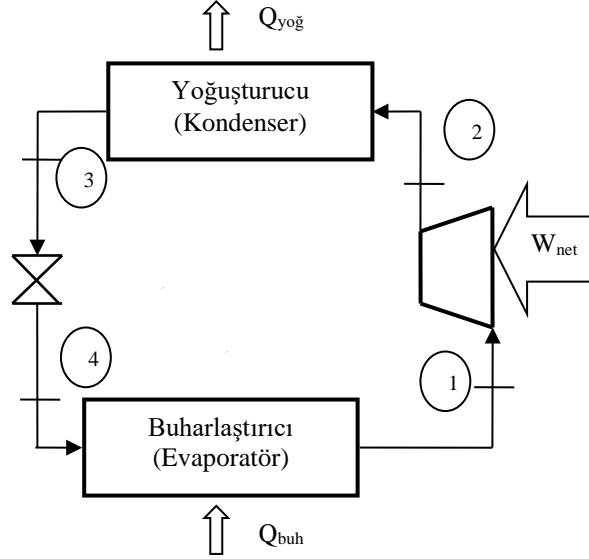
Uluslararası Montreal Protokolü ile klor ve brom içeren soğutucu akışkanlar dahil olmak üzere ozon tabakasına etki eden bileşenlerin üretimi kontrol altına alınmıştır. CFC tipi (R11, R12, R113 ve R114 gibi) soğutucu akışkanların üretimi 1996 yılında tamamen durdurulmuştur. HCFC (hidrokloroflorokarbon) tipi soğutucu akışkanlardan R22 üretimi 1996 yılı üretim seviyesinde sabit tutulmuştur. Bu akışkanın üretiminin 2020 tarihinde % 0.5 seviyelerine indirilmesi ve 2030 tarihinde tamamen durdurulması öngörülmüştür (Kabul ve Alkan, 2016).

Bu çalışmada buhar sıkıştırma mekanik soğutma sisteminde çevre dostu olan alternatif soğutucu akışkanların kullanıldığı kabul edilerek termodinamik analiz çalışması yapılmıştır. Soğutucu akışkan olarak NH₃, R-134a, R-

404A, R-410A, R-407C, R-290, R-123, R-600 ve R-600a soğutucu akışkanları seçilmiştir. Teorik olarak analiz edilen soğutma çevrimlerinin performans katsayılarının karşılaştırılması yapılmıştır.

Buhar Sıkıştırılmalı Mekanik Soğutma Çevrimi

Buhar sıkıştırılmalı mekanik bir soğutma çevriminde iki ana bölüm mevcuttur. Bu iki bölüm, alçak ve yüksek basınç tarafı olarak adlandırılır. Alçak ve yüksek basınç taraflarından oluşan soğutma çevrimi, dört ana elemandan oluşmaktadır. Bu elemanlar sırasıyla, kompresör, yoğusturucu (kondenser), buharlaştırıcı (evaporatör) ve kısılma vanası (genleşme valfi) dir (Yamankaradeniz ve diğ., 2002).



Şekil 1: Buhar sıkıştırılmalı mekanik soğutma çevrimi.

Şekil 1’de buhar sıkıştırılmalı mekanik soğutma çevriminin şematik diyagramı görülmektedir. Buhar sıkıştırılmalı mekanik soğutma sisteminde; kompresörde yüksek basınca sıkıştırılan soğutucu akışkan kızgın buhar halde yoğusturucuya gönderilir. Burada, çevreye ısı vererek yoğuşan soğutucu akışkan, kısılma vanasında alçak basınca kısılarak ıslak buhar halde buharlaştırıcıya girer. Buharlaştırıcıda soğutucu akışkan ortamın ısını çekerek ortamı soğutur ve buharlaştırıcı çıkışında doymuş buhar halde kompresör tarafından emilir. Böylece çevrim sürekli olarak tekrarlanır.

Soğutucu Akışkanlar

İnsanoğlunun günlük yaşantısı içerisinde yaşadığı ortamları, gıdaları, içecekleri soğutarak koruması yaşamının önemli gereksinimleri arasındadır. Soğutma teknolojilerinin yaşam içerisinde yoğun kullanımı, enerji performans ve tasarrufu beraberinde getirmektedir. Montreal Protokolü kapsamında; yüksek enerji taşıma kapasiteli, insan ve çevreye minimum zararlı, yeni nesil soğutucu akışkanların geliştirilmesi ve kullanımı evrensel olarak teşvik edilmektedir (Selimli vd., 2014).

Ozon krizi soğutma endüstrisinde soğutucu akışkanların dikkatle gözden geçirilmesine neden olmuş ve yeni arayışlar gerektirmiştir. Çünkü araştırmalara göre ozon tabakasının incelmesinin en önemli sebebi atmosferdeki klor ve brom miktarlarının artmasıdır; bu zararlı maddeleri ihtiva eden CFC’ler atmosferde sera etkisine ve yeryüzünün ısınmasına katkıda bulunmaktadır. Bunun sonucu 1987’de yapılan Montreal Protokolü ve Kyoto Protokolü gereği CFC’lerin üretimi tamamiyle durdurulma aşamasına gelmiştir (Arcaklıoğlu ve Erişen, 2003).

Soğutucu akışkanları kloroflorokarbon (CFC), hidrokloroflorokarbon (HCFC), hidroflorokarbon (HFC) ve karışım ve inorganik soğutucu akışkanlar şeklinde incelenebilir. Bu akışkanlar ve özellikleri aşağıda verilmiştir (Onat, 2004):

Kloroflorokarbon (CFC): CFC’ler ozon tabakası üzerinde en fazla tahribat yapan soğutucu akışkanlardır. Ayrıca küresel ısınma potansiyelleri oldukça fazladır. Bunlardan dolayı CFC’lerin kullanımı için bazı yasaklar ve önlemler dünya çapında alınmaktadır. Uygulamada en çok R-11, R-12, R-13, R-114 ve R-115 kullanılmaktadır.

Hidrokloroflorokarbon (HCFC): HCFC'lerin önemli özellikleri şunlardır. Atmosferde kimyasal yapıları bozulmadan uzun süre kalamazlar. (15-20 yıl) Ozonu delme potansiyelleri düşüktür. Uygulamada en çok kullanılan HCFC'ler şunlardır: R-22, R-124, R-123

Hidrokloroflorokarbon (HFC): Yapılarında klor atomu bulunmadığı için HFC'lerin ozonu delme potansiyelleri sıfırdır. Yani ozon tabakası üzerinde hiçbir olumsuz etki yapmazlar. Buna rağmen küresel ısınmaya biraz olumsuz etki yaparlar.

Karışım ve İnorganik Soğutucu Akışkanlar: İki daha fazla soğutucu akışkanın belirli oranlarda karıştırılarak elde edilen yeni soğutucu akışkana karışım adı verilir. En popüler karışımlar R-500, R-502, 404A ve 407C'dir. İnorganik soğutucu akışkanlar 1900'lü yıllarda çok kullanılmasına rağmen günümüzde yalnızca zehirleyici özelliği olmasına rağmen termodinamik özellikleri mükemmel olan amonyak (NH₃) kullanılmaktadır.

Çevrimlerin Termodinamik Analizi

Bu çalışmada buhar sıkıştırırmalı soğutma çevrimleri için çevre dostu NH₃, R-134a, R-404A, R-410A, R-407C, R-290, R-123, R-600 ve R-600a alternatif akışkanlar olarak seçilmiş ve bu soğutucu akışkanlar için teorik olarak oluşturulan soğutma çevrimlerinin termodinamik analizi yapılmıştır.

Çevrimler için genel kütle dengesi ve enerji dengesi aşağıdaki gibi yazılabilir (Yamankaradeniz ve diğ., 2002):

$$\sum \dot{m}_g = \sum \dot{m}_\zeta \quad (1)$$

$$\dot{Q} - \dot{W} = \sum \dot{H}_\zeta - \sum \dot{H}_g \quad (2)$$

Buna göre buhar sıkıştırırmalı mekanik soğutma sisteminin enerji denklikleri, performans katsayısı (COP) ve ekserji verim (ECOP) eşitlikleri Tablo 1'de verilmiştir.

Tablo 1. Buhar sıkıştırırmalı mekanik soğutma sisteminin enerji, performans katsayısı (COP) ve ikinci kanun verim eşitlikleri.

Bileşen	Enerji Denklemleri	Denklem No
Buharlaştırıcı	$\dot{Q}_{buh} = \dot{m}_1.(h_1 - h_4)$	(3)
Kompresör	$\dot{W}_{komp} = \dot{m}_1.(h_2 - h_1)$	(4)
Yoğuşturucu	$\dot{W}_{yoğ} = \dot{m}_1.(h_3 - h_2)$	(5)
COP	$COP = \dot{Q}_{buh} / \dot{W}_{komp}$	(6)
ECOP	$ECOP = - \frac{\dot{Q}_{buh} \left(1 - \frac{T_o}{T_{buh}} \right)}{\dot{W}_{komp}}$	(7)

Bu çalışmada Şekil 1' de gösterilen çevrimin bütün noktalarındaki termodinamik özellik değerleri Tablo 2'de verilmiştir. Tek kademeli buhar sıkıştırırmalı soğutma sisteminde R-134a seçilerek analiz yapılmıştır. Sistemin çalışma koşulları olarak T_{buh}=5°C ve T_{yoğ}=40°C, soğutma yükü 50 kW alınmıştır. Ayrıca buhar sıkıştırırmalı soğutma sistemindeki kompresörün izantropik verimi η_{is}=0.8 ve ölü hal standart olarak 101,325 kPa ve 25°C olarak alınmıştır.

Tablo 2. Analiz edilen çevrimin çeşitli noktalarındaki termodinamik özellikleri.

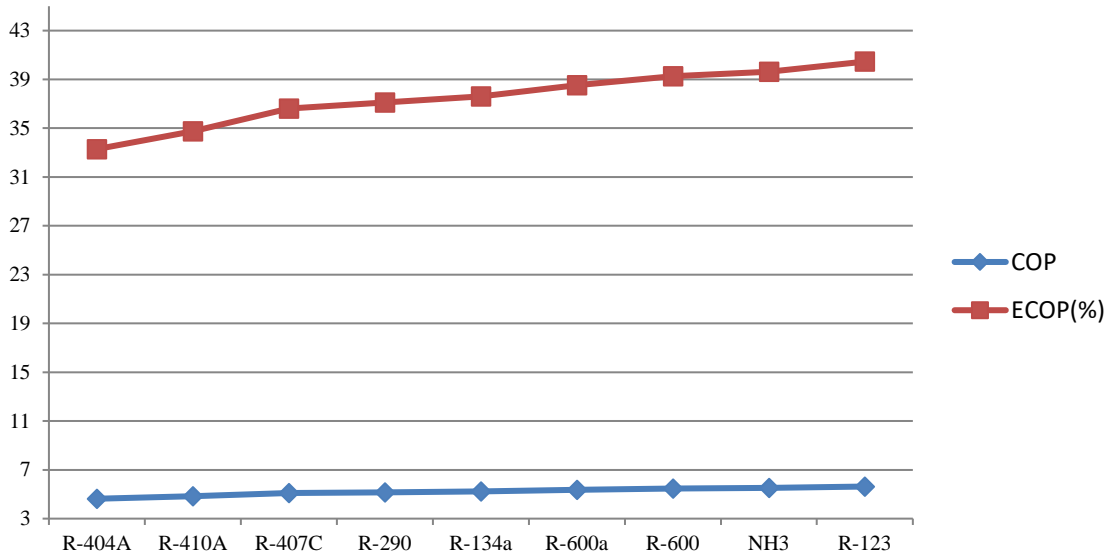
Akış No	Sıcaklık (°C)	h (kJ/kg)	m (kg/s)
1	5	400.073	0.347
2	48	427.576	0.347
3	40	256.160	0.347
4	5	256.160	0.347

Çalışmada aynı çalışma koşullarındaki ($T_{buh}=5^{\circ}\text{C}$ ve $T_{yoğ}=40^{\circ}\text{C}$, soğutma yükü 50 kW) buhar sıkıştırma mekanik soğutma çevriminde NH_3 , R-134a, R-404A, R-410A, R-407C, R-290, R-123, R-600 ve R-600a alternatif soğutucu akışkanların kullanıldığı kabul edilerek oluşturulan çevrimlerin karşılaştırmaları yapılmıştır (Tablo 3). Buna göre çevrimde R-404A kullanım durumunda kompresör işi (10.799 kW) en yüksek olup, bunu R-410A, R-407C, R-290, R-134a, R-600a, R-600 ve NH_3 takip etmektedir. En küçük kompresör işi de R-123 (8.885 kW) kullanım durumunda elde edilmektedir.

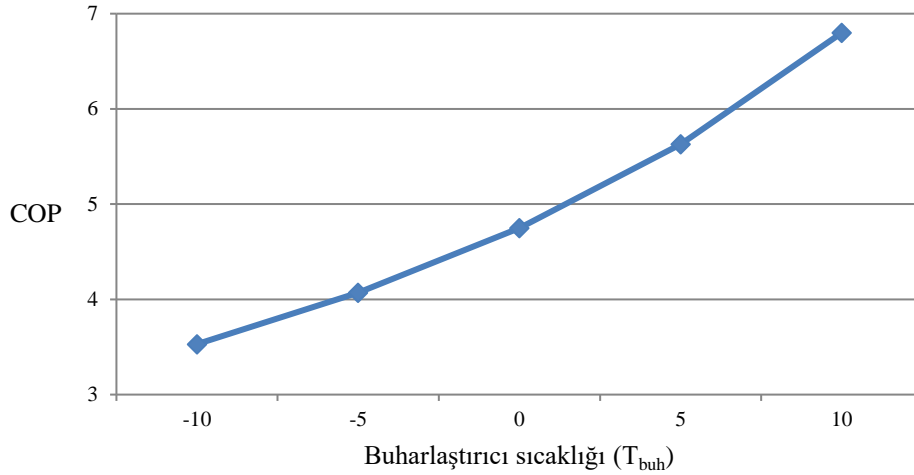
Tablo 3. Alternatif soğutucu akışkanlara göre analiz edilen tek kademeli buhar sıkıştırma soğutma çevrimlerinin sistem elemanlarının ısı kapasiteleri değerlerinin karşılaştırılması.

	R-404A	R-410A	R-407C	R-290	R-134a	R-600a	R-600	NH_3	R-123
W_{komp} (kW)	10.799	10.347	9.819	9.690	9.556	9.333	9.156	9.072	8.885
$Q_{yoğ}$ (kW)	60.799	60.347	59.819	59.690	59.556	59.333	59.156	59.072	58.885
Q_{buh} (kW)	50	50	50	50	50	50	50	50	50

Alternatif soğutucu akışkanlara göre analiz edilen tek kademeli buhar sıkıştırma soğutma çevrimlerinin COP ve $ECOP$ değerleri Şekil 2’de verilmiştir. Buna göre maksimum COP (5,63) değeri R-123 çevrimde elde edilmiştir. En düşük COP (4,63) değeri R-404A çevrimde görülmüştür. Ekserji analizinde ise maksimum ekserji verimi R-123 çevriminde (%40.46) meydana gelirken minimum ekserji verimi de R-404A çevriminde (%33.29) meydana gelmektedir.

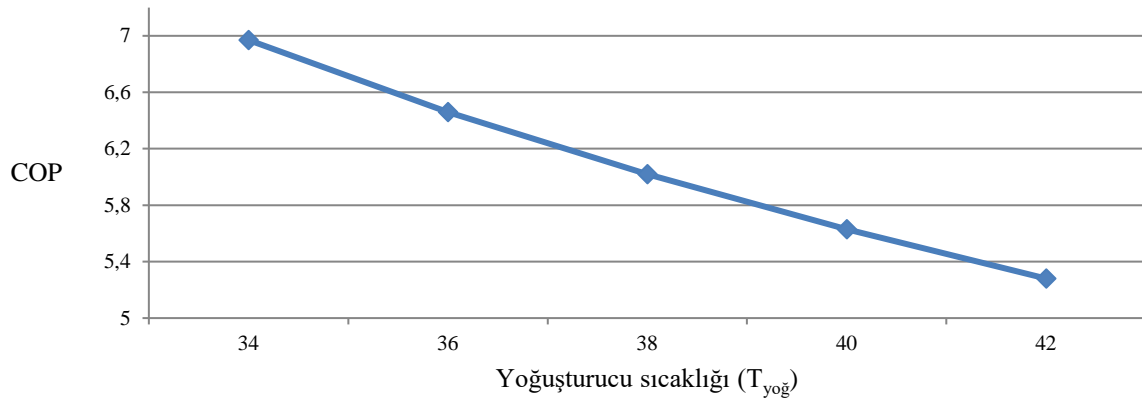

Şekil 2. Alternatif soğutucu akışkanların COP ve $ECOP$ değerleri.

Çalışmada ayrıca R-123 soğutucu akışkan için farklı buharlaştırıcı ve yoğuşurucu sıcaklıkları için (50 kW soğutma yükünde) performans katsayısının (COP) değişimleri incelenmiştir. Şekil 3’ten $T_{yoğ}=40^{\circ}\text{C}$ yoğuşurucu sıcaklığı için buhar sıkıştırma soğutma sisteminin performans katsayısının (COP), buharlaştırıcı sıcaklığı (T_{buh}) ile değişimi görülmektedir. Performans katsayısı (COP), buharlaştırıcı sıcaklığı ile artmaktadır.



Şekil 3. R-123 soğutucu akışkan için performans katsayısının (COP) buharlaştırıcı sıcaklığı (T_{buh}) ile değişimi.

Şekil 4'te performans katsayısının (COP) yoğuşurucu sıcaklığı ile değişimini verilmiştir ($T_{buh}=5^{\circ}C$ ve soğutma yükü 50 kW). Performans katsayısı (COP) artan yoğuşurucu sıcaklığı ile azalmaktadır.



Şekil 4. R-123 soğutucu akışkan için performans katsayısının (COP) yoğuşurucu sıcaklığı ($T_{yoğ}$) ile değişimi.

Sonuçlar Ve Öneriler

Günümüzde artan soğutma ihtiyaçları nedeniyle soğutma sistemlerinde kullanılan soğutucu akışkanların hem ozon tabakasına zarar verdiği hem de küresel ısınmaya neden olduğu tespit edilmiştir. Montreal Protokolü kapsamında ozon tabakasının tüketimine neden olan HCF ve HCFC grubu soğutucu akışkanların kullanılmaması karar alınmıştır. Bu nedenle ozona tabakasına zarar vermeyen ve küresel ısınmaya az neden olan soğutucu akışkanlar üzerine araştırmalar yapılmaktadır. Bu kapsamda bu çalışmada buhar sıkıştırırmalı mekanik soğutma sisteminde çevre dostu olan alternatif soğutucu akışkanların kullanıldığı kabul edilerek termodinamik analiz çalışması yapılmıştır. Çalışmada aynı çalışma koşullarındaki ($T_{buh}=5^{\circ}C$ ve $T_{kon}=40^{\circ}C$, soğutma yükü 50 kW) buhar sıkıştırırmalı mekanik soğutma çevriminde NH_3 , R-134a, R-404A, R-410A, R-407C, R-290, R-123, R-600 ve R-600a alternatif soğutucu akışkanların kullanıldığı kabul edilerek oluşturulan çevrimlerin karşılaştırmaları yapılmıştır. Elde edilen sonuçlara göre R-404A kullanım durumunda kompresör işi en yüksek olup, bunu R-410A, R-407C, R-290, R-134a, R-600a, R-600 ve NH_3 takip etmektedir. En küçük kompresör işi de R-123 kullanım durumunda elde edilmektedir. Alternatif soğutucu akışkanlara göre analiz edilen tek kademeli buhar sıkıştırırmalı soğutma çevrimlerinin ekserji analizinde ise maksimum ekserji verimi R-123 çevriminde (%40.46) meydana gelirken minimum ekserji verimi de R-404A çevriminde (%33.29) meydana gelmektedir.

Çalışmada ayrıca R-123 soğutucu akışkan için farklı buharlaştırıcı ve yoğuşurucu sıcaklıkları için (50 kW soğutma yükünde) performans katsayısı (COP) değişimleri incelenmiştir. Performans katsayısı (COP) buharlaştırıcı sıcaklığı ile artmaktadır. Performans katsayısının (COP) artan yoğuşurucu sıcaklığı ile azaldığı sonucu elde edilmiştir.

Montreal Protokolü gereği buhar sıkıştırırmalı mekanik soğutma sistemlerinde ozon tabakasına olumsuz etki yapmayan ve küresel ısınmaya az neden olan akışkanların kullanılması gerekmektedir. Bu çalışmada soğutma sistemlerinde kullanılan mevcut soğutucu akışkanların yerine yeni nesil alternatif soğutucu akışkanların kullanımının yaygınlaştırılması önerilmektedir.

Semboller

h	Entalpi [kJ/kg]
\dot{m}	Kütleli debi [kg/s]
\dot{Q}	Isıl güç [kW]
T	Sıcaklık [$^{\circ}\text{C}$]
\dot{W}	Kompresör gücü [kW]

Alt indisler

buh	Buharlaştırıcı
\dot{c}	Çıkış
g	Giriş
komp	Kompresör
yoğ	Yoğurturucu

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CASE STUDY OF THE IMPACT OF USING TECHNOLOGY IN SAUDI ARABIA PRIMARY SCHOOL IN SUPPORT OF TEACHING AND LEARNING WITH REGARD TO THE ENGLISH CURRICULUM

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Abstract

This paper reports on an experimental case study that aimed to explore the impact of the use of technologies in the teaching of English in a primary school in Saudi Arabia. In this study, the researcher applied various technologies such as an iPad, a computer, and a projector when teaching English language to the groups of Primary children. These groups comprised of three different classes, while the traditional method of teaching, lecture style input was applied to control groups also made up of three age matched classes in the same school. The aim of using an experimental research approach was to determine the effectiveness of the technology when the teacher applied them in their English classes in a Saudi setting, and the effectiveness of using such technology in terms of the students' achievements particularly when technology is not traditionally used to support teaching in this context. The analysis included both qualitative and quantitative. The results drawn from this study demonstrates evidence that the different technological devices do support English language learning in some students.

Literature Review

According to Riasati, Allahyar and Tan (2012), technology helps to increase student motivation such as when fun and games are brought into the classroom. Furthermore, it is proposed that the students' experience of new technologies in the learning environment can improve their engagement and motivation with regard to performing tasks. The authors also note that when used in the classroom as a tool for learning, technology encourages collaboration and communication during the performance of learning activities. For example, using technology such as an iPad, computer and projector, enables students to gather information and interact with resources such as songs, videos, presentations and images. According to Riasati, Allahyar and Tan (2012), another major advantage of using technology in the classroom is that it helps lower learners' anxiety levels, increase learner autonomy and encourage the development of particular language skills.

Moreover, Almutairi (2008) suggests that, as far as teaching English in Saudi classrooms is concerned the traditional method of teaching is that of lecture style, students only sit and listen to what the teachers says, while the teacher spends a lot of time explaining basic things to the students. While this technique makes it easier for the learners to achieve grammatical proficiency, it does not sufficiently implement new teaching techniques such as using technology in the classroom to support the teaching process. It could also be proposed that this lecture style approach does not enable students to practice their skills as effectively and does not support full mastery of the language. The research highlighted some of the problems with learning English in Saudi schools such as the large numbers of students in the class, limited English lessons, and the poor availability of technology in the classroom. As a result of this research, a number of recommendations are made in order to improve future practice and prevent these problems. In this paper, the researcher will present a case study of the impact of using technology in a Saudi primary school to support teaching and learning with regard to the English curriculum.

Learning English Technology to support types of Technology

A number of different technologies can be used in order to support learning in classroom, the focus for this study is on a number of readily available devices that could be applied in the classroom in Saudi Arabia, these include the computer and iPads. The computer and iPad applied by the researcher in teaching two different classes in the sampled school each fall within the umbrella of a computing device or a computer technology (Pearson Education, 2002). A computing device in this regard is an electronic device controlled by a processor and that can accept many software programmes for performing different functions (Emory University, 2017). A projector in itself is not a computing device but rather is an electronic device that is used to display images from a computer, film or images as noted by National Council For Teacher Education (2016).

The use of tablets or iPads and other devices such as mobile phones, and smartphones in teaching and learning has remained a subject of great controversy (Chartrand, 2016). For example: mobile devices have also been associated with hardware and software failures and smaller screens which make reading of content and input of text difficult (Chartrand, 2016). However, there is a view that such technologies bring a wealth of creative options to the learning environment and, therefore, enhance the learning experience (Chartrand, 2016; Pellowe et al., 2014).

Many educational experts have noted the importance of computers and related technology in education (Simmons & Markwell 2001; Saba 2009). On their part, Simmons and Markwell (2001) note that technology can enhance education and is becoming more and more essential to learning. Saba (2009) is quick to note that mounting evidence indicates that technology helps improve student achievement both in terms of overall performance and in core subject areas. In addition, computers and mobile devices allow access to resources such as the Internet and YouTube, which may present new and exciting learning opportunities especially for students (Chartrand, 2016). Chartrand (2016) goes further to note that language teachers have found mobile devices useful in accessing online content, music and videos, all of which support the learning of new languages. Moreover, Saba (2009) notes that computers do not only have a potential impact on quantitative assessment performance in subjects but also leads to qualitative improvements compared to traditional teaching and learning methods. Studies also indicate that students with special needs and those who are low achievers tend to improve even more than high achievers and average students when they learn using computers as opposed to when they learn using traditional instructional methods (Saba, 2009).

On the other hand, projectors have been used to display images, notes and book content to the entire class and also to display course material to engage learners in games, songs, videos, presentations, simulations and quizzes among other activities (Klopfer et al. 2009). In both cases, the projectors have replaced or complemented whiteboards in the classroom, reducing the need for teachers and students to write notes on whiteboards (National Centre for Technology in Education, 2008). Also, Harrison (2008) notes that projectors when used to display presentations and electronic books enable the teacher to present well organised notes and make it easier for students to take better notes as they have the ability to discern the most useful information that the teacher displays to them. At the same time, the projector allows the easy and convenient display of previous information whenever there is need to revisit important content. One other main advantage of projectors is that they can be used to display information to an entire class rather than having to display information to each student individually such as through individual computers as noted by the National Centre for Technology in Education (2008). Furthermore, projects enable better use of time as the teacher does not necessarily need to write on the board and erase it when it is full. Instead, a simple click of the mouse leads to the display of new information, which effectively frees time for the teacher who would otherwise have to write and rewrite information (National Centre for Technology in Education, 2008).

Another benefit of using a projector in education relates to its capacity to reach students with multiple approaches. In this regard, learners enjoy seeing, hearing and interacting with technology as opposed to simply listening to the teacher or reading a textbook (Harrison 2008; National Centre for Technology in Education 2008). Learners can also take part in interactive and real time activities, which can help to promote the development of critical thinking skills. The projector can be used as a tool to effectively display or illustrate events or concepts in a way that may not be possible using the whiteboard according to the National Centre for Technology in Education (2008). National Centre for Technology in Education (2008) notes that when a projector is used in teaching and learning, the teacher and students can still maintain eye contact and can benefit from verbal and non-verbal communication as well.

The aim of this study is to explore the impact of technologies such as the iPad, computer and projector in support language learning in a primary school in Saudi Arabia. One of the research questions was: What is the impact of technology on student achievement and on making good progress in the English language?

The researcher used the assessment process to measure the learning outcomes. The assessment process was completed by the main English teacher. In the section below, the researcher explains the assessment methods, experimental design, and the experimental results to answer the research question.

Participants

This research focused on applying a single case study for understanding how technology enhances the English language learning in Saudi Arabian primary schools. In Saudi primary schools English lessons are started from grade four. These English language classes comprise grades four (A&B), five (A&B) and six (A&B) where students of ages 10, 11, and 12, in that order are enrolled. Each grade has two classes with a minimum of 30 students each. These grades have two teachers of English who teach English twice a week for each class in a 45 minutes long session. In this part of the study, the researcher applied various technologies such as an iPad for grade four B, a computer for grade five B, and a projector for grade six B when teaching English language to the experimental groups. These comprised three different classes, while the traditional method of teaching was applied to control groups made up of three different classes: grade four A, grade five A, and grade six A. The researcher then used the assessment process to measure the learning outcomes. The assessment scale in this experiment is as follows: Excellent, Very Good, Good and Fail and was consistent with the form typically used in the school. The assessment process was completed by the main English teacher. The aim of using an experimental research approach was to determine the effectiveness of the technology when the teacher applied them in their teaching in English classes, and the effectiveness of using technology in terms of the students' achievements.

Methodology

Experimental Design

It is a challenge to conduct true experimental research within real life scenarios since it is difficult to derive perfectly aligned groups in relation to multiple variables including aspects of age, gender, income or work grade (Gray, 2004). In the current researcher's experiment, pupils were randomly assigned to either an experimental or a control group. In the current research, the researcher also explored the fluency in the language in terms of the ability of the students to read, write, comprehend, and speak English through assessment as accessed. In this assessment, the researcher follow the English curriculum but made change to the presentation aids. This approach enabled the researcher to explore if and how technology can be employed to support English language learning. The use of an experimental research design could be considered in the context of the wider research around the use of technological aids in the classroom. Associated technological aids are utilised towards evaluating 'treatment groups' in the context of action research. Such processes entail a significant degree of cooperation amongst both researchers and participants, which emphasises bringing around noticeable changes within the overall organisation (Gray, 2004). The emphasis of the initiative is to bring about changes within the attitudes and perspectives of participants within the field so that the data could be compiled in the context of both qualitative and quantitative methodologies (Gray, 2004).

The experimental group was provided with treatment – the introduction of iPads, computers, and projectors – while the control group experienced teaching in the normal way. The current study draws upon multiple methodologies to ensure the overall credibility and integrity of the study conducted.

Assessment Method

In the researcher's current experiment, pupils were randomly assigned to either an experimental group receiving intervention, or a control group receiving normal tuition. All of these groups are age matched. Learner assessments are some of the most important drivers of student learning, for example, computerised tests. Assessments aim to measure achievement of learning outcomes, and grading or classifying student achievement as noted by Winston-Salem State University (2016). In this study, the assessment method applied was exam testing. The assessment scale in this experiment is as follows: excellent, very good, good and fail. The results of the study revealed that learners in lower grades tended to show a dislike for taking exams possibly because of their inexperience and lack of confidence in using English language. However, experts note that written exams as an assessment method is advantageous in that it is economical and is a valuable source of information on student achievement, offers equal opportunities to learners and is less subject to plagiarism (Murphy, 2009). Also, Murphy (2009) mentioned that it is a fact that different teachers differ in their grading practices and policies which is another major limitation of exams as an assessment method.

Technology and Motivation

Qualitative Results

The qualitative results of this study have been collected by the current researcher from both controlled and experimental groups. So far, the results have demonstrated that, when the researcher used technology in the experimental groups, the students in classes who used technologies, seemed to be more motivated to learn than their counterparts in the traditional classes. This finding is consistent with several studies that indicate a relationship between technology use and learner motivation. Saba (2009) notes that technology is effective in improving attitudes towards learning. Many research studies have shown that most learners prefer to learn by using technology which subsequently leads to confidence boost and a better attitude towards education. Some experts are of the view that technology provides the opportunity for individualised learning as stated by Saba (2009). For example, when students take control of the rate at which they learn as they use technology which helps them avoid embarrassments that may come with making mistakes publicly. Another main advantage of learning using technology is that it provides immediate feedback with resultant reduction in learning time. This in effect makes learners feel more confident, develop a sense of accomplishment, and leads them also to develop a positive attitude towards learning (Erdamar & Melek 2008; Riasati, Allahyar and Tan, 2012). However, the use of different technologies in education is a subject that's has received significant attention among educational researchers. According to Brown (2011), the use of different technologies can lead to higher levels of productivity, unprecedented flow of ideas and the avoidance of boredom. This rationale supported the researcher's use of different technologies during lessons with an aim of that specific technologies may not be rich in all aspects and therefore may need to be used together with other technologies or methods to meet the diverse needs and learning styles of learners.

Experimental Results

The results revealed that in grade 4A, 25 (58%) out of 43 students in the class in which the traditional teaching method was used scored Excellent grade in the English test. The remaining 18 (41%) students in the same class

scored very good grade, with no student having a good or fail grade as evidenced by (Table 1). In grade 4B where technology was used to teach (iPad), 31 (72%) out of the 43 students in the class got excellent grade while the rest 12 (27%) of the students got very good grade as evidenced by (Table 2). No student got a good or fail grade as evidenced by (Fig. 1).

Grade four A (Traditional methods)

Students	Percentage
Excellent 25	58%
Very good 18	41%
Good 0	0%
Failed 0	0%

Table 1: The number of children achieving each grade when using traditional methods

Grade four B (IPad)

Students	Percentage
Excellent 31	72%
Very good 12	27%
Good 0	0%
Failed 0	0%

Table 2: The number of children achieving each grade when using iPad

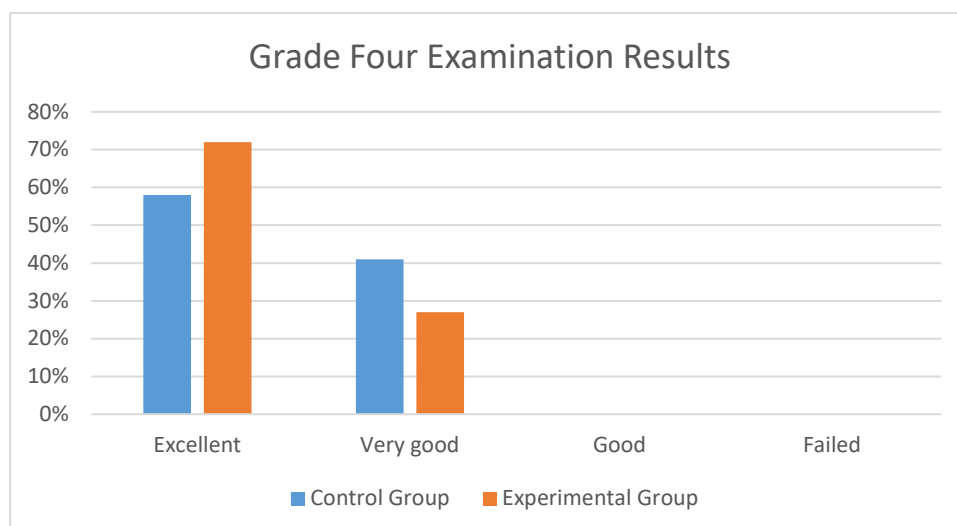


Figure 1: summaries the test results as scored by grade 4A (the control group) and grade 4B (the experimental group) students.

The results demonstrate that these children in both the experimental and the control group were of similar ability, allowing the researcher to make comparisons easily. These results indicate that the use of an iPad appears to support learning in some children.

In grade 5A, in which the traditional method of teaching was used, 8 students out of 41 (20% of the class) obtained an excellent grade in the English test. Also, 24 students obtained a very good grade, accounting 59% of the class, 8 students were graded as good, accounting for 20% of the class while, and a student (2%) was graded Fail as evidenced by (Table 3). In grade 5B, in which technology was applied in teaching in the form of computers, 19 out of 40 students (48%) were given an excellent grade. Also, 17 students (43%) in the same class got a very good grade, and 4 got a good grade (10%) as evidenced by (Table 4). None of the students in the class was given a fail grade as evidenced by (Fig.2).

Grade five A (Traditional methods)

Students	Percentage
Excellent 8	20%
Very good 24	59%
Good 8	20%
Failed 1	2%

Table 3: The number of children achieving each grade when using traditional methods

Grade five B (Computer)

Students	Percentage
Excellent 19	48%
Very good 17	43%
Good 4	10%
Failed 0	0%

Table 4: The number of children achieving each grade when using computer

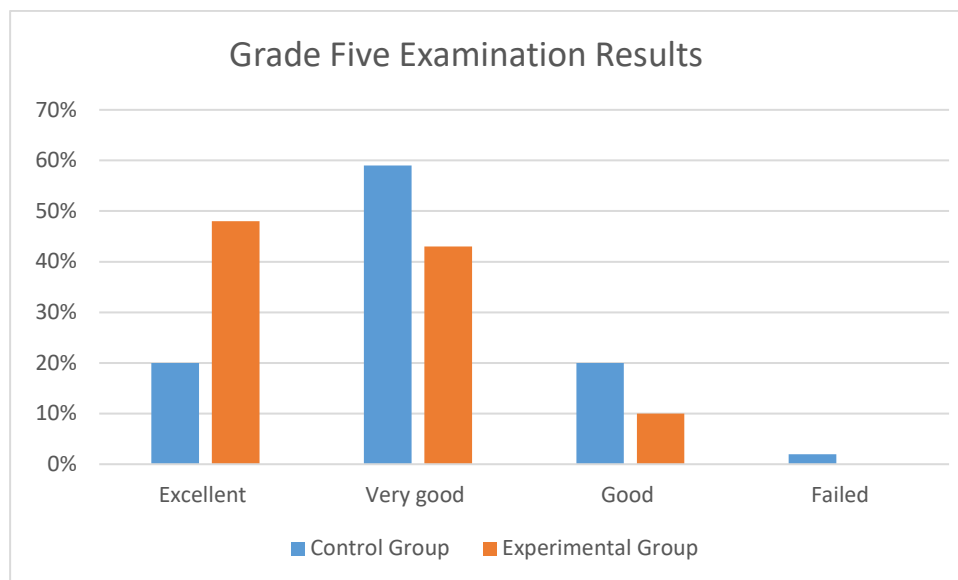


Figure 2: presents a summary of the test results for grade 5A (the control group) and grade 5B (the experimental group).

These results show that these children in the experimental and control groups were of similar ability. Consequently, it made comparisons easy. These results suggest that the use of computers appear to support learning in some children. However, it would appear that a much higher proportion passed the exam with an excellent grade when using a computer to support their learning. In addition, there were no failed students in the experimental group.

In grade 6A where the traditional method of teaching was applied, 17 (41%) out of the 41 students got excellent grade in the English test. Those who got very Good grades were 22 (54%) and good 2 students (5%) respectively. No student got a fail grade in the test as evidenced by (Table 5). On the other hand, 19 students (46%) out of 41 students in grade 6B, in which technology was applied in teaching (Projector), got excellent grade. Those who got very good grade were 22, representing (54%) of the class population as evidenced by (Table 6). None of the students in the class got good or fail grade as evidenced by (Fig.3).

Grade six A (Traditional methods)

Students	Percentage
Excellent 17	41%
Very good 22	54%
Good 2	5%
Failed 0	0%

Table 5: The number of children achieving each grade when using traditional methods

Grade six B (Projector)

Students	Percentage
Excellent 19	46%
Very good 22	54%
Good 0	0%
Failed 0	0%

Table 6: The number of children achieving each grade when using projector

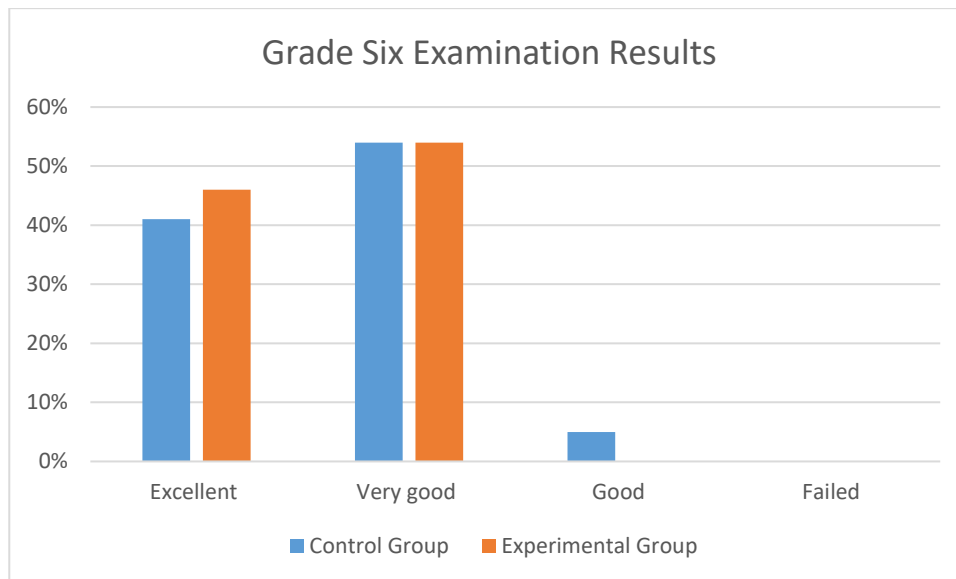


Figure 3: presents a summary of the results of the test for grade 6A (the control group) and grade 6B (the experimental group).

These results show that the children in both the experimental and control group were of similar ability. These results suggest that the use of a projector appears to support learning in some children. However, it would appear that a higher proportion of children passed the exam with an Excellent grade when using projector to support their learning and both groups more or less stayed obtained the same very good grade. Also, there were no good or fail students in this experimental group. This means that the use of the projector improved the students' achievement in the experimental group in that there were more excellent and good results.

It is evident from the test results that in each of the three grades, the experimental group showed better performance compared to the control group. On average, the experimental group had 16% higher number of students with excellent grades than the control group. The experimental groups also generally had a lower number of students with fail and good grades compared to the control groups in each grade as evidenced by (Fig.4).

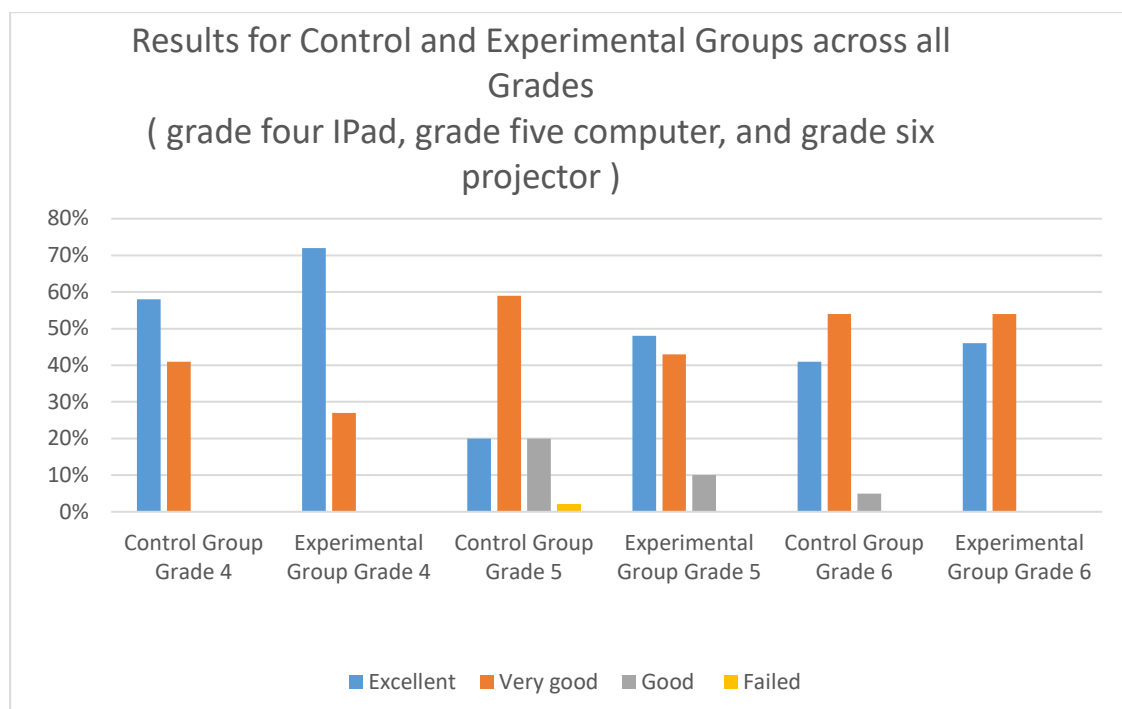


Figure 4: results for control and experimental groups across all grades

Table 4 shows the results of the assessment data across all the grades and conditions in the study. For example, the experimental groups in all grades had a higher number of students in the excellent category, and no students

obtained a fail grade. It appears that in all cases, regardless of the type of technology used, its inclusion had a positive impact on learning compared to that of traditional classes which is the control groups.

The Key findings:

This paper presents the evidence from a single site case study in order to demonstrate the potential effectiveness of using technology in order to support student performance and motivation for English language learning in a primary school in Saudi Arabia. Various technologies, including a tablet (IPad), a computer and a projector were used when teaching the English language to the experimental groups. It has been discovered that the use of these devices supported learning in some students. At the same time, a much higher proportion of children passed the exam with an 'Excellent' grade when using the mentioned devices to support their learning. Also, Saba (2009) mentioned that technology contributed to higher levels of students' academic achievement. One key finding from the experimental study that group work was more beneficial to individual students' success and performance compared to working alone.

It is relevant to conclude that Saudi schools should more actively invest in technology in order to equip their teachers and students with the necessary tools and resources. The analysis outcomes have demonstrated that the use of technology such as tablets (IPad), computers, and projectors facilitates the development of students' proficiency in the English language and add to their overall academic performance. At the same time, it is important to ensure that Saudi teachers are ready and willing to integrate technologies in the learning process and use these technologies in an effective manner (Abukhattala, 2016). So that they are able to capitalise on possible learning experience and advantages of using technology.

However, the Ministry of Education in Saudi Arabia said that the education will be transferred from the curriculum taught through the use of books, to electronic-based education, and the Ministry of Education stated that electronic-based education will cost 1.6 billion Riyals for the next three years. He said that electronic-based education will be available in 150 schools in the coming year, then 1,500 schools the year after, and it will be available to all schools in the third year. Moreover, as a result, he mentioned that this electronic-based education will be a very important event that would be available in every Saudi Arabian school by 2020 (Algamdi, 2017). As a result of the Ministry of Education's statement, this study into the impact of technology on English language learning and teaching, will support the introduction of electronic-based education. This development to more technology-based education highlights the timeliness of this study. However, this study has positively impacted on the use of the technology which can be used for other aspects of the curriculum in Saudi Arabia schools. This study will also supports the transfer of education from the use of books to electronic-based education by 2020.

According to Shar (2018) at the second session of the fifth Professional Development meeting held at the Ministry of Education in Saudi Arabia on 31 January 2018, Dr. Al-Juhani pointed out that electronic learning is a form of informal education, but over time the general idea of informal education will change. It will become as important as formal education, especially with regard to the increased use of distance learning and the increase around the world of the interest of people in technology. In addition, Dr. Al-Juhani explained that electronic learning is based on the use of modern technology as a means of providing an educational curriculum that differs from what is offered within the traditional classroom. It can also take an interactive form as educational programs on the Internet. Dr. Al-Juhani reviewed some statistics and figures indicating the increasing reliance on technology and the use of the Internet. He pointed out that by mid-2017, is equivalent every 10 children have six children using the Internet, many of whom participate in called electronic learning, even if they do not realise it (Shar, 2018). This research supported the impact of the use of technology in primary school in Saudi Arabia.

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CHALLENGES IN TEACHING GLOBAL SOFTWARE ENGINEERING TO UNDERGRADUATE STUDENTS: COURSE DESIGN

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Abstract: Unlike many courses in the field of computer science, teaching software engineering comes with a set of challenges. These major challenges can be categorized into five aspects, namely: (1) incorporating a case study based approach to the design of lectures and assignments, (2) including projects from a range of domains, technology, and platforms, (3) keeping up with rapid evolution of technology, (4) setting up a development environment enabling students to understand the impact of geographical, social, and cultural implications on software development, and (5) having students understand the fact that software development is not simply a technical activity, but involves facilitating effective operation of teams. Since software systems have now become an integral part of almost every single industry, producing students who can develop and maintain systems that span across various industries is critical. This paper describes each of these challenges and possible approaches towards overcoming these challenges. The focus of this paper will address the challenges of creating a course within an undergraduate computer science curriculum to teach global software engineering. Due to the globalization of software development activities, industries are looking at recruiting students who are equipped with skills needed to deal with challenges around global software engineering. Designing instructional materials and assessment tools to develop this unique mix of skill sets is addressed in this paper. We also discuss both the traditional and non-traditional aspects of teaching software engineering to computer science students.

Keywords: Global software engineering, Course design, Challenges

Introduction

Software engineering has become an important course in the CS curriculum. Students entering into software engineering companies are expected to have a wide range of skills sets ranging from communication to purely technical skills. Most importantly, today's computing industries operate across the globe where either their customers are from a different country or their development team operates from another country. Industries hiring CS students have a general observation that our students struggle with projects that require them to be operating in a global environment. Organizations have started to research and invest on bringing Global Software Engineering (GSE) into classrooms and teach students the needed skill set enabling them to succeed in a global project development environment. This paper is also one such effort of teaching GSE to undergraduate CS students and add it as a required course into the CS curriculum.

Global Software Engineering involves software engineering practices carried over a global setting. Today's software development activities get distributed across the globe mainly to lower the development cost. By outsourcing development tasks to low-wage countries, the overall software development cost can be brought down. This introduces a scenario of global software development team who have to operate together to build a reliable software product. To remain competitive in the market, software companies have to deliver a product that gets used by global customers. This furthermore adds on challenges of building a software product that should satisfy requirements from multi-cultural settings, varying political, ethical, and societal backgrounds. Global software development teams have to ensure proper communication and planning to overcome language and time zone barriers. Non – functional aspects of the software like look and feel, ease of use, and aesthetics vary across the globe. If a software is built for global customers, then care should be taken to ensure that these non-functional aspects get addressed during the software design.

Teaching software engineering to Undergraduate students has become challenging due to the complex nature of evolving software systems. Simulating real world software development inside a classroom setting is not easy due to several resource constraints. Educators have been working on pedagogies that can effectively simulate the real-world software development experience for students. Teaching global software engineering is even more challenging compared to teaching software engineering. Simulating a global software engineering environment to teach the principles and practices of global software engineering is very challenging. In this paper, a sample syllabus is presented for educators to use in their curriculum. The global software engineering course design proposed in this paper has been done after careful analysis and through the experience of many years of offering software engineering coursework.

The rest of this paper is organized with a related work section, a teaching software engineering section, a global software engineering – course design section, and a summary section.

Related Work

Urban [11] addressed software engineering on the web through a graduate level course on software requirements and specifications. The course project involved the development of a web-based software tool that implemented the ANSI/IEEE standard on software requirements specifications. The graduate course was offered during the Fall 1998 semester. The concepts developed in the graduate course were followed through into an undergraduate senior-level software engineering project two course sequence during 1999. There were several other IEEE software engineering standards developed into web-based software engineering tools during subsequent years.

Deiters, Constanze, et al. [4] stated that depending on the stakeholder located in a particular region, the distribution of the software development projects varies. There must always be a good combination of theory and practice for a software engineering program in a university. The paper brings forth the concepts behind the common teaching atmosphere for global software engineering called the GlobSELab. Based on the feedbacks obtained from the participants, the GlobSELab was added to the course. The lab describes the teaching intentions, project management, and quality assurance. Motivated by the experiences of the distributed practical course, foreign universities were invited to create a platform that correlate more of an industrial reality. The course will be of great benefit to provide solutions to typical problems of global software engineering.

Paasivaara, Maria, et al. [10] developed a course where they incorporated the concepts of distributed Scrum in a global software engineering (GSE) environment. The course adapts a combination of both agile methodologies and industry best practices. The previously used GSE courses used plan-driven methods. Whereas the distributed Scrum method is unique in assessing the student expectations and learning. A mixed-method approach has been employed to assess the learning, distributed collaboration, building trust, and inter-cultural collaboration. The results obtained from the analysis of data before, during, and after the course yielded the discussion about the

challenges in applying the skills, strategies to overcome the challenges, and the strategy effectiveness. Hence, distributed Scrum in combination with GSE would be considered as an important course design.

Lescher, Christian, et al. [6] in their paper have stated that GSE has brought forth several new challenges in the market. Some of them are geographic separation, various time zones, cultural and language barriers which causes a delay in the communication and often leads to quality and cost issues. In the paper, GSE was taught in two different classrooms in order to compare them with the traditional classroom setting. This approach resulted in the reflection on GSE key effects on communication issues, and distribution delay. This effort is intended to expand the work on interactive GSE exercises and to extend the set of exercises by evaluating additional exercises for teaching GSE.

Nordio, Martin, et al. [9] discussed several challenges that a software engineering student will face in distributed software development. A software engineering course was taught using globally distributed projects with an aim to prepare the student to meet such challenges. The paper presents the experience regarding an approach used to teach distributed software engineering. Even though the approach is an old method, improvements have been made based on the lessons learned by the authors. The API design has an important role in this approach. In addition, this approach has an emphasis on the development of communication skills as almost 30% of the time is spent by the student in a project by corresponding to communication.

Beecham, Sarah, et al. [1] adopted a Global Teaming Model framework to describe the requirements of global software development. From the assessment of three small or medium sized enterprises (SME), GTM practices that are relevant to SMEs have been identified. Assessment was also done on the gap between practices addressed by GSE-Ed literature and the needs of SMEs engaged in GSD. Seven GTM practices were relevant and two were lacking. The analysis brings forth the complexity involved in the roles and responsibilities of the instructors in GSE-Ed courses. Hence, students face the reality that practitioners of SMEs need to actively participate in the education process. Beecham, Sarah, et al. [2] have also conducted a study in offering different options to CS educators teaching CS courses in a global setting. They specifically focussed on learning GSE theory and learning GSE by doing. Studies that take a hybrid approach of combining theory and practice were also included in this paper.

Matthes, Florian, et al. [8] stated that international aspects must be included in the education of software engineers along with technology and management. The paper described an applied approach that involved 43 participants at 5 different distributed academic institutions. The paper presented the lessons learned from recommendations by teaching staff and students. The approach introduced is expected to serve as a base foundation for similar GSE ventures.

Li, Yang, et al. [7] stated that software engineering is now facing challenges due to globalization. Many industries ensure global competitiveness by transferring a part of their development activities to distributed countries. Instructors face the problem of incorporating skills related to recent developments in global software engineering. The paper describes the exercises required for teaching GSE in a single class room and report the experiences. The students gain experience to work with various time zones and time management. Hence, such exercises could be included in the course curricula.

Kuhrmann, Marco, and Jürgen Münch [5] stated the importance to understand the need for interdisciplinary teamwork for a successful project execution. A course unit discussed in this paper, was used to create an awareness among students regarding the role of communication in distributed software development. The course unit presents: 1) an environment in which students can learn distributed agile software and 2) a controlled experiment instrument for organizing a small software project to be carried out in virtual teams. Some of the challenges faced by the students are to overcome the limitations, set up teams, and develop the application. The results due to poorly organized communication indicated that there were issues regarding technical, architecture and developmental resources. Hence, the lack of communication protocols can impact the team's coordination and performance.

Damian, Daniela, et al. [3] presented a framework for teaching GSD skills in collaboration with three universities. The findings from their research show that the students learned to recognize the importance of effective communication between clients and developers and how the GSD environment influenced the communication.

Teaching software engineering

The following are the issues and some solutions on addressing those issues while teaching software engineering.

(1) incorporating a case study based approach to the design of lectures and assignments,

Adopting a single case study throughout the course work has proven not to be successful while covering different concepts of software engineering. While the other extreme of using too many case studies inside the coursework have also often confused the students. The approach that has proven to be useful is usually to take two different case study examples for preparing the lecture materials and use two or more complete different ones for coming up with assignments and in-class activities. Through this approach, the students get to understand the concepts by applying them to just enough case study examples. Usually referring to more than one textbook for case studies and also looking out for more real-world examples to help them understand the real-life scenarios has proved to be very successful.

(2) including projects from a range of domains, technology, and platforms,

Selecting appropriate projects from a range of domains, technology, and platforms is a key factor in teaching software engineering. By including projects from different domains, we can prepare students with skills sets needed to be successful in the real-world. A real challenge is developing these projects and preparing the students with the background information needed. For instance, if we include software projects from the healthcare domain, how do we prepare students with the background information on healthcare industries in general to help them build projects in this domain? How much time do we spend investigating the domain before we let the students perform the actual development? One of the solution to this problem is to have a system analysis and design course as a pre-requisite to this course where we can focus on teaching students analysis and design techniques. Requirements analysis techniques, such as root-cause analysis, informal benchmarking, observation, and outcome analysis, can be used to investigate the problems that come from different domains.

(3) keeping up with rapid evolution of technology,

The projects of choice and the technology used during software development should reflect current technology. By keeping up with the technology, we not only teach students on how to build with latest technology, but also use the latest CASE tools and techniques to aid project development. This situation is crucial and challenging due to rapid growth of software technology. By letting the students do technical feasibility analysis during the initial stages of project development, incorporating the use of CASE tools during software development, and the choice of hardware and software based on the industry needs will help handle this situation.

(4) setting up a development environment for enabling students to understand the impact of geographical, social, and cultural implications on software development, and

This challenging aspect addresses problems beyond just solving the problem and implementing a solution. Students usually try to overlook this phase and underestimate the importance. The non-functional aspects of software development needs to be included during the early phases of software development. Conducting a pre and post mortem analysis with respect to these aspects during software project development will help students understand and experiment the impact of geographical, social, and cultural implications during software development.

(5) having students understand the fact that software development is not simply a technical activity, but involves facilitating effective operation of teams.

Teamwork is an essential skill required for software engineering jobs. Efficient team management skills and their effective operation is key to successful completion of the project. Students come in with varying interoperable skill sets and are required to learn the importance of being responsible team players. Some of the proven methods of helping students to work efficiently in teams include: effective team formation, practice of recording team meeting minutes, maintaining an anonymous online team resolution center where students can report team problems and get solutions, having 2-3 teamwork assessments done during the course of project development, and having a percentage of the grade assigned for effectively working in teams.

GSE – Course Design

The prerequisite of this course should be a Requirements Engineering or System Analysis and Design course. Students should be able to clearly state the non-functional aspects of the project, such as the geographical, social, and cultural implications as requirements. Course design of a GSE course is provided in Appendix A. The course description, objectives, and the major components of the course are highlighted in the syllabus. 50% of the total weight has been assigned to global project development and the components with descriptions are detailed in Table 1.

This course provides the students with an opportunity that in the GSE course is unique when considering that many other course for group projects puts together students who immediately begin development of the software from a problem statement. The team formation activities that occur early in the GSE course will set the stage for enhanced communication, member strength analysis, and project management aspects.

The concepts in the GSE course adds a level of complexity to a software engineering course project that is not experienced in most other software engineering projects. The success of the students will transfer into software engineers who are industry ready.

Summary

Current literature clearly supports the need for global software engineering courses at the undergraduate level. This paper has provided the motivation and survey of earlier efforts for the development of global software engineering courses in a CS curriculum which includes issues and relevant solutions in teaching software engineering. The authors present GSE – Course Design which elaborated on one instance of a GSE course at the course information level including the syllabus that will be used during implementation fall 2018. The next step will be to gather data on the further design and implementation of the stated GSE course. Through continuous process improvement, the constituents will help drive course enhancements.

Appendix A

CS – XXXX - Global Software Engineering

Prerequisites

Requirements Engineering or System Analysis and Design

Course Descriptions

This course teaches the essential skills necessary to develop software systems in a global environment. This course will cover fundamental topics of a global software engineering life cycle process from requirements specifications to testing of a completed software system in a global setting. The course has an emphasis on essential communication skills required by the students to effectively conduct the software development process in a global setting. This course is project based involving practical implications along with team work. Projects for this course will be approved by the instructor in advance and will be originating from different countries. A major part of the course will involve students to work with global stakeholders to design and develop software systems. Students will be supervised and are expected to be well organized while working with team members and developing their presentation and management skills.

Objectives

After completion of the course, students will be able to

- Select appropriate software life cycle process models to be used for global software development
- Describe and apply fundamentals of software engineering methodologies and techniques to build projects on a global setting
- Recognize the importance and challenging aspects of gathering software requirements especially when the customers are geographically distant
- Translate software requirements to design, design to code, and then test the software system based on appropriate global software engineering methodologies
- Choose appropriate CASE tools, models, design patterns, architecture, and programming language for global software engineering
- Employ team work – that includes project management skills, interpersonal, and communication skills in a global setting
- Describe different software testing methodologies that have been effective with global software engineering

Grading Policy

Class attendance and participation	5%
Homework/Lab assignments	15%
Project	50%
Exam (2 midterms 10% each, 1 final 10%) :	30%
Total:	100%

Table 1: Project Grade Distribution

Here is the breakdown of how the project grade is being calculated.

S.No	Tasks	Description	Weights
1.	Project plan and feasibility analysis	During the first two weeks, students are required to establish communication with their global customer as directed by the instructor. They are required to come up with a project plan and also conduct feasibility study.	5%
2.	Decide on a software life cycle model and establish modes of contact with the global customer	Choice of a suitable software development life cycle (SDLC) model along with effective modes of communication between the team and customer is very important.	5%
3.	Requirements analysis	Based on the choice of SDLC, this phase would differ. A good understanding of the requirements is essential for all project development.	10%
4.	Design	Design and implementation will be done by the project teams with constant feedback from their global customer.	15%
5.	Implementation		20%
6.	Testing	Testing will be done by another team different from the ones who developed this project. Test data and the methodology should be clearly specified by the project developers. The other team should consider themselves working in a different country and follow the practices followed in that specific country to conduct the testing.	10%
7.	Appropriate use of software tools Post-mortem analysis of what went well and what can be improved	The appropriate use of technology will be weighed as a factor contributing to the performance of the project members. Factors that led to success and failure of the project will be documented by the student.	10%
8.	Documentation Meeting minutes	Documentation of the entire project development along with the minutes recorded during every meeting should be reported.	10%
9.	Customer evaluation and feedback	Rubrics will be provided to the customers for evaluating the teams working on their requirements.	5%
10.	Final Presentation		10%
	Total:		100%

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Chemical Design and Environment

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Abstract. The title of this paper refers to evolving and adapting homes to encounter the emerging requirements of people with the help of chemical sciences. By 2000s, most of humanity stays in big and large places and about 60-65 percent of the world's individuals would be city-dwellers. The problems which to be encountered in getting food, water and energy source are massive, when improved by climate change (Prest, 2009). In this paper, we are focusing at the role for chemists in the growing cities face due to the difficulties that get on resources, regarding the produce energy generation and use at homes.

Keywords: chemical design, environment, energy, city, home, transfer

Introduction

Metropolises have massive needs on waste, water and air value organization. We require technologies and sciences which aid to offer healthy, clean, maintainable city environments. Metropolises have only 2 percent of the Ground's surface, and cities consume 75 percent of the earth's natural sources (UN-HABITAT, 2008). In this report, it was stayed they consist of water, fuels, food, building elements. There is a need for technologies and sciences that provide healthy, clean, sustainable urban environments (Prest, D. 2009). Air pollution emissions are probable to rise when cities expand step by step. Calculating air pollution presents us a data scientific origin for its controlling. Scientific approaches and technological advances need to be designed in developing low cost, developing urban environments and sensor networks for monitoring atmospheric pollutants (Teitelbaum, 2007). It is underlined in the above report that this transformation must be coupled with changing greenhouse gases and by great international warming probable to low destructive crops and improving catalysts for destroying pollutants. Also, He added that the technological transform needed to decrease the burdens located on food, energy and water are settled in the particular units (Prest, D. 2009).

Waste is a serious issue for cities (IPCC, 2009). Valuable materials could significantly reduce this burden with adding existing technologies in gasification for reprocessing plastic waste into fuels (<http://ec.europa.eu/environment/waste/index.html>, available at 23.06.2018). According to European commission reported that The EU produces 1.3 billion tons of waste every year, equal to 3.5 tons of solid waste. Also, it is added to this report that most of all waste is placed in landfill (Prest, D. 2009). We deal with the following subjects to explain the role of chemistry for home or city construction;

- Construction materials
- Energy generation and consumption at home

Construction materials

It is required to operate materials for building, and form extra aids in the application, and could be used for new form and for reconstructing more structures (Prest, 2009): Prest noted that every year, 4500 million tons of materials are used in building in the UK. The building industries build four times more waste than the national sector, over a ton per person life. (BWEA, 2008). The technological support should be modulated as bellow (Prest, D. 2009; international Energy Agency, 2016):

- developing recycling methodologies,
- rising larger structure materials for reconstruction of older buildings,
- increasing low energy resources

According to BWEA report, the chemical sciences add to the expansion of energy efficiency processes in homes. It is stressed in the report that these technologies should be attached with innovations in developing superior construction resources to make a significant step change. Eco-efficiency in the construction home will also be achieved with technological innovations in the following areas (BWEA, 2008):

- the expansion of flexible anechoic construction materials,
- functional textiles with superior energy balance (figure 1),
- the development of construction materials to present extra aids.

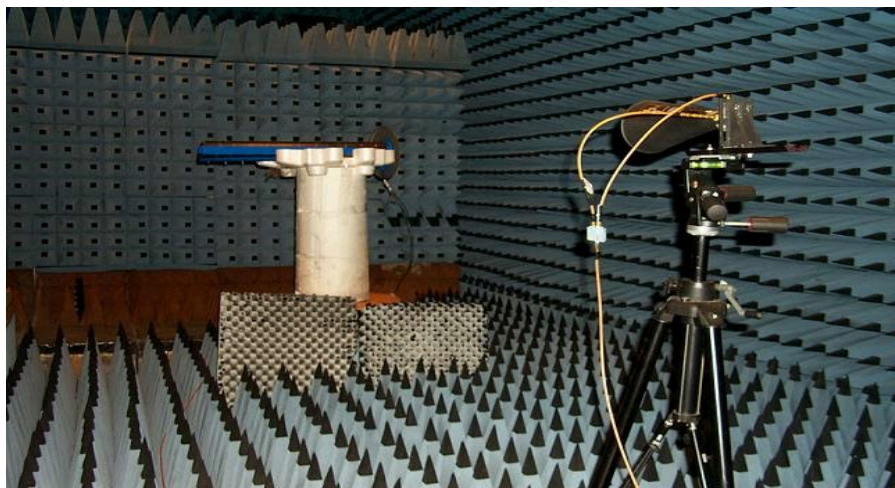


Figure 1. Anechoic Chamber is a room designed to completely absorb reflections of electromagnetic waves.

(anechoicchamberdesign.blogspot.com/)

Energy generation and consumption at home

Many households go on ineffective energy technologies (Prest, D. 2009; Schlögl, R. 2010). It was required to advance new technologies and plans for home energy generation. The plans for global carbon emissions from structures is forecasted to grow from 8.6 GtCO₂ in 2004 up to 15.4 GtCO₂ by 2030, donating about 30 percent of total emissions (RSC, 2009). According to RSC report, technological developments and source direction techniques have turned it out possible to cut energy consumption by up to 90 per cent. Also noted in this report that it will be probable to decrease the environmental effect of households to zero if energy effective structures could keep down the energy (Prest, D. 2009; Doroodian and Boyd 2003).

Many national energy generation technologies are verified to make electricity as via solar photovoltaic cells (HM Treasury, 2007; Prest, D. 2009). Renewable energy technologies are using widely, as solar and wind energy. (NSW, 2009). However, technological opportunities are active for increasing national forms of alternative energies and innovations are required to maximize cost effective energy collection from the sun (figure 2).



Figure 2. Hybrid Wind/Solar Power Generators for Homes & Businesses.

(https://c1cleantechnicacom-wpengine.netdna-ssl.com/files/2011/06/solair_solar-wind-power-roof.jpg)

Current technologies can meaningfully decrease the necessity of households on energy ingesting (BWEA, 2008). It is noted in this report that a classic family with two children spends 70 percent of its yearly energy consumption in the household. Present technologies in energy use are central to efforts to decrease climate change and, can significantly reduce the necessity in the consumption (Prest, D. 2009).

The chemical sciences make effort to evolving and installing energy efficiency measures in households (Prest, D. 2009). For this reason, technological innovations are required to make a significant change. These include (<http://ec.europa.eu/environment/waste/index.html>, last available 23.06.2018):

- the integration of intelligent information and computer technology components to plane lightweight displays,
- photochromic coatings for glass,
- superior building materials,
- nanocoating for decorations.

Result

There is an essential necessity for technologies which offer maintainable city environments. Determining and understanding air pollution presents an academic source for the administration and regulation. Technological developments need to be done in evolving minimum price. It should be partnered by developing substances for altering greenhouse gases by high universal warming possible to low damaging crops.

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Chemical Technology for Students

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Abstract. Global competition has led to the world textile industry to modernize and become cost competitive because developing nations have turned out that exporting textile products to the world is an attractive way to enhance their economic growth. Their work standard costs have pressured domestic producers into replacing manufacturing equipment with automated, efficient and technology machinery. The sector has focused on reducing costs, improving quality and developing quick response scenarios. Engineers focused on improving quality and efficiency make up the rest. The technical knowledge is in the form of supplier technical bulletins. A few are in written form, and what does exist, is not easily accessible to others needing the knowledge.

In this study, many chemistry knowledge lessons are analyzed to take part in a flexible curriculum in a traditional chemical profession master's degree. Lessons should make learning for upcoming chemistry teaching and their possible involvement in work life and industry, and provide students with a much better technical foundation than normally recent tryouts.

Keywords: chemistry, chemical technology, Industry

Introduction

In recent years, an interesting growth in chemical information with the promise that in chemistry it can take optimistic and meaningful changes to civilization and resolve the difficulties that arise in this century. This is possible if the chemical manufacturing prospers in endorsing the inventions in the workshop to new goods in the marketing sector. The next chemist will have the practical skills to positively fulfill the new tests expected for the new technological life. The main point for all the requirements is the creation of a chemistry graduate or technical education, which continues to be deprived of the technical relevance required for this field.

Matis and Prashar (2015) stated that chemistry has always been considered as the basic locomotive for innovation and developments in science area. According to him, the European chemical industry would require the support of the prevailing forms to accomplish the goals of the global development, effectiveness and green world goals in the near future world stagnation. Industrial chemists have worked very little while doing science and need detailed background knowledge (Lawton, 1997; Wei, 2008). Matis and Prashar (2015) noted that chemistry sections are efficient at training students to do scientific tryouts; students yield graduates by chemical information. So many graduates think they're not ready to study at college to get their lessons".

The chemical public in European countries is signified by five establishments, which promote in opposite ways chemical disciplines and knowledges in zones of basic and useful research, and education and working out (Matis and Prashar 2015). This teamwork said organizations came together to form an Alliance of Chemical Sciences and Technologies to organize their actions to encourage chemistry and chemical manufacturing. Also, they underlined that to save our chemical tutoring we must accept that we are all if we can cooperate with a solitary resolve. Another perspective about this situation is stated by Clifford (1997) that "Knowledge will not substitute teachers, but teachers who use knowledge will substitute the teachers who do not".

Chemistry in Vocational Schools

Chemistry in the vocational school of European countries was established by the European Chemical Thematic Network Association (<http://www.ecn-assoc.org>) to identify reference points on an international basis and to guarantee the quality of chemical degrees in all countries. In this program, chemical technology is classified as a semi-optional course. Many competences can be further developed by teaching the traditional subject (Matis and Prashar 2015).

Chemistry undergraduate students and vocational schools need to add industry-oriented modules offered by the departments of chemical engineering in their programs. Another approach proposed by Matis and Prashar (2015) is to attract experienced industrial chemists for short time teaching at universities and vocational schools. In this method, students may be aware that they can develop skills outside their universities or vocational schools.

Matis and Prashar (2015) gave a view that the reference in an environmental application of chemistry to real everyday problems and establishes the best instructive example: they stated that it will confidently attract the student's care and give feasibility to the complete knowledge. Trainer could add more applied elements to academic lessons.

The Role of The Technology in the Chemistry Courses

Translating a scientific idea into a manufacture-scale process needs an considerate of fundamental chemical procedures, conceptual ways of the concepts and an mindfulness of related parts such as ecological issues, gear, controller systems and other connected sectors (Matis and Prashar 2015; Mills, 2002). Mills also stated that the commercial insinuations and period of each plan also need to be considered as a basic component. According to Mills skills and abilities of students are often developed in hands, especially in vocational schools, on knowledge in manufacturing somewhat than through official education and this will confidently be supported and improved by considerate of chemical knowledge.

Scientists and engineers in the chemical departments cannot remain to exist and effort in a single punishment or at one useful area (Whitfield, 2012). He underlined that chemists should be more elastic, operating at an inter sciences border to create new production. Matis and Prashar (2015) presented some examples for technology applications in vocational school chemistry courses;

- One of the requests of thermodynamic values is the warmth stability of a procedure of economic importance.
- When investigating the kinetics of a chemical alteration, it is certainly helpful to teach the principles of chemical reactors.

Chemistry Program with Chemical Skill

An efficient chemistry curriculum with chemical technology content was proposed by Matis and Prashar (2015). The main line of the program;

- A. Portion of the core lesson:

- Introduction codes of chemical knowledge; 5 ECTS, ie one hour of model, two hours of training and one hour laboratory (this course is a prerequisite for advanced chemical technological issues) and has the recommended content:
- B. Semi-elective lesson:
 - Separation procedures; 10 ECTS, ie 2 hours of model, 3 hours of training and two hours of workroom, recommended content:
 - Examination of key meeting techniques, insertion, filtering, dimensions decrease,, precipitation, absorption, freshening etc. Above courses and workroom studies.
- C. Optional lessons:
 - Bioprocures: Biological mass and warmth balance systems applications and transport phenomena (liquid flow and mixture, warmth and mass transfer), kinetic, downstream processing and separation, bioreactors.
 - * Transportation phenomena
 - * Manufacturing organic chemistry
 - * Manufacturing procedures

Conclusions

Chemistry is usually referred to as “the central science” due to its interconnectedness with other fields as science, knowledge, engineering, and math fields (STEM) (Matis and Prashar) (2015). Chemistry and the language of chemists play important roles in biology, medicine, materials science, forensics, environmental science, and many other fields of science. In the developing world by the effect of knowledge, chemistry graduate or application studies in vocational schools needs many abilities and multiple functional perspectives in order to struggle with the new tests of the modern culture. We believe that chemical knowledge has key role to accomplish this target (Matis and Prashar (2015). Finally, chemistry curriculum study in vocational schools is necessary to change the situation.

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CHOQUET İNTEGRAL KULLANILARAK AKADEMİK PERFORMANS DEĞERLENDİRMESİ

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Özet: Akademik performans değerlendirme, yükseköğretim kurumlarının kritik konularından biridir. Performans değerlendirme kriterleri ise doğası gereği bağımlı olmasına rağmen, geleneksel değerlendirme yöntemlerinin çoğu bu bağımlılığı dikkate almamaktadır. Choquet integrali ise performans değerlendirme kriterleri arasındaki etkileşimleri göz önünde bulunduran etkili bir birleştirme operatörü olarak önerilmektedir. Çalışmada, Türkiye'de bulunan bir üniversitedeki öğrencilerin akademik performans değerlendirmesi, karmaşıklık temelli ve entropi temelli Choquet integral kullanılarak değerlendirilmiştir. Ayrıca, iki farklı yapıdaki Choquet integrali yöntemlerinin etkinliğinin karşılaştırılması amacıyla öğrencilerin performanslarının değerlendirilmesinde yaygın olarak kullanılan k -ortalama yöntemi ile de sınıflama yapılmıştır. Elde edilen sonuçlar, entropi temelli Choquet integrali yönteminin, çoğu durumda karmaşıklık temelli yöntemden ve k -ortalama yönteminden üstün olduğunu göstermektedir.

Keywords: performans değerlendirme, bulanık ölçü, Choquet integral, k -ortalama

Communications Schemes

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Abstract. In the work, it is focused on safety a regulator element such that it manages the organization to eliminate defective apparatus from keep going facility to the maximum quantity of clients. It is giving an overview on communication schemes by the view of the authors. In the past, electric power regulator schemes made of machinists. In the current climate, engineers project schemes that operate power microchip-based element capable of technical fortification and mechanical regulator (Moxley and Woodward, 2002).

Keywords: communication system, power regulator system, automated regulator

Introduction

We see that several notions advanced in recent years.

Most of the basic concepts can be classified as collection approaches (Linda 2007):

- Collection created on the physical ways
- Marketable accumulation notions

We add that the investigation in the sector is usually mechanical structure. Linde at all. pointed out that the concluding is making for a contribution in energy marketplaces and this investigation in the way emphases on the marketing principles. Electrical sector, circulation, and communication turned out a difficulty before that it continues today (Heussen, 2011; Xu at all., 2009; Ilic, 207; Pudjianto at all., 2007).

Moxley and Woodward (2002) pointed out that the degree to which you can get maximum performance from a structure by exterminate the conclusion procedure is a within limit. According to them, engineers have consumed much energy fixing choice methods and power structure conformations in power system protection and automation (Moxley and Woodward, 2002). We know that the old protecting equipment has restricted ability to transmission analog between protecting de equipments.

Telecommunications Schemes

It is provided a lots of techniques to offer telecommunications methods among safety procedures (Moxley and Woodward, 2002). We can note the most popular ones as below:

- Rented ranks,
- digital telecommunications networks,

Rented Line: A few of the firstly analog data transmissions for safety and manager arose over pilot wire schemes (Schweitzer at all., 1997; Elmore, 2001 and Demetrious at all., 1999). According to them, “a pilot wire system is a two-conductor wire that provides an uninterrupted path from one regulator device to another” (Moxley and Woodward, 2002) (figure 1).

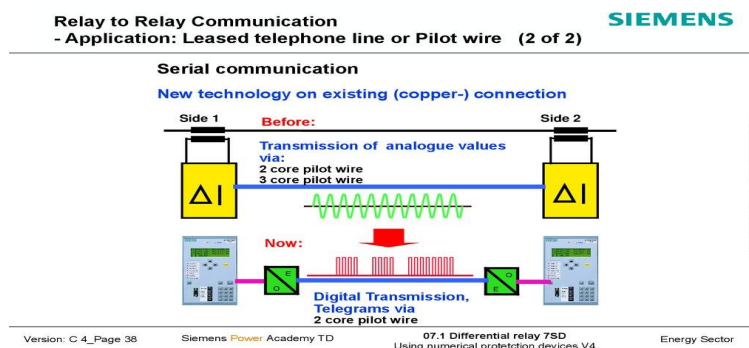


Figure 1. Lease line and Pilot wire communication mode

(www.google.com.tr/search?q=Leased+Line+and+Pilot+Wire:&rlz)

They listed the subjects that can be related with pilot wire schemes (Moxley and Woodward):

- Counteraction corresponding for each foot
- Maximum distance determined by loop counteraction

Digital Point-to-Point Telecommunications: It provides many systems for digital telecommunications (Roberts, 2001). Fiber-optic cable and wireless are usually well-known. We know which point-to-point contacts could drive crossways networks. Fiber-optic cable be connected between substations to construct well-design fiber-optic schemes (Moxley and Woodward) (figure 2).

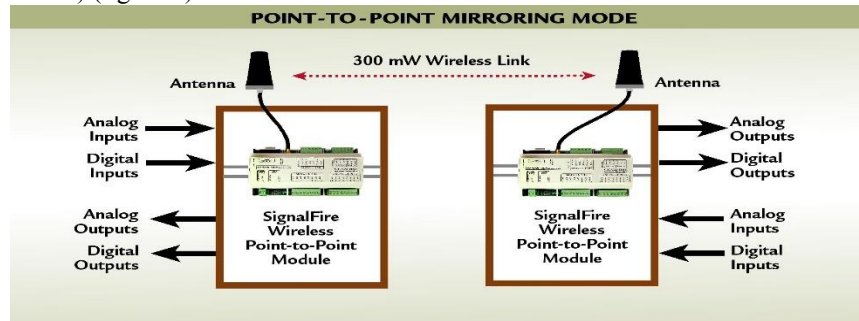


Figure 2. Digital point to point communication mode system

(www.google.com.tr/search?q=Digital+Point-to-Point+Telecommunications&rlz)

Digital Telecommunications Networks: According to Schwitzer at all. (1998), digital telecommunications networks offer point-to-point data transmission like to point-to-point networks. In the mode, communications are lined from one point to and different forming a virtual circuit or link (Moxley and Woodward) (figure 3).

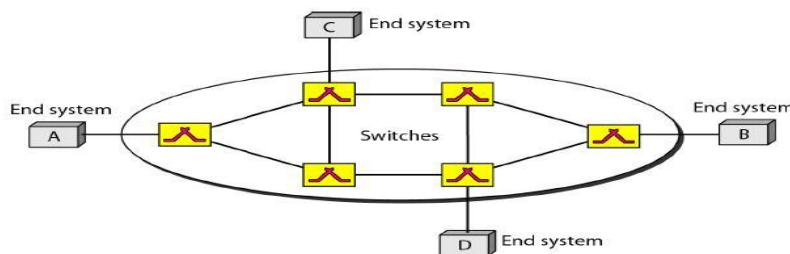


Figure 3. Virtual Circuit on a Digital Telecommunications Network

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Result

It is presented a brief version of connection schemes by the view of the some research papers. By the light of the analyses of the communication system, we see that current model wire schemes could need translation to digital net effort telecommunications. Also, we say that digital telecommunications provide communicate of much amounts lacking of linking to an effective measure. Changes in the telecommunications technology could need a new expression at the safety systems to offer a scheme which is easier. Innovation in the communication method gets benefit of rises in presentation provided by fresh telecommunications methods (Moxley and Woodward). Telecommunications of analog data could extend operative scheme regulator activities and rise the rapidity of counteractive activities.

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COMPARISON OF ACTIVATED CARBON PRODUCED FROM CAROB STONES WITH 4A ZEOLITE FOR ALLURA RED AC DYE ADSORPTION

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Abstract: The objective of the study was to prepare low-cost activated carbon from carob stones (*Ceratonia siliqua*) and compare its adsorption behavior for allura red dye with that of a commercial 4A zeolite. The carob stones activated carbon (AC) and commercial 4A zeolite (4AZ) were characterized BET surface area, micropore volume, total pore volume, average pore size. Adsorption of a food dye, allura red, by AC and 4AZ was examined. The experimental adsorption equilibrium data were compared with the Langmuir and Freundlich isotherm models and the isotherm model parameters were determined. Pseudo-first-order and pseudo-second-order equations were fitted to the kinetic data, and the rate constants were evaluated. Results showed that activated carbon produced from carob stones is suitable for the adsorption of allura red food dye and could be used as a low cost effective adsorbent in the treatment of the industrial wastewater.

Keywords: Carob stones, 4A zeolite, activated carbon, allura red, food dye.

Introduction

Activated carbon is one of the widely used adsorbents in removal of food dyes because of its large surface area, pore size distribution and high adsorption capacities. Activated carbon is produced from variety of raw materials such as cherry stones, apricot stones, cornelian cherry stones, olive stones, wood and coal. Activated carbons can be produced by chemical activation. Chemical activation is a single step method for the preparation of raw material in the presence of chemical agent such as KOH, NaOH, LiOH, ZnCl₂ and H₃PO₄ (Erdogan 2016; Erdogan and Erdogan 2016). Philip (1996) produced activated carbon from apricot stones by activation with H₃PO₄. The highest specific surface area and micropore volume and mean pore radius were found as 1603 m²/g, 0.752 cm³/g, 9.4 Å, respectively. Erdogan (2016) produced activated carbons from cherry stones by KOH and NaOH treatments. The highest specific surface area and micropore volume were found as 1380 m²/g and 0.630 cm³/g, respectively. Li et al. (2008) prepared coconut shell based activated carbons at carbonization temperatures ranging from 400-1000 °C. In their study, BET surface area and micropore volume of the sample obtained were 1926 m²/g and 0.931 cm³/g, respectively. Erdogan and Erdogan (2016) prepared activated carbon by chemical treatment (H₃PO₄) from cherry stones for dye adsorption. Zeolites are microporous and crystalline silicates commonly used as adsorbents in various chemical reaction. Dyes are widely used in food, textile paper and cosmetic industries. Allura red belongs to the monoazo class of synthetic food colourants. Chemically it is identified as Red No. 40 and this compound is disodium 6-hydroxy-5-(2-methoxy-5-methyl-4-sulphophenylazo)-2-naphthalenesulphonate (Sánchez-Duarte et al. 2012). The main objects of this study are: (i) to study the feasibility of using the activated carbons produced from carob stones as a low-cost adsorbent for the removal of allura red dye, (ii) to compare its adsorption behavior for food dye to that of a commercial 4A zeolite (iii) to determine the applicability of various isotherm models (Langmuir and Freundlich) to find out the best-fit isotherm equation and (iv) to determine kinetic parameters and explain the nature of the adsorption.

Materials and Methods

In this study, carob stones were obtained from Antalya in Turkey. The precursor, carob stones were first air dried, then crushed. Then, carob stones were contacted with dilute a 15 vol.% sulfuric acid solution for 12 hours and washed with hot distilled water. 4A zeolite (4AZ) was purchased from Sigma-Aldrich.

Preparation of the activated carbon: 20 g of dried carob stones (<2 mm) was mixed in a beaker with 200 mL of LiOH solution which corresponded to an impregnation ratio of 4:1 (weight of impregnation reagent/weight of carob stones) for 10 hours at 65°C. The mixtures were immersed in the ultrasonic bath for 120 minutes at 65°C and then the impregnated sample was then dried over a night in a moisture oven at 120°C. Then, the impregnated sample was carbonized in a tube furnace (Protherm STF) under N₂ flow at a heating rate of 10°C/min up to 700°C for 1 hour. After the activation, the sample was allowed to cool down to the room temperature under N₂ flow before its removal from the furnace. The activated sample was washed several times with HCl and hot distilled water to remove residual chemicals until it did not give chloride reaction with AgNO₃. The activated sample was dried for

6 hours at 120°C. Activated sample was stored in a sealed flask and labelled. The pores of activated carbon were characterized by analysis of N₂ adsorption-desorption isotherms at 77 K using Micromeritics ASAP 2020 (Erdogan 2018a).

Adsorbate

The commercial food dye FD&C Red 40 (C₁₈H₁₄N₂O₈S₂Na₂, molecular weight 496.4 g/mol, C.I. 16045, λ_{max}=500 nm, pK_a= 11.4, chemical structure shown in figure 1) was supplied by Sigma-Aldrich. Distilled water was used to prepare all solutions.

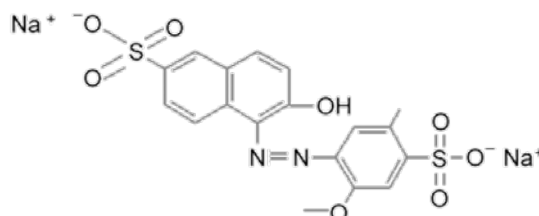


Figure 1. Chemical structure of FD&C Red 40.

Results and Discussion

The N₂ adsorption-desorption isotherms of the activated carbon (AC) is shown in Figure 2. It can be seen that, activated carbon possessed a combination of type I and type IV isotherms according to IUPAC classification. Appearance of hysteresis loop indicates the presence of mesopores.

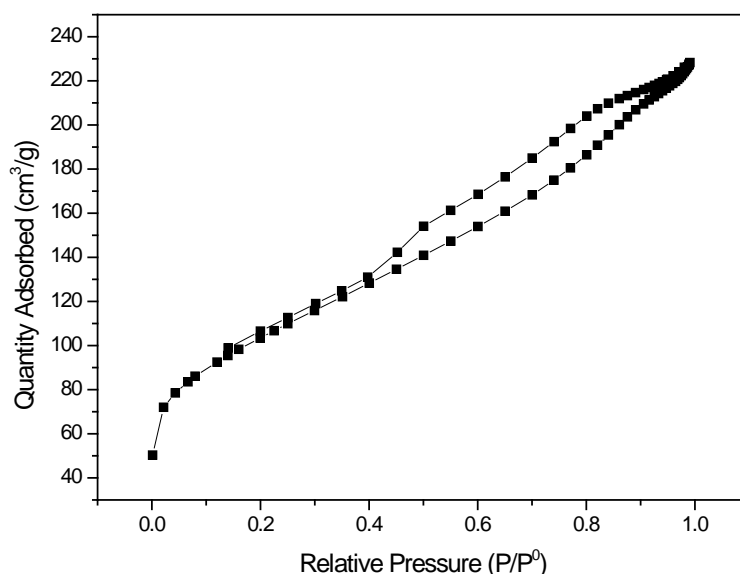


Figure 2. The adsorption-desorption isotherms of activated carbon sample (AC).

Average pore widths and pore volumes were calculated from the nitrogen adsorption isotherm data by t-method analysis. Table 1 gives the values of the BET surface areas, Langmuir surface areas, total pore volumes, micropore volumes and average pore widths which were calculated by using the nitrogen adsorption-desorption data obtained at 77 K. The BET and Langmuir surface areas were found for the AC produced with LiOH activation, as 359.76 and 563.76 m²/g, respectively. In our previous studies we have reported that the BET surface areas and pore volumes and average pore widths of 4A zeolite (Erdogan 2018b). BET surface area and average pore width of 4AZ adsorbent were found as 18.09 m²/g and 19.391 nm, respectively.

Table 1: Physical characteristics of the activated carbon sample (AC).

BET surface area (m ² /g)	359.76
Langmuir surface area (m ² /g)	563.76
Total pore volume (cm ³ /g)	0.349
Micropore volume (cm ³ /g)	0.023
Average Pore Width (nm)	3.880

Allura Red Adsorption:

Figure 3 and 4 present the adsorption isotherms of allura red as the relationship between the amount of dye adsorbed per unit mass of a given porous adsorbents and time. Fig. 3 shows that the adsorption capacities at equilibrium (q_e) decreased with an increase in adsorbent dose from 0.005 to 0.05 g/L. This corroborates the reports of our previous study (Erdogan and Erdogan 2016). Figure 4 showed that the adsorption capacities at equilibrium (q_e) decreased with an increase in adsorbent dose from 0.05 to 0.2 g/L. This is explained as a consequence of partial aggregation, which occurs at high adsorbent amount resulting in decreased active sites. Similar results have been reported for the sorption of various adsorbate onto various adsorbents in literature (Erdogan and Erdogan 2016, 2018).

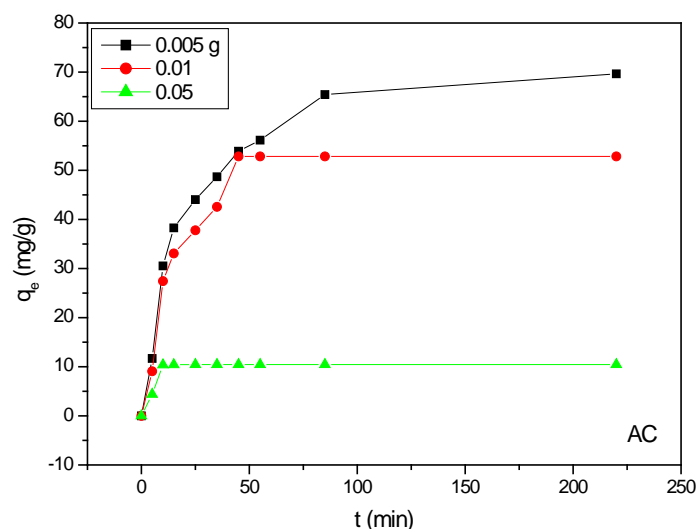


Figure 3. Effects of adsorbent dosage and contact time on the adsorptive uptake of allura red dye onto the carob stones-derived adsorbent (conditions: $C_0=20$ mg/L; temperature=30 °C).

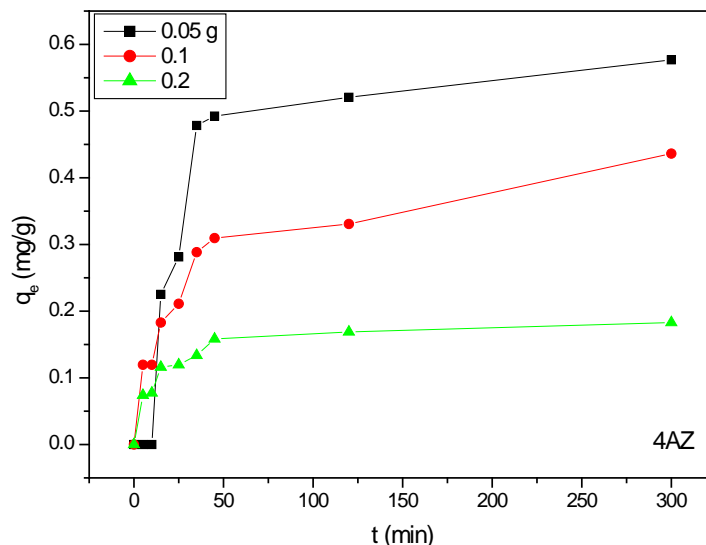


Figure 4. Effects of adsorbent dosage and contact time on the adsorptive uptake of allura red dye onto 4A zeolite adsorbent (conditions: $C_0=20$ mg/L; temperature=30 °C).

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 allura red dye adsorption onto activated carbon and 4A zeolite were 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 for AC. Langmuir adsorption isotherms constants related to adsorption capacity, Q_0 were found as 94.877 and 0.048 mg/g for AC and 4AZ, respectively. The relatively large adsorption capacity for AC could be attributed to its relatively large surface area (359.76 m²/g) and total pore volume (0.349 cm³/g). The results revealed that the adsorption of food dye on carob stones-based activated carbon was best described by the Langmuir isotherm, indicating the adsorption was homogeneous and a monolayer was present.

Table 2: Freundlich and Langmuir isotherm constants for the adsorption allura red onto AC and 4AZ at 30 °C

Isotherms	Parameters		
Freundlich	K_F (mg/g)(L/mg) ^{1/n}	1/n	R ²
AC	32.926	0.321	0.236
4AZ	6.2E-14	10.43	0.066
Langmuir	Q_0 (mg/g)	K_L (L/mg)	R ²
AC	94.877	0.421	0.718
4AZ	0.048	0.052	0.023

Langmuir adsorption isotherm constant related to adsorption capacity, Q_0 were found as 94.877 mg/g. To confirm the favorability of the adsorption, the separation factor R_L was calculated by the following equation;

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

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 0.106 and 0.490 for AC and 4AZ, respectively, which

further confirmed that the Langmuir isotherm was favorable for of food dye on two adsorbents.

Adsorption kinetics provides an understanding of the mechanism of adsorption, which in turn governs mass transfer and the equilibrium time. Allura red was adsorbed on adsorbents as a function of time. Pseudo-first-order and pseudo-second-order models have been obtained at the temperatures of 30 °C for the various adsorbent amount (0.005, 0.01 and 0.05 g for AC and 0.05, 0.1 and 0.2 g for 4AZ). The regression coefficients (R^2) were evaluated for all models. The results are shown in Table 3. As shown in Table 3, the highest R^2 values were obtained for the pseudo-second order kinetic model and the experimental q_e values matched well with the calculated data. The higher regression coefficients indicated that the pseudo-second-order model was a better fit than the pseudo-first-order model. Therefore, it can be said that the pseudo-first-order model is not suitable to explain the adsorption process accurately. Similar results have been found for the our previous study (Erdogan and Erdogan 2016).

Table 3: Kinetic model parameters for the adsorption of allura red dye onto AC at different adsorbent dosage.

			Pseudo first order			Pseudo second order		
T(°C)	$m_{ads}(g/L)$	$q_{e,exp}(mg/g)$	$k_1(min)$	$q_{e,cal}(mg/g)$	R^2	$k_2(g/mgmin)$	$q_{e,cal}(mg/g)$	R^2
30	0.005	69.653	0.0305	60.218	0.977	8.86E-4	74.294	0.990
	0.01	52.838	0.0468	47.913	0.948	1.92E-3	55.928	0.988
	0.05	10.441	0.650	51.395	0.934	0.0858	10.526	0.999

Kinetic parameters for the removal of allura red by 4AZ are represented in Table 4. The results for the 4AZ showed good agreement with the two kinetic models, especially with the pseudo-second order kinetic model except for 0.05 g adsorbent, suggesting the presence of chemisorption for 4AZ.

Table 4: Kinetic model parameters for the adsorption of allura red dye onto 4AZ at different adsorbent dosage.

			Pseudo first order			Pseudo second order		
T(°C)	$m_{ads}(g/L)$	$q_{e,exp}(mg/g)$	$k_1(min)$	$q_{e,cal}(mg/g)$	R^2	$k_2(g/mgmin)$	$q_{e,cal}(mg/g)$	R^2
30	0.05	0.5769	0.0212	0.4627	0.730	-30.42	1.52E-4	0.086
	0.1	0.4362	0.0421	0.714	0.915	0.106	0.452	0.984
	0.2	0.1829	0.0339	0.163	0.963	0.538	0.188	0.998

Conclusion

The present investigation showed that biowaste carob stones can be effectively used as a raw material for the preparation of activated carbon via chemical activation using LiOH. The BET surface area and total pore volume of produced activated carbon were 359.76 m²/g and 0.349 cm³/g, respectively. This activated carbon (AC) and commercial 4A zeolite (4AZ) were used to remove allura red food dye from aqueous solutions at various temperature. In a batch of adsorption studies, the efficiency of allura red dye adsorption by AC or 4AZ increased with adsorbent dosage, but the equilibrium adsorption capacity decreased significantly. Adsorption capacities of allura red dye onto AC and 4AZ were 94.877 and 0.048 mg/g, respectively. The Freundlich and Langmuir isotherm models were used for the mathematical description of the adsorption of allura red dye onto AC or 4AZ at 30 °C and the results suggested that the adsorption equilibrium data fitted well to the Langmuir model for AC. The pseudo-first order and pseudo-second order models were used to analyze the data obtained for allura red dye adsorption onto the prepared activated carbon and 4AZ. The kinetic calculations show that the adsorption followed

the pseudo-second order model for AC. This study has revealed that carob stones based activated carbon can be used as a highly efficient and economically viable adsorbent for allura red dye removal from aqueous solutions.

Acknowledgements

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ÇELİK LİF TAKVİYELİ, POLİPROPİLEN LİFLİ GERİ DÖNÜŞÜM AGREGALİ BETON

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Özet: Günümüzde çelik ve polipropilen lifler betonda yaygın olarak kullanılmaktadır. Atık betonların değerlendirilmesi çevre açısından önemlidir. Bu çalışmada lif katkılı betonların geri dönüşümde nasıl değerlendirilebileceği araştırılmıştır. Bu yüzden bu çalışmada, geri dönüşüm agregalarından beton üretilmiştir. Betonda kullanılan agregaların tamamı geri dönüşüm agregasıdır. Öncelikle kaynak betonları üretilmiştir. Kaynak betonları da polipropilen lif katkılıdır. Kaynak betonlarında sekiz (8) çeşit polipropilen lif kullanılmıştır. Polipropilen lifler kaynak beton karışımına üç (3) farklı oranda ilave edilmiştir. Kaynak betonlar 120 gün sonunda çeneli kırıcıda kırılarak, 0-4mm, 4-15mm ve 15-22,4 mm boyutlarında geri dönüşüm agregaları elde edilmiştir. Ayrıca çelik lifler geri dönüşüm agregalı beton içerisine 10 ve 20 kg/m³ olacak şekilde ilave edilmiştir. Çelik lif ilavesi taze betonun işlenebilirliğini düşürmüştür. Geri dönüşüm agregalı betonların, basınç, eğilme ve yarmada çekme dayanımları incelenmiştir. Geri dönüşüm agregalı betona çelik lif ilavesi betonun basınç dayanımı düşürmüştür. Eğilme ve yarmada çekme dayanımlarını artırmıştır.

Anahtar Kelimeler: Çelik lif, Geri Dönüşüm, Çökme, Basınç Dayanımı, Eğilme Dayanımı.

Giriş

Çok eski zamanlarda lifler kırılmalarda kuvvetlendirmek için kullanılmıştır. Beton içerisinde kullanılan birçok lif çeşidi bulunmaktadır. Bunlar; çelik, cam, polipropilen ve karbon liflerdir. Liflerin beton üzerindeki etkileri, lifin tipine, cinsine, şekline, boyutlarına ve betonu oluşturan diğer malzemelerin özelliklerine göre değişmektedir (Daniel J.I., 1998, Daniel J.I., Roller J.J. and Anderson E.D., 1998, Özel C., 2007, Ünal B., Köksal F. ve Eyyubov C., 2003, Ünal O., Uygunoğlu T. ve Elmacı Ö., 2005, Topçu İ.B. ve Canbaz M., 2006). Ağırlıkça 3.5 kg/m³ lif takviyeli betonların, yollar için, özellikle tünellerin içerisinde, verimli, güvenli ve düşük maliyetli bir çözüm olduğu belirtilmiştir (Nobili A., Lanzoni L. and Tarantino A.M., 2013). Dönüşümlü petlerden elde edilen liflerin hacimce %1 oranında katkısı betonun eğilme dayanımını artırmıştır (Fraternali F., Ciancia V., Chechile R., Rizzano G., Feo L. and Incarnato L., 2011). Hacimce %0.1 ve %0.5 polipropilen lif katkısı, betonun basınç ve eğilme dayanımı düşürmüştür (Manolis G.D., Gareis P.J., Tsonos A.D. and Neal J.A., 1997). Metakaolin ve pomza içeren 12 mm uzunluğundaki polipropilen lif takviyesi, eğilme dayanımındaki sehim miktarını artırmıştır (Rashiddadash P., Ramezani pour A.A. and Mahdikhani M., 2014). Farklı boyutlardaki hacimce %0.25, %0.50 ve %0.75 polipropilen lif oranının beton yoğunluğunu %10-30 azaltmış, basınç dayanımını %14 artırmıştır (Yap S.P., Alengaram U.J. and Jumaat M.Z., 2013). Hacimce %0.5 oranında polipropilen lif katkısının basınç dayanımını yaklaşık %37.5 düşürmüş, eğilme dayanımını ise %30 artırmıştır (Wang H. and Belarbi A., 2013). Lif katkısının özellikle düşük dayanımlı betonda yüksek birim deformasyon sağladığını ve lifin köprü etkisi yaptığını fakat yüksek dayanımlı betonda liflerin köprü etkisini azalttığını belirtmişlerdir. Lif katkısının betonun sünekliğini artırdığı sonucuna varmışlardır (Cifuentes H., García F., Maeso O. and Medina F., 2013). Hacimce %1 ve %1.5 oranında karbon lif katkısının, yalın beton basınç dayanımı 52.8 MPa iken karbon lifli betonun basınç dayanımı değerleri 51.2-53 MPa arasında değişmiştir. Basınç dayanımında çok büyük bir değişiklik olmadığı sonucuna varmışlardır (Tabatabaei S., Volz J.S., Keener D.I. and Gliha B.P., 2014).

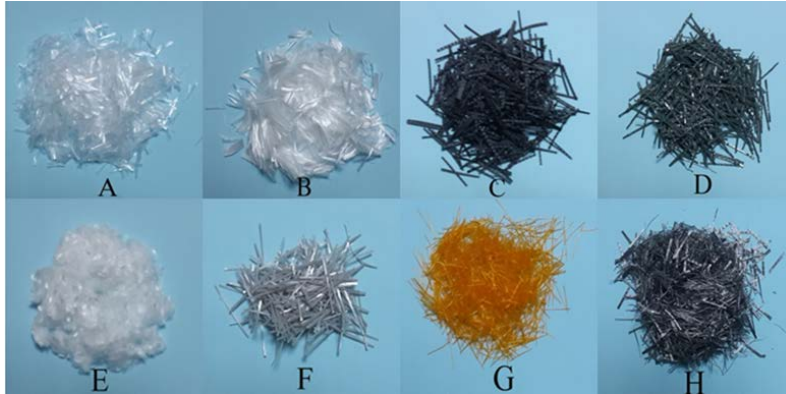
Karışımında çimento miktarının %6'sı kadar polipropilen lif kullanımının 15 cm küp basınç dayanımı, 7 günde %22.72, 28 günde %20.83 artırmıştır. Parçalanma ve kırılmayı engellediğini, çatlaktan sonra yük taşımaya devam ettiğini belirtmişlerdir (Aktaş A., Alparslan L., Arabacı S. ve Başyigit C., 2010). Hacimce; %0.25, %0.50 ve %0.75 polipropilen lif katkısı, %20 uçucu küllü karışımın 7 günlük basınç dayanımı düşmüştür. 28 ve 90 günlük basınç dayanımı değişmemiştir. Hacimce %0.50 ve %0.75 lifli karışımın basınç dayanımı düşmüştür. Lif katkısı ile numunelerin parçalanmasını engellemiştir. Eğilmedeki sehim değerini artırmıştır. Lif miktarı arttıkça birim kısalma azalmıştır (Üte A.A., 2008). Ağırlıkça 3, 6, 9 kg/m³ monofilament, 0.6 kg/m³ elyaf lif ve 3, 6, 9 kg/m³ monofilament ile 0.6 kg/m³ elyaf lif takviyeli betonun yarmada-çekme dayanımı %8.88 ile

%13.35, artmıştır (Hsie M., Tua C. and Song P.S., 2008). Ağırlıkça 7 kg/m³ lif katkısının yarmada-çekme ve eğilme dayanımını arttırmıştır. Çatlama sonrası bir miktar daha moment taşıma kapasitesine sahip olduğu belirtilmiştir (Yap, C.H. Bu, U.J. Alengaram, Mo K.H. and Jumaat M.Z., 2014).

Hacimce %2, %4 ve %6 cam lif katkısı betonun yarmada-çekme dayanımını %52-%73 arttırmıştır (Kurt G., 2006). Hacimce %0.25 polivinil lif katkısının betonun yarmada-çekme dayanımını %30 arttırmıştır (Noushini A., Samali B., and Vessalas K., 2013). Endüstriyel atıklar ve hacimce %0.2 polipropilen lif katkısı, betonun yarmada-çekme dayanımını %10 düşürmüştür (Özcan A., 2006). Ağırlıkça 900 g/m³ polipropilen lif katkısı, betonun yarmada-çekme dayanımını %1.75 arttırmıştır (Arslan M., Subaşı S., Durmuş G., Can Ö. ve Yıldız K., 2007). Yapılan çalışmalar incelendiğinde; çelik ve polipropilen liflerin betonun basınç dayanımını olumsuz etkilediği görülmüştür. Bunun yanında yarmada-çekme ve eğilme dayanımlarını arttırdığı görülmüştür. Bu çalışmada; çelik liflerin, polipropilen lif katkılı geri dönüşüm agregalı betona etkisi incelenmiştir.

Malzemeler ve Yöntem

Deneysel çalışmada öncelikle lif katkılı ve lif katkısız kaynak betonlar üretilmiştir. Lif katkılı beton karışımlarında sekiz çeşit polipropilen lif kullanılmıştır (Şekil 1). Polipropilen liflerin teknik özellikleri Tablo 1’de verilmiştir. Kaynak beton karışımına her lif çeşidinden üç farklı oranda katılmıştır. Lif oranları 600-1200 ve 1800 g/m³’tür. K: Polipropilen lif katkısız kaynak betonları, A,B,C,D,E,F,G,H ise polipropilen lifleri ifade etmektedir. Örneğin A6; A lifinden 600 g/m³ katkılı, B12; B lifinden 1200 g/m³ katkılı, C18; C lifinden 1800 g/m³ katkılı olduğunu göstermektedir. Kaynak beton üretiminde, 0-4mm, 4-15mm ve 15-22,4mm boyutlarında kırmataş agregası kullanılmıştır. Tüm karışımlardaki çimento tipi CEM I 42.5 R’dir. Kaynak beton karışımındaki su-çimento oranı sabit tutulmuştur. Taze betonun akışkanlığını korumak için hiperakışkanlaştırıcı katkı kullanılmıştır. Karışımlardaki lif oranı arttıkça akışkanlaştırıcı katkı oranı da artırılmıştır. Akışkanlaştırıcı katkı oranı, taze betonun çökmesinin belli bir değerin altına inmemesi ve segregasyon yapmaması için deneme karışımları ile belirlenmiştir. Lif katkılı ve katkısız olmak üzere 25 seri kaynak beton üretilmiştir. Kaynak beton numune boyutları 150 mm çapında ve 300 mm yüksekliğindedir. Kaynak beton karışım oranları Tablo 2’de verilmiştir.



Şekil 1. Polipropilen Lifler

Tablo 1. Polipropilen Liflerin Teknik Özellikleri

Lif	Çekme Dayanımı (MPa)	Birim Ağırlık (g/cm ³)	Ergime Noktası (°C)	Elastisite Modülü (MPa)	Su Emme (%)
A	450-600	0.91	160-590	3500	0.01/0.02
B	400-500	0.91	160-590	3500	0.01/0.02
C	400-800	1.36	253	11300	0.04
D	400-800	1.36	253	11300	0.04
E	600-700	0.91	150-160	3500	0.01/0.02
F	620	0.90	160-590	9500	-
G	400-800	1.36	250	11237	0.4
H	600	0.90	230	3800	0.01/0.02
Fiber	Uzunluk (mm)	Genişlik (mm)	Kalınlık (mm)	Narinlik	Şekli

A	12	0.48	0.30	25	Dairesel
B	19	0.48	0.30	37.5	Dairesel
C	30	1.20	0.30	100	Yivli
D	30	1.20	0.45	25	Kancalı
E	30	0.48	0.30	62.5	Dairesel
F	40	0.433	0.433	0.92	Düz
G	18	0.3	0.50	36	Dairesel
H	20	0.6/1.3	0.18/0.22	33/46	Düz

Tablo 2. Kaynak Beton Karışım Oranları

Karışıma Giren Malzemeler		CNL	Karışımlar ve Lifler, g/m ³		
			600	1200	1800
Kum (0-4 mm)	(kg/m ³)	1127	1127	1127	1127
Kırma Taş (7-15 mm)	(kg/m ³)	451	451	451	451
Kırma Taş (16-22,4 mm)	(kg/m ³)	301	301	301	301
Su	(kg/m ³)	156	156	156	156
Çimento	(kg/m ³)	300	300	300	300
Polipropilen Lif	g/m ³	-	600	1200	1800
Katkı	%	0,6	0,8	0,9	1,1
Su-çimento ratio	W/C	0.52	0,52	0,52	0,52
Birim Ağırlık	(kg/m ³)	2335	2335	2335	2335

Şekil 3. Polipropilen Lifli Geri Dönüşüm Agregaları

Geri Dönüşüm Agregalarının Yeniden Beton Karışımında Kullanımı

Polipropilen lif katkılı kaynak betonları çeneli kırıcıda kırılarak geri dönüşüm agregaları elde edilmiştir. Kaynak betondan elde edilen geri dönüşüm agregalarının yeniden betonda kullanılması için öncelikle deneme karışımları yapılmıştır. Laboratuvar tipi çeneli kırıcıda yeterli incelikte ince agrega elde edilememiştir. Yapılan deneme karışımlarında, geri dönüşümden elde edilen ince agreganın (0-4mm) tamamının ince agrega olarak betonda kullanımının, taze beton özelliklerini olumsuz etkilediği görülmüştür. İnce malzeme oranı az olduğundan üretilen betonda segregasyonun çok fazla olduğu gözlenmiştir. Bu yüzden ince agrega miktarını yarısı kadar doğal kırma taş kum kullanılmıştır. Geri dönüşüm agregalı betona iri agrega olarak, 4-15 mm ve 15-22.4 mm boyutlarında geri dönüşüm agregaları ilave edilmiştir. Kaynak beton karışımlarında her lif çeşidinden üç farklı oranda (600-1200 ve 1800 g/m³) kullanıldığından, her lif çeşidinden üç farklı geri dönüşüm agregası elde edilmiştir. Yeni karışımlarda her lif çeşidinden elde edilen agregalar kendi içinde karıştırılarak kullanılmıştır. Örneğin, A lifli karışımdan elde edilen 600-1200 ve 1800 g/m³ lif katkılı geri dönüşüm agregaları kendi içinde eşit ağırlıklarda karıştırılmıştır. R: Çelik lif katkısız geri dönüşüm agregalı betonu göstermektedir. RS10: 10 kg/ m³ çelik lif ilaveli, polipropilen lifli geri dönüşüm agregalı betonu, RS20: 20 kg/ m³ çelik lif ilaveli, polipropilen lifli geri dönüşüm agregalı betonu göstermektedir. Çelik lif ilaveli, polipropilen lifli geri dönüşüm agregalı betonun karışım oranları Tablo 3'te verilmiştir. Çelik lifler 60 mm uzunluğunda ve 0.89 mm çapındadır. Çelik liflerin her iki ucunda kancalar vardır.

Tablo 3. Çelik Lif Katkılı Geri Dönüşüm Agregalı Beton Karışım Oranları

Karışımlar	K	Çelik Lifli Karışımlar	
		10 kg/m ³	20 kg/m ³

Kum (0-4 mm)	(kg/m ³)	991	991	991
Kırma Taş (4-15 mm)	(kg/m ³)	354	354	354
Kırma Taş (15-22,4 mm)	(kg/m ³)	425	425	425
Su	(kg/m ³)	220	220	220
Çimento	(kg/m ³)	350	350	350
Akışkanlaştırıcı	%	1,0	1,0	1,0
S/Ç	W/C	0.63	0.63	0.63
Birim Ağırlık	(kg/m ³)	2340	2350	2360

Çökme Deneyi

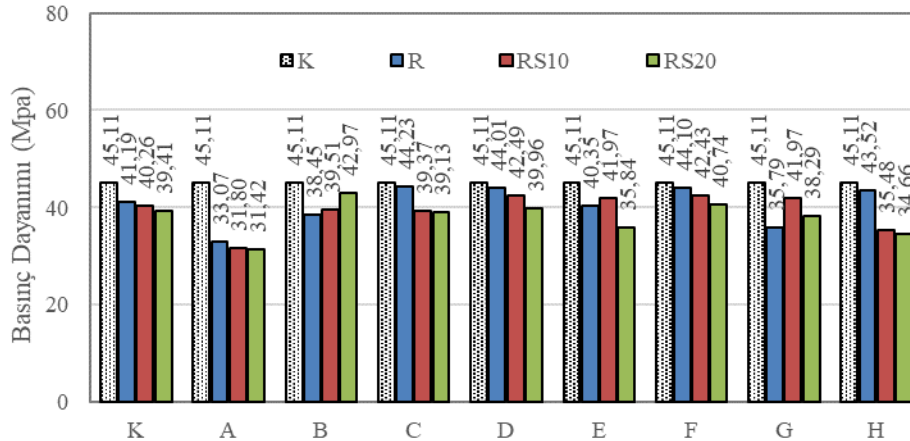
Taze betonun çökme değerleri incelendiğinde en düşük çökme değeri, 100 mm ile D, F ve H lifli polipropilen lifli geri dönüşüm agregalı betonlara 20 kg/m³ çelik lif ilavesinde ölçülmüştür. Karışımların çökme değerleri 200 ile 100 mm arasında değişmektedir. En yüksek çökme değeri A, C ve D polipropilen lifli karışımlardan elde edilen geri dönüşüm agregalı betonlarda ölçülmüştür. Polipropilen lifli geri dönüşüm agregalı betona çelik lif ilavesi arttıkça taze betonun çökme değeri de düşmüştür. Çökme deney sonuçları Tablo 4'te verilmiştir.

Tablo 4. Çökme Deneyi Sonuçları

Lifler	Geri Dönüşüm Karışımları		
	R	RS10	RS20
K	190 mm	170 mm	120 mm
A	200 mm	170 mm	110 mm
B	180 mm	140 mm	110 mm
C	200 mm	190 mm	170 mm
D	200 mm	170 mm	100 mm
E	190 mm	150 mm	120 mm
F	190 mm	150 mm	100 mm
G	190 mm	140 mm	120 mm
H	180 mm	130 mm	100 mm

Basınç Dayanımı

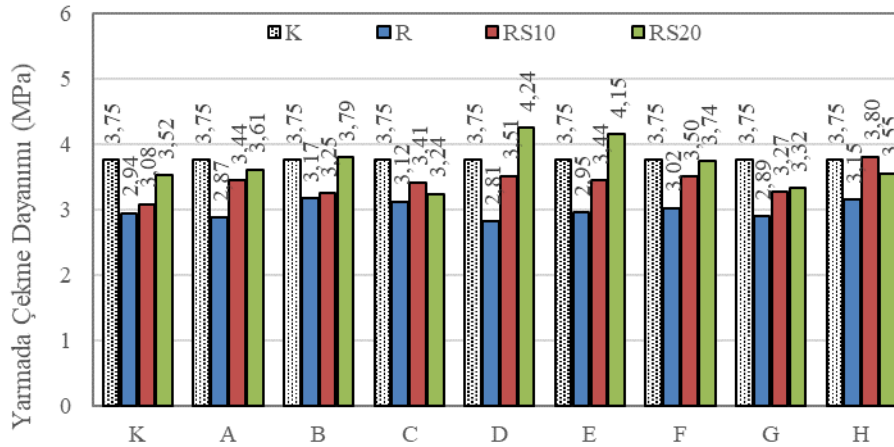
Lif katkısız kaynak beton basınç dayanımı 45,11 MPa'dır. Geri dönüşüm agregalı betonların basınç dayanım değerleri düşmüştür. En düşük basınç dayanımı A polipropilen lifli geri dönüşüm agregalı ve 20 kg/m³ çelik lif ilaveli beton (31,42 MPa) karışımındadır. En yüksek basınç dayanımı ise, C polipropilen lifli geri dönüşüm agregalı ve çelik lif ilavesiz beton (44,23 MPa) karışımındadır. Geri dönüşüm agregalı betonların basınç dayanımları çelik lif ilavesi ile birlikte genelde düşmüştür. Sadece B lifli karışımda çelik lif ilavesi arttıkça basınç dayanımı artmıştır. E ve G lifli karışımlarda 10 kg/m³ çelik lif ilavesinde basınç dayanımında biraz artış görülmesine rağmen, 20 kg/m³ çelik lif ilavesinde tekrar düşmüştür (Şekil 2).



Şekil 2. Slindir Basınç Dayanımı

Yarmada Çekme Dayanımı

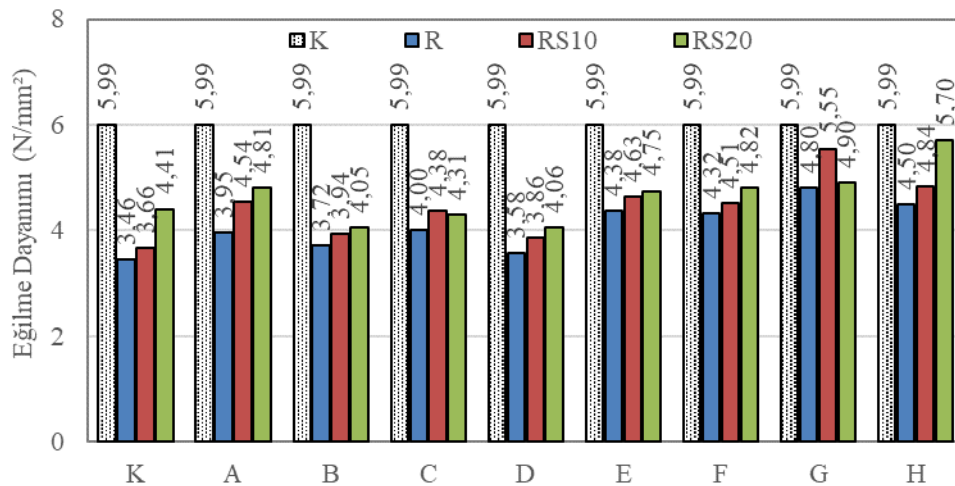
Polipropilen lif katkısız betonun yarmada çekme dayanımı 3,75 MPa'dır. Çelik lif ilaveli polipropilen lifli geri dönüşüm agregalı betonların yarmada çekme dayanımları 2,81 MPa ile 4,24 MPa arasında değişmektedir. Polipropilen lifli betonların geri dönüşüm agregalarından elde edilen betonların yarmada çekme dayanımları kaynak beton yarmada çekme dayanımlarına göre düşmüştür. Fakat karışımlara çelik lif ilavesi ile birlikte yarmada çekme dayanımları artmıştır. B (3,79 MPa), D (4,24 MPa) ve E (4,15 MPa) lifli geri dönüşüm agregalı karışımlara 20 kg/m³ çelik lif ilavesi ile birlikte yarmada çekme dayanımı kaynak beton yarmada çekme dayanımından fazla ölçülmüştür (Şekil 3).



Şekil 3. Yarmada Çekme Dayanımı

Eğilme Dayanımı

Polipropilen lif katkısız betonun eğilme dayanımı 5,99 MPa'dır. Çelik lif ilaveli polipropilen lifli geri dönüşüm agregalı betonların eğilme dayanımları 3,46 MPa ile 5,99 MPa arasında değişmektedir. Polipropilen lifli betonların geri dönüşüm agregalarından elde edilen betonların eğilme dayanımları kaynak beton eğilme dayanımlarına göre düşmüştür. Fakat karışımlara çelik lif ilavesi ile birlikte eğilme dayanımları artmıştır. En yüksek eğilme dayanımı H (5,70 MPa) lifli geri dönüşüm agregalı karışımlara 20 kg/m³ çelik lif ilaveli betonda ölçülmüştür (Şekil 4).



Şekil 4. Eğilme Dayanımı Deney Sonuçları

Sonuçlar

Polipropilen lifli betonlar geri dönüştürüldüğünde elde edilen agregalar yeniden beton karışımında kullanılabilmesi için ince agrega ilavesi gerekmektedir. Karışımlarda sadece geri dönüşüm agregası olarak iri agrega kullanılmıştır. Toplam agrega oranının %44'ü kadar geri dönüşüm agregası kullanılmıştır. Taze betonda segragasyon oluşmaması ve betonun işlenebilirliğinin olumsuz etkilenmemesi için karışımlara ince agrega ilavesinin gerekli olduğu sonucuna varılmıştır. Çelik lif ilavesi ile birlikte taze betonun çökme değerinin de düştüğü sonucuna varılmıştır.

Polipropilen liflerde olduğu gibi çelik lif ilavesi de betonun basınç dayanımını düşürmüştür. Karışıma geri dönüşüm agrega ilavesi betonun basınç dayanımını düşürmüştür. Ayrıca çelik lif ilave edilmesi de basınç dayanımının daha düşmesine neden olmuştur. Çelik lif ilaveli polipropilen lifli geri dönüşüm agregalı betonların basınç dayanımları kaynak beton basınç dayanımlarına göre %30'a kadar düşmüştür. Kaynak beton karışımındaki çimento miktarının 50 kg arttırılmasına rağmen gerçeşen bu düşüş oldukça fazladır.

Çelik lif ilaveli polipropilen lifli geri dönüşüm agregalı betonların yarmada çekme dayanımları çelik lif ilavesi ile birlikte artmıştır. B, D ve E lifli geri dönüşüm agregalı karışımların yarmada çekme dayanımları kaynak betona göre artmıştır. Yarmada çekme dayanımları D lifli karışımında kaynak betona göre yaklaşık %13 artmıştır. Yine D lifli karışımında çelik ilavesi olmadığında yarmada çekme dayanımının kaynak betona göre yaklaşık %25 düştüğü görülmüştür.

Çelik lif ilaveli polipropilen lifli geri dönüşüm agregalı betonların eğilme dayanımları çelik lif ilavesi ile birlikte artmıştır. Geri dönüşüm agregalı betonların eğilme dayanımları çelik lif ilavesine rağmen kaynak beton eğilme dayanımı değerinin altında kalmıştır. En iyi eğilme dayanımı değeri H lifli karışımında olmasına rağmen kaynak beton eğilme dayanımından yaklaşık %5 düşmüştür. En düşük eğilme dayanımı ise kaynak betona göre %42 ile kontrol (K) karışımındadır. Çelik lif ilavesinin geri dönüşüm agregalı betonun yarmada çekme ve eğilme dayanımlarını iyileştirdiği fakat kaynak betonun değerlerinin altında kaldığı sonucuna varılmıştır.

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Defining Cloud Computing

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Abstract: With the development of computing technologies that have been at many points in our lives, cloud computing technology has begun to be used in a wide range of environments from a portable computer to a server computer. Accessibility is easy, cloud computing is at the top of the reasons for preference. Big companies in information technology (Microsoft, Google etc.) are leading the cloud computing services. It is thought that the installation of the cloud computing system is a big financial budget. However, a cloud computing system can be installed even in our home or office computers.

The aim of this work is to explain the installation steps of our own cloud computing server and client system on a virtual or real server system. It is to explain that a cloud computing system is easily installable. A cloud computing system can be set up in short steps and at low cost. In this way, contributed to the growth of national software works. The data is stored in cloud computing servers, one or more national and reliable institutions.

Keywords: Cloud Computing, Server, Linux Operating System, Open Source Software, OwnCloud, Cyber Security

Introduction

1. Cloud Computing System

While it is not known exactly when the term cloud computing is known (Estimated 1950s), this concept is the most generic name given to the Internet-based information services that can be shared among users by using the server computers and similar devices connected to the Internet. It is about the provision of services to be taken by using software at minimum level without the need for service infrastructure by the user. Cloud computing provides services based on three basic models. These are Software as a Service, Platform as a Service, Infrastructure as a Service.

With cloud computing, data, applications and many other information services are stored in the server systems of the provider or organization. Ease of use is one of the great benefits. Google Drive, Microsoft OneDrive, cloud services are the obvious. With mobile, tablet, laptop or desktop computer access, data can be accessed continuously wherever an Internet connection is available. While cloud computing has good sides, it also has bad sides. The presence of data in a server system that is unaware of the user can lead to unpredictable results if the trust agreement is compromised. For example, cloud computing is one of the bad results that the country has cut off its support on a country or company basis. In terms of security, countries must have their own cloud computing server systems.

Advantages;

Variable cost instead of capital investment: Instead of making large investments in data centers and servers that you don't know how to use, you can only pay for the resources it uses and the time you use it.

Benefit from the advantages of large-scale use: You can benefit from low usage costs that you cannot reach yourself by using cloud computing. With hundreds of thousands of customers in the cloud, large service providers can reach more affordable costs on large scales, which reduces pay as you go.

Stop capacity estimation: Stop anticipating the capacity needs of your infrastructure. If you determine the capacity before you distribute the application, you may have to pay high wages for the resources you have paid, or you may have to manage with insufficient capacity. Cloud computing eliminates these problems. You can access the desired size of resources and increase or decrease the scale as required by just a few minutes in advance.

Get faster and more agile: In the cloud computing environment, new IT resources are just a click away. This allows you to reduce the time it takes to deliver these resources to software developers from a few weeks to a few minutes. This significantly increases the agility of the organization as it pulls down the costs and time required for testing and development.

Stop running data centers and spending money on maintenance: Focus on projects that will make a difference for your business, not infrastructure. With cloud computing, you can focus on your customers rather than server staging, editing, and infrastructure provisioning.

Turn to the world in minutes: Deploy your app to different regions around the world in just a few clicks. This allows you to easily and cost-effectively reduce latency and offer a better experience to your customers.

Disadvantages;

Security: Cloud companies are becoming an open target for attackers because many companies or customers receive service. The cloud computing firm must maximize its security level.

Privacy: The firm or customers receiving services from the Cloud Computing Company register their data on the server computers. These data should not be available to unauthorized persons.

Continuity: The service provided by the cloud computing company should be continuous. Any interruption in service will affect the workflow of all customers.

1.1. Cloud Computing Service Models

Software as a Service (SaaS): A software deployment model that hosts software (SaaS) as a service and delivers them to users over the Internet. It also includes the application of services over the cloud. For example, the Microsoft Office application runs online through the cloud.

Platform as a Service (PaaS): The platform as a Service (PaaS) is a complete cloud computing environment for development and deployment that includes resources that allow us to distribute everything from simple-based applications to cloud-enabled advanced enterprise applications. However, we can purchase the resources we need from a cloud service provider based on the price you pay, and access resources through a reliable Internet connection.

Infrastructure as a Service (IaaS): Infrastructure as a Service (IaaS) is an instant data processing infrastructure provided and managed over the Internet. IaaS supports our cost and complexity of purchasing and managing our own physical servers and other data center infrastructure. Each resource is offered as a separate service component, so we can only rent what we need and for the time required.



Figure 1: SaaS

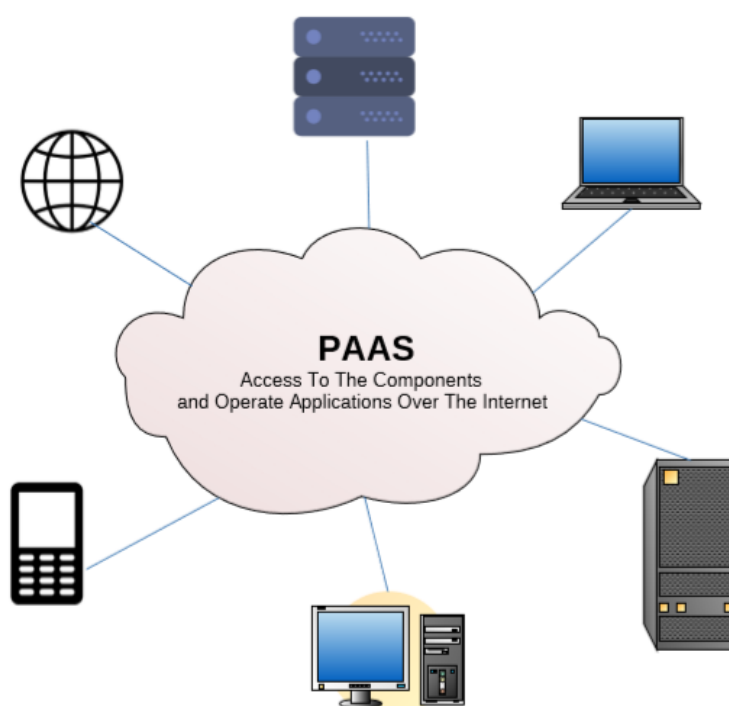


Figure 2: PaaS

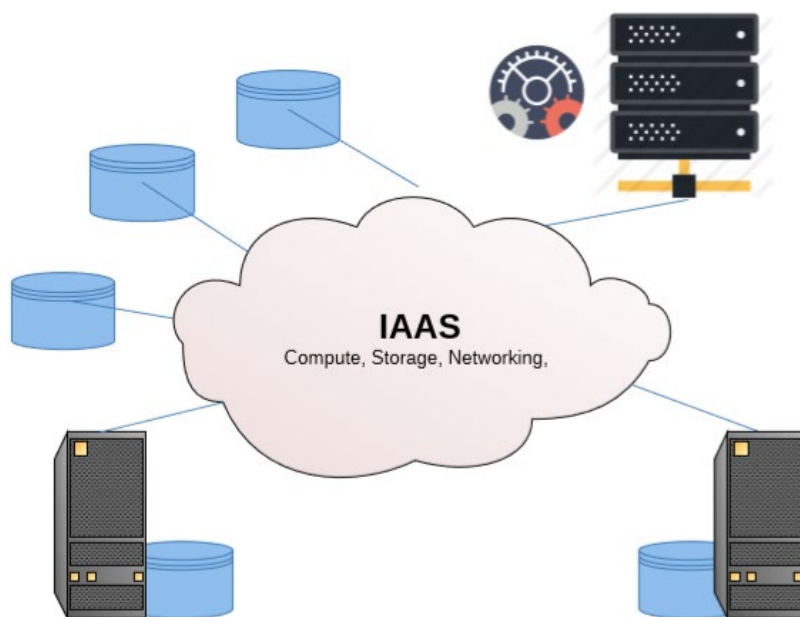


Figure 3: IaaS

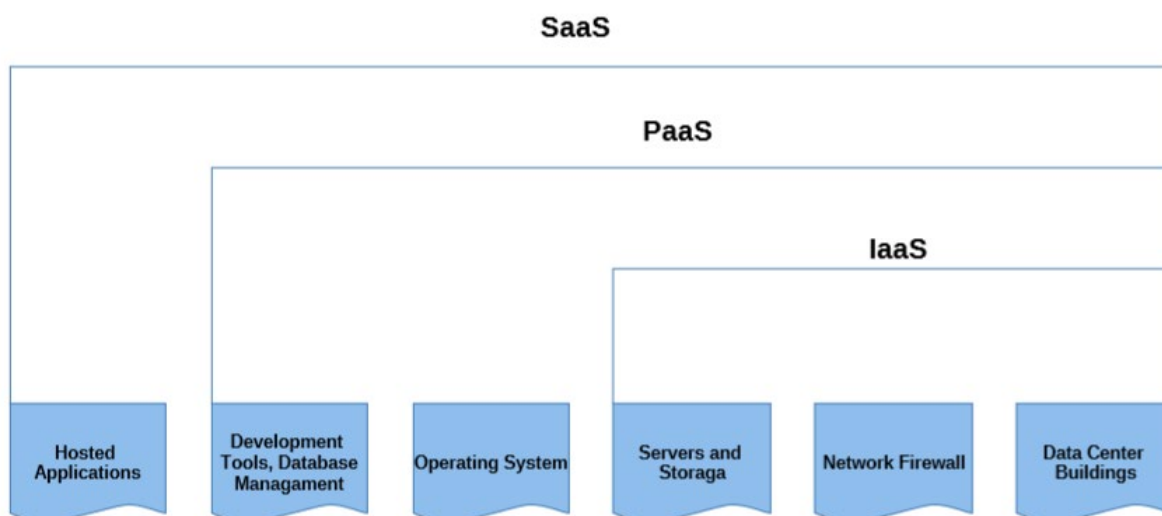


Figure 4: Cloud Computing service models

Conclusions

With the ownCloud system, small or medium sized companies can install their own cloud systems. It is enough to install the public version on their servers. In this way, they can share their files securely. Files can only be accessed from their network. The philosophy of general public license (GPL) responds to many needs without paying any price. ownCloud system is one of them. There is always no need to pay a large amount for a good information system. Sometimes a free software can do a lot more work. In a few steps as described above, we were able to establish our own cloud computing system.

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DETERMINATION OF FATTY ACID COMPOSITIONS OF TOTAL LIPID, PHOSPHOLIPID AND TRIACYLGLYCEROL FRACTIONS OF THE WILD EDIBLE MUSHROOM *PLEUROTUS OSTREATUS* AND *RUSSULA DELICA* WITH CYTOTOXIC ACTIVITIES ON PC-3 CELL LINES

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Abstract

Fatty acids (FAs) of *Pleurotus ostreatus* and *Russula delica* were identified in TL (Total Lipid), TG (Triacylglycerol) and PL (Phospholipid) fractions. The major FAs of TL, TG, PL in both species were C16:0 (palmitic acid, PA), C18:1 n-9 (oleic acid, OLA) and C18:2 n-6 (linoleic acid, LA). In both species, total PUFA amounts were found to be higher than total MUFA and total SFA in TL, TG and PL fractions. The efficient production of the fatty acids especially linolenic and oleic acids which are majorly needed in building blocks of dietary human has confirmed these species as good source of nutrition. On the other hand, insufficiently studied cytotoxic activity (using PC-3 cell lines) of these mushrooms were investigated by using various solvent systems. Ethyl acetate extract of *Russula delica* and *Pleurotus ostreatus* showed significant inhibitory value at the concentrations of 520-530 µg/ml (99,45 % - 92,82 %) against PC-3 cell lines with IC₅₀; 274,53-297,77 µg/mL respectively. Methanol extracts did not show any cytotoxic activity. It has been found that the potential of cytotoxic activity is depended on concentration and solvent type of extracts.

As a result, the present study is a guide for biochemical and nutritional values of the both species and can be useful for further investigation on pharmacological applications.

Keywords : *Russula delica*, *Pleurotus ostreatus*, Fatty acids, Cytotoxic activity, PC-3 cell lines

DETERMINATION OF PHYSICAL AND MECHANICAL PROPERTIES OF POLYPROPYLENE FIBRE CONCRETE

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Abstract: In this study, it is aimed to investigate the physical and mechanical properties of concretes obtained by using polypropylene fibers at different ratios by keeping amount of cement constant in the concrete mixtures. According to experimental results, it was seen that the increasing fiber dosage in the concrete mixtures, flexural strength and ultrasonic velocity was increased by addition of fibers to concrete, compressive strength and slump was decreased.

Keywords: fiber concrete, polypropylene fiber, mechanical strengths.

Introduction

Since the existence of humankind the second basic necessity has been the sheltering after the necessity of eating and drinking. In this way the building sector has always remained on the agenda and has continued to work on developing practical methods. In today's world, as in all areas, the basic goal is to reach the solution at the earliest with minimal expenditure. Various special properties have been developed or some special concrete with different production and application techniques are widely used due to emerging needs in today's use. It is very important to design and economical production of concrete for the purpose of use. (Sarıkaya, 2014). Due to the increase in the world population, complex and multi-storey buildings have been widespread in recent years instead of simple and single storey buildings. As the building height and number of floors increase, the quality of the material used becomes important (Erdem vd., 1997). In multi-storey buildings, concrete performance is of great importance in order to reduce the structural security and the effect of the earthquake (Neville, 1981).

Concrete; is a composite material consisting of mortar phase and aggregate which is obtained by mixing cement, water, aggregate and additives if necessary (mineral, chemical, fiber etc.) in certain conditions and ratios and which is in plastic form at the beginning and gains resistance by hardening by developing chemical reaction (hydration) over time between cement and water (Özel, 2007). When concrete has just been mixed, it takes the name of fresh concrete and when it hardens it becomes hardened concrete (Neville, 1993). In concrete, when the materials entering the composition are specifically rated, the mixture can be poured anyplace and brings a plastic mass that can take the shape of the mold and the size (Baradan, 1997).

Cement based materials such as concrete, tensile strength and tensile unit deformation capacity are materials with very low brittle construction. Conventional concrete is typically; it shows poor performance in terms of fatigue strength, cavitation and abrasion resistance, tensile strength, deformation capacity, shear strength, load carrying strength after cracking and toughness. Where these properties of concrete are obviously required, the addition of high-tech fibers produced from different materials within the concrete improves the above weaknesses of the concrete, thereby increasing the interest in materials such as concrete. The result of the addition of technical properties high fiber, produced from different materials in concrete, improves the poor features of the concrete above, causing to increase the interest in materials such as concrete. Thus, polypropylene fiber, carbon fiber, plastic-glass based fibers and steel fibers have begun to be used in concrete. In terms of advantages in the field of Civil Engineering, the importance of fiber reinforced concrete is increasing rapidly and important steps have been taken to improve the properties of composites (Yardımcı, 2007).

The polypropylene fiber used in this study is a very light polymer that is contained within the thermoplastics as material. It forms almost half of the raw materials used in daily life. From this point of view, it is also possible to say that production is a cheap plastic. The most important effect of polypropylene fiber concrete in concrete or plaster is to check cracks due to plastic shrinkage within the first few hours after pouring concrete into the mold. In the first phase of concrete hardening, the velocity of formation of concrete strength is slower than the rate of

formation of tensile stresses due to shrinkage. This plastic shrinkage is essentially a natural consequence of chemical reaction and evaporation starting between water and cement (Arazsu, 2012). Polypropylene fibers increase the mechanical strength of concrete compared to steel fibers and are not very effective. Yet, at a minimum, they give to concrete energy absorbing capability the plastic shrinkage with the feature is also very effective. Especially polypropylene fibers are preferred against very strong shrinkage. The function of polypropylene fibers, while the concrete is limited to soft, plastic phase, the strength-increasing effect of steel fibers, after taking the concrete setting and hardening it will continue to be noticeable. In the plastic phase of the concrete there is a preventive and limiting effect of the cracks of steel fibers. However, it is weaker than the effect of polypropylene fibers dispersed perfectly in concrete (Figure 1). However, with the reduction of cracks due to long-term drying shrinkage of hardened concrete, steel fibers significantly increase the strength of the concrete by giving a certain durability and toughness to the material (Bekaert, 1998).



Figure 1. Polypropylene Fiber

Material and Methods

In this study, 15 cement samples were produced at 10 cm x 10 cm x 10 cm sizes using 1%, 2% and 3% (polypropylene fiber) of cement weight, keeping amount of cement constant for C 30 concrete. The chemical properties of cement, normal aggregate and polypropylene fiber used are shown in Table 1 and the chemical and physical properties of the polypropylene fiber are shown in Table 2.

Table 1. Chemical Properties of Cement, Aggregate and Polypropylene Fiber Used in Concrete Mixtures

Composition	CEM I 42,5 R (%)	Normal Aggregate (%)	Polypropylene Fiber (%)
SiO ₂	20.02	2.75	0.38
Fe ₂ O ₃	3.52	1.29	0.06
Al ₂ O ₃	5.16	-	-
CaO	63.46	0.2	53.85
MgO	1.03	2.8	0.34
SO ₃	2.74	-	-
Loss of ignition	2.35	-	-

Table 2. Chemical and Physical Properties of Polypropylene Fibre

Appearance	Natural White Fibers
Purity	% 100 Pure
Specific Gravity	0.91 g/cm ³
Module of Elasticity	3000-3500 N/mm ² (MPa)
Tensile Strength	450/700 N/mm ² (MPa)
Melting Point	162 °C
Ignition Point	593 °C
Length	6mm - 12 mm – 19 mm
Profile & Diameter	Circular 18µm - 40 µm

Production of concrete samples, physical and mechanical properties tests were carried out in the Construction Laboratory of Civil Engineering Department of Uşak University. In this study, concrete was produced in 4 different mixing ratios. The amount of cement and fiber dosage was kept constant in all mixtures. Mixing ratios of the produced samples are shown in Table 3. Natural spring water was used for mixing water. The concrete mixing process was carried out with the help of a vertical axis mixer. In order to determine the consistency of the samples, slump with abrams cone concrete temperatures and spesific bulk densitys were measured. For use in various experiments, the mortar was placed in three stages, 100 mm × 100 mm × 100 mm size cube molds on vibratory table unit. At each stage, the mortar was vibration by the vibratory table tool for 10 seconds. For each series, 15 cube samples were produced. The samples were left in mold for 24 hours. At the end of this period, the samples were removed from the mold with the aid of rubber wedges. The samples were kept in the curing pool until the day of the experiment.

Table 3. Mixture ratios of the produced samples

Mix	Cement (% wt)	Polypropylene Fiber (%)
NB	100	-
NL1	99	1
NL2	98	2
NL3	97	3

ASTM C143 (2000) and TS EN 12350-2 (2002) standards have been adopted in many countries. In this experiment also called Abrams Cone; As shown in Figure 2, the top of a 100 mm diameter, 200 mm lower diameter and 300 mm height is cut into three equal layers into a truncated conical metal mold and each layer is freshly squeezed 25 times with a special rod (diameter 16 mm, length 600 mm) concrete filled.

Then the filled concrete was pulled up through the truncated cone mold before it was vibrating. The concrete has collapsed with its own weight and the slump value was measured (Özel 2007).

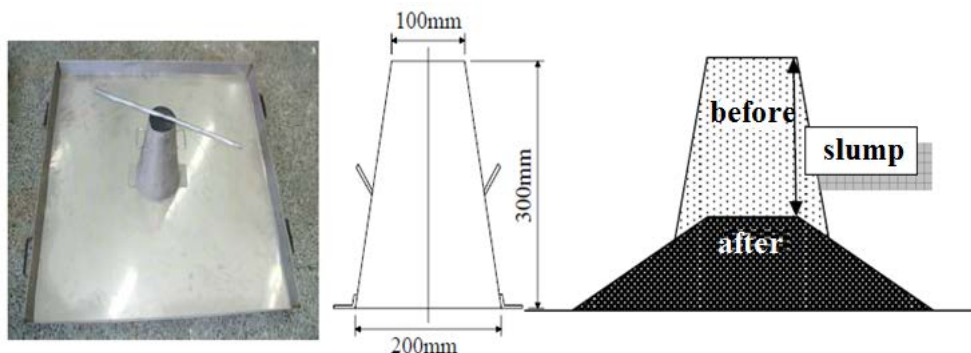


Figure 2. Tools used in the slump test and experimental procedure (Özel, 2007)

In the destructive test method, uniaxial pressure test and flexure test were performed. To measure ultrasonic pulse velocity, ultrasonic measuring instrument in the Construction Laboratory of Civil Engineering Department of Uşak University was used (Figure 3). The ultrasonic velocity measurement was performed with a 12-volt accumulator-equipped with a digital indicator ultrasonic measuring instrument. The instrument was first set to zero, then calibrated. By spraying grease on both sides of the samples, gaps between the probes and the sample were prevented. By the experiment on the cube samples, the times of passing sound waves were measured.

In evaluating ultrasound velocity test results, the ultrasonic pulse velocity time values (micro second) were calculated in terms of km/s in ultrasonic velocity, calculated by Equation 1.

$$V = \frac{L}{t} \quad (1)$$

V: Ultrasonic velocity (km/s),

L: Sample size (km),

t: Ultrasonic pulse velocity time (s)



Figure 3. Ultrasonic measuring instrument

Results and Discussions

The test results of concrete samples produced within the scope of this study are shown in Table 4. The results of polypropylene fiber added concrete are given in Figure 4-7.

Table 4. Physical and mechanical properties of polypropylene fiber added concrete samples

Mix	Dry Unit Weight (kg/m ³)	Slump (mm)	Ultrasonic Velocity (km/sn)	28 Days Compressive Strength (MPa)	28 Days Flexural Strength (MPa)
NB	2.419	170	19.50	49.76	9.68
NL1	2.395	45	20.10	45.88	9.78
NL2	2.375	30	20.70	45.17	10.15
NL3	2.365	20	21.10	44.19	10.45

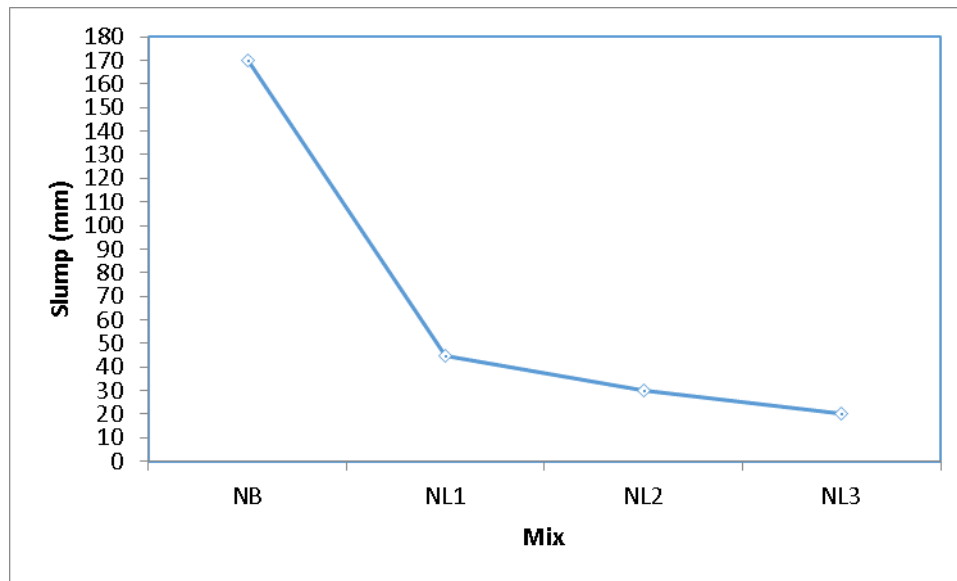


Figure 4. Slump Test Results of Polypropylene Fiber Added Concrete Samples

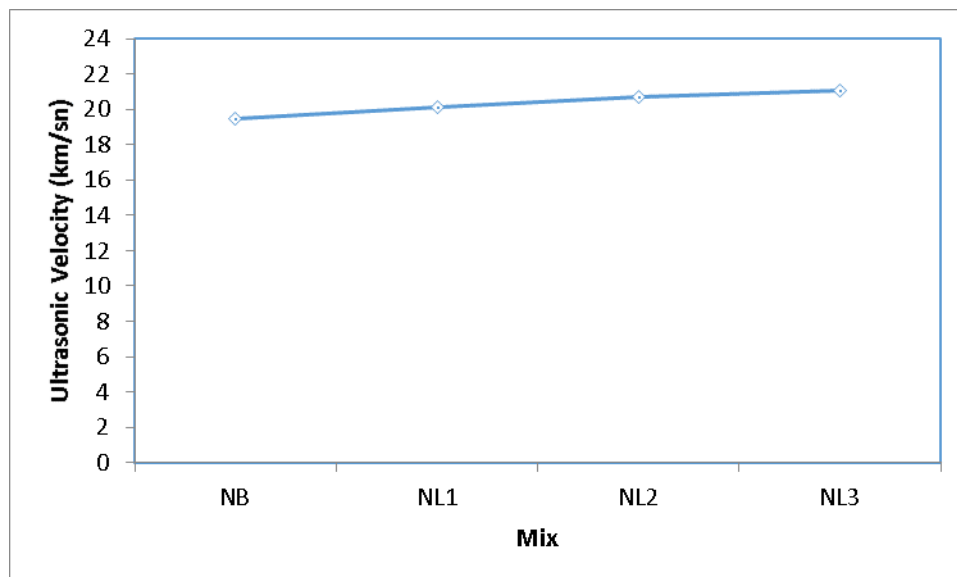


Figure 5. Ultrasonic Velocity Test Results of Polypropylene Fiber Added Concretes Samples

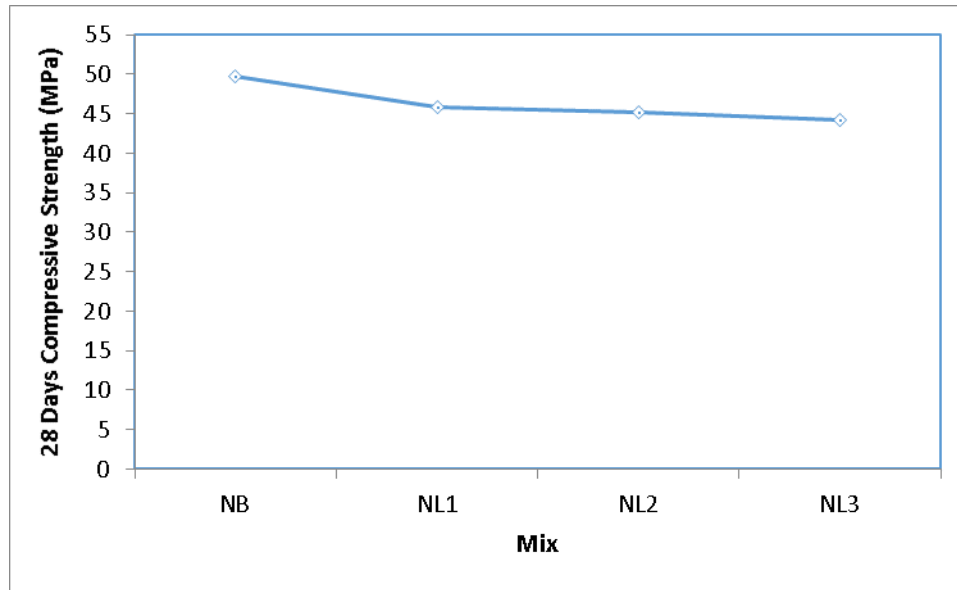


Figure 6. Compressive Strenght Test Results of Polypropylene Fiber Added Concretes Samples

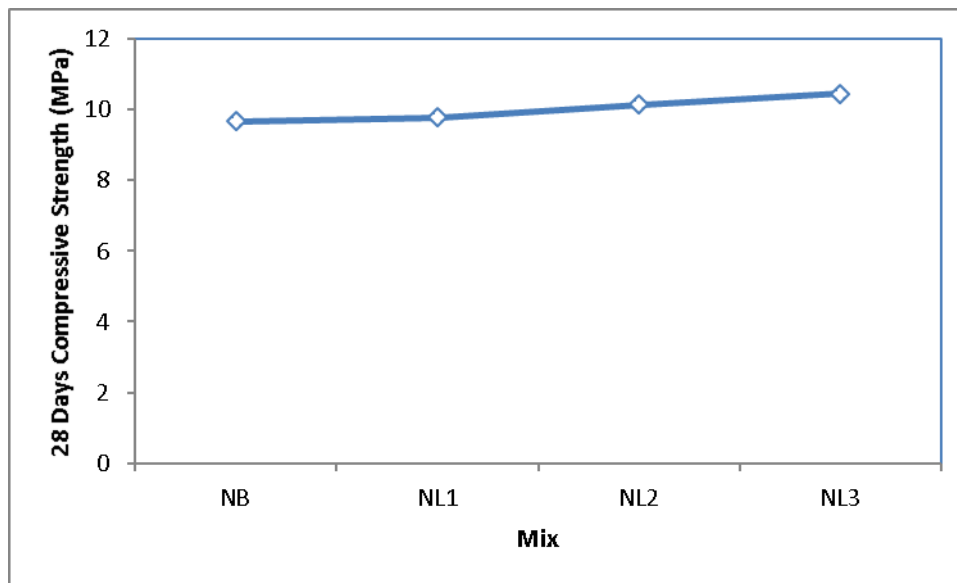


Figure 7. Flexural Strenght Test Results of Polypropylene Fiber Added Concretes Samples

Conclusion

- Increasing fiber dosage in fluid concrete brings about a decrease slump. This is an important feature in terms of cohesion of fresh concrete, even though workability may seem like a negative effect.
- Increasing fiber dosage brings about a decrease in 28 days compressive strenght results.
- Increasing fiber dosage brings about a increase in 28 days flexural strenght results.
- As the fiber dosage increases, ultrasonic velocity increase.

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DETERMINATION OF SOME HEAVY METALS IN FOOD SAMPLES USING ICP-OES AFTER DIFFERENT DIGESTION METHODS

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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. 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

Introduction

Trace metals are important in daily diets, because of their essential nutritious value and possible harmful effects (Tuzen et al., 2007). Fruits and vegetables have low energy content, while the nutrient densities are very high (Chekri et al., 2002). Increased consumption of fruits and vegetables can help replace foods high in saturated fats, sugar and salt and thus improve the intake of most micronutrients and dietary fibre (Grusak and Dellapenna, 1999). However, these foods may contain trace levels of toxic trace metals such as cadmium, lead, mercury and nickel, so it is important to monitor the levels of these toxic metals in these foods (Soylak et al., 2009; Altundag and Tuzen 2011; Sanchez-Castillo et al., 1998).

Various analytical techniques have been used to quantify metals following in the analysis of heavy metals in plant materials and food samples atomic absorption spectrometry (GFAAS, FAAS) (Dundar and Altundag, 2007) is reported the most frequently. Elements such as iron, copper, zinc and manganese are essential elements since they play an important role in biological systems, whereas lead and cadmium are non-essential elements as they are toxic, even in traces (Soylak et al, 2005; Cooper et al., 2011). The present work aimed was to estimate the trace element (Cu and Zn) contents of some food commercially available in Sakarya, Turkey. Trace element contents in food samples were determined by ICP-OES after wet and microwave digestion methods.

Experimental

Apparatus

Spectro Arcos model ICP-OES was used for the determination of elements. Its appearance alone sends out a definite signal: The SPECTRO ARCOS optical emission spectrometer (SPECTRO Analytical Instruments, Kleve, Germany) is different from conventional ICP-OES. The SPECTRO ARCOS can be outfitted with an interface for either axial or radial plasma observation. The proprietary ICAL system logic automatically monitors operation of the SPECTRO ARCOS guaranteeing continuous optimum operating conditions. The operating parameters of ICP-OES were set as recommended by the manufacturer. The ICP-OES operating conditions and analytical characteristics of elements are listed in Table 1 and Table 2, respectively.

Table 1. The operating parameters of determination of elements by ICP-OES

Instrument	: SPECTRO ARCOS
Viewing Height (mm)	: 12
Wavelength	: nm
Replicates	: 3
RF Power (W)	: 1450
Spray Chamber	: Cyclonic
Nebulizer	: Modified Lichte
Nebulizer flow (L/min)	: 0.8
Plasma Torc	: Quartz, fixed, 3.0 mm Injector tube
Replicate read time	: 50 sec per replicate
Plasma Gas Flow (L/min)	: 13
Auxiliary Gas Flow (L/min)	: 0.7
Sample aspiration rate (mL/min)	: 2.0
Sample Pump Rate (rpm)	: 25

Milestone start D microwave (Soriso-Bg Italy) closed system (maximum pressure 1450 psi, maximum temperature 300 °C) was used.

Table 2. Analytical characteristics of analyte ions by ICP-OES

Analyte	Wavelength (nm)	Slopes of the calibration curves
Copper	324.754	0.99987
Zinc	213.856	0.99852

Reagent and Solutions

All chemicals used throughout the experiments were of analytical-reagent grade (Merck, Darmstadt, Germany). HNO_3 (65%), H_2O_2 (30%), and HCl (37%) were of suprapur quality (E. Merck, Darmstadt, Germany). All glassware and polyethylene bottles were kept overnight by soaking in 10 % HNO_3 , and cleaned by rinsing five times with distilled de-ionised Ultra High Quality (UHQ, chemical resistivity: $18 \text{ M}\Omega \text{ cm}^{-1}$) water (Millipore, Bedford, MA, USA) prior to use. A aliquots of an ICP multi element standard solution ($10 \mu\text{g/mL}$) containing the analyzed elements (Cu and Zn) was used in the preparation of calibration solutions. These solutions were prepared by serial dilution with 0.2 % (v/v) HNO_3 to the required concentrations with UHQ water prior to use. For calibration, commercially available standard solutions were used. The ranges of the calibration curves (6 points) were selected to match the expected concentrations (10- 320 $\mu\text{g/L}$) for all the elements of the sample studied by ICP-OES.

Sampling

Chemical analysis

Some food samples were digested with two different methods (wet and microwave digestion). After making up the final solution to volume with UHQ water, the concentrations of each of Cu and Zn were determined by ICP-OES equipped with an auto-sampler. Prior to analysis, the instrument was calibrated according to manufacturer's recommendation. Blank digestion was also carried out by completion of full analytical procedure without sample. All determinations were made in triplicate. We used standard addition method for possible matrix effect.

Digestion procedures

Three sample digestion procedures using wet and microwave digestions are compared for the ICP-OES analysis of some food samples.

Wet digestion

For the digestion of samples, the temperature was maintained at 130°C for 4 h during digestion of 1.0 g of sample with 6 ml HNO_3 (65 %) and 2 ml H_2O_2 (30 %) mixtures on the hot plate until the solubilization of the sample was completed and then diluted to 10 ml with distilled water. The residue was filtered through whatman filter paper and then the sample was diluted to 10 mL with distilled water. Element contents of final solution were determined by ICP-OES. Blanks were prepared in the same way as the sample, but omitting the sample. Three replicates (acid digests) were performed for each sample.

Microwave digestion

A microwave assisted digestion procedure was carried out, in order to achieve a shorter digestion time. Weighed triplicate 0.25 g of certified samples and 1.0 g of real samples in reaction vessels (100 mL in capacity) directly, added to each flasks 8 mL of a freshly prepared mixture of concentrated HNO_3 - H_2O_2 (6:2, v/v) and stood for 10 min. Digestion conditions for the microwave system were applied as 2 min for 250 W, 2 min for 0 W, 6 min for

250 W, 5 min for 400 W, 8 min for 550 W, vent: 8 min. After cooling, the resulting solutions were diluted up to 10 mL in volumetric flasks with 1 M HNO₃. Blanks were prepared in the same way as the sample, but omitting the sample. Three replicates (acid digests) were performed for each sample.

Quality Control and Quality Assessment

Quality of the analytical procedures was assured using Certified Reference Material (NIST-SRM 1515-Apple Leaves and Dorm-3). Analysis of Certified Reference Material (CRM) allowed an assessment of accuracy and precision over a wide range of element concentrations (Table 3).

Table 3. The results of analysis with microwave and wet digestion procedures of tea leaves (INCYTL-1) certified reference material (μg/g), N=4

Element	Certified value	Wet ashing	Microwave digestion
Copper	20.4±1.5	19.4±1.8	20.1±1.9
Zinc	35±2.7	33±3.4	34±2.5

Concentration data for Cu and Zn determinations of CRM drawn against certified values indicate that observed values correlate well with certified values. Four replicates (acid digests) were performed for each sample of CRM. Three measurements were made for each digest. The results are given in Table 4. The results from the analysis of CRM were all within the 95% confidence limit.

Results and discussion

It is showed that wet ashing procedure was slow and time consuming, so microwave digestion procedure was preferred. The comparison of wet and microwave digestion methods showed no statistically significant differences in results obtained with these three methods. The SPECTRO ARCOS with axial plasma observation offers a simple, fast, accurate, precise and cost efficient method for the analysis of dried fruits.

Microwave sample digestion is an accurate, simple, and fast method for the ICP-OES determination of Cu and Zn in some food samples. Standard reference material, NIST-SRM 1515-Apple Leaves was selected for the quantification of analytical data. The achieved results are in good agreement with certified values (Table 4).

The accuracy of the method was evaluated by means of trace element determination in the standard reference material. Relative standard deviations (RSD) were found below 20%. The results for this study are presented in Table 5. Recovery values of elements were nearly quantitative for microwave digestion method. Recovery values were not quantitative for wet digestion methods for Cu and Zn.

Table 4. The results of analysis with microwave and wet digestion procedures of NIST SRM 1515 Apple leaves certified reference material ($\mu\text{g/g}$), $N=4$

Element	Certified value	Wet ashing	Microwave digestion
Copper	5.64 ± 0.24	5.90 ± 0.18	5.47 ± 0.23
Zinc	12.5 ± 0.3	13.6 ± 1.7	13.1 ± 1.9

Copper is known to be vital for many biological systems. Copper forms part of at least 13 different enzymes, and its presence is needed for each if they are to function properly.

Zinc is necessary for the functioning of over 300 different enzymes and plays a vital role in an enormous number of biological processes (Aberoumand and Deokule, 2009). The maximum level of zinc ion permitted for food is 5 mg/kg according to Turkish Food Codex (Saracoglu et al, 2009). Sattar et al. reported that the lowest and highest levels of zinc were found as 64.2 and 65.8 $\mu\text{g/g}$ in spices, dry fruit and plant nuts from Pakistan, respectively (Sattar and Durrani, 1989).

Table 5. Trace element contents ($\mu\text{g/g}$) in some food samples after wet and microwave digestion, N=3

Sample	Digestion	Copper	Zinc
Turkish coffee	Wet	17.25 \pm 1.45	11.52 \pm 1.48
	Microwave	16.88 \pm 2.12	13.13 \pm 1.12
Carrot	Wet	19.45 \pm 3.52	10.36 \pm 0.82
	Microwave	18.13 \pm 2.35	9.06 \pm 0.16
Lentil	Wet	13.56 \pm 2.18	54.14 \pm 4.15
	Microwave	15.60 \pm 1.42	51.25 \pm 3.14
Mushroom	Wet	22.45 \pm 3.45	74.16 \pm 1.98
	Microwave	21.72 \pm 1.52	76.33 \pm 6.32
Lettuce	Wet	24.98 \pm 2.56	65.17 \pm 3.65
	Microwave	25.01 \pm 3.73	62.66 \pm 5.14
Cheese	Wet	32.14 \pm 1.49	50.46 \pm 4.52
	Microwave	32.34 \pm 2.25	51.02 \pm 2.18
Tea	Wet	22.15 \pm 1.73	55.43 \pm 1.78
	Microwave	24.45 \pm 2.41	9.29 \pm 0.17
Rice	Wet	36.92 \pm 3.72	16.46 \pm 0.45
	Microwave	34.76 \pm 3.14	14.30 \pm 2.15
Chocolate	Wet	106.52 \pm 7.19	63.47 \pm 3.65
	Microwave	102.90 \pm 4.85	60.55 \pm 4.56
Sesame	Wet	14.73 \pm 2.48	74.19 \pm 4.52
	Microwave	13.75 \pm 1.63	71.17 \pm 5.45
Peanut	Wet	16.37 \pm 1.63	19.14 \pm 3.47
	Microwave	16.56 \pm 2.18	21.25 \pm 2.36
Tobacco	Wet	15.96 \pm 1.46	24.12 \pm 2.58
	Microwave	16.33 \pm 2.86	24.53 \pm 2.10
Banana	Wet	58.46 \pm 4.69	32.18 \pm 1.45
	Microwave	57.89 \pm 4.75	33.01 \pm 3.19
Cow meat	Wet	26.43 \pm 3.47	260.45 \pm 10.45
	Microwave	27.19 \pm 2.36	253.13 \pm 9.43
Fish (Kaptirga)	Wet	74.25 \pm 6.19	176.14 \pm 6.52
	Microwave	71.33 \pm 1.46	181.72 \pm 7.15

Conclusions

Almost all dried fruits may provide a substantial daily intake dose of this element and qualify well for the provision of a handsome dose of the element to the consumer. Therefore, the studied food samples in general may be used as a good dietary resource. Microwave digestion is more accurate, simple, and fast method than dry and wet digestion method for the ICP-OES determination of Cu and Zn in food samples. Recovery values of elements were nearly quantitative for microwave digestion method. Relative standard deviations (RSD) were found below 20%. The results obtained for trace elements in analyzed food samples were acceptable to human consumption at nutritional and toxic levels.

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DEVELOPING AN ARCHITECTURAL FRAMEWORK FOR ARTIFICIALLY INTELLIGENT COMPUTER BASED TRAINING PROGRAMS

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Abstract: Computer Based Training and Artificial Intelligence are two areas of the technology arena which has advanced over the beginning of the 21st century. Computer Based training allows learners to work at their own pace and from the comfort of their desired locations while Artificial Intelligence allows processes to be done without the direct involvement of a human. Companies in Silicon Valley have demonstrated a high demand for experts with experience in Artificial Intelligence. Experts from various government organizations have called for a need for more Computer Based training using Artificially Intelligent educational programs. Experts have concluded that there is a need for an Architectural framework which demonstrates artificial intelligence in computer-based training. In addition to this, the Department of Defense lacks the presence of artificially intelligent induced educational programs.

By Developing a Systems Architectural Framework for building a more advanced Computer Based training program, we fill a gap to eliminate the absence of this framework. We also eliminate the need to constantly restructure a framework for each AI Computer Based System. In this case, we provide the fundamental building blocks for establishing this framework. This entry into the world of Science and Technology will provide a platform for the advance of education and artificial intelligence so that people will benefit from around the world.

DEVELOPMENT OF MESH-STRUCTURE APPLIED GUM METAL ARTIFICIAL MEDICAL PRODUCTS

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Abstract: It is interested in this study to develop mesh-structure applied Gum Metal (one kind of titanium alloy, also called Gum Titanium) plates with high biocompatibility, elastic deformability and comparatively lower elastic modulus for implant applications. Meshed gum metal plates with excellent 3-dimensional flexibility and light-weight performance compared to usual metal plate implants are designed parametrically using 3D CAD tools for different bone graft applications. Mechanical properties like tensile/compression and bending stiffness and volume densities of sample meshed gum metal plates are experimentally and analytically evaluated with respect to different design parameters like basic mesh shapes, mesh line width etc.

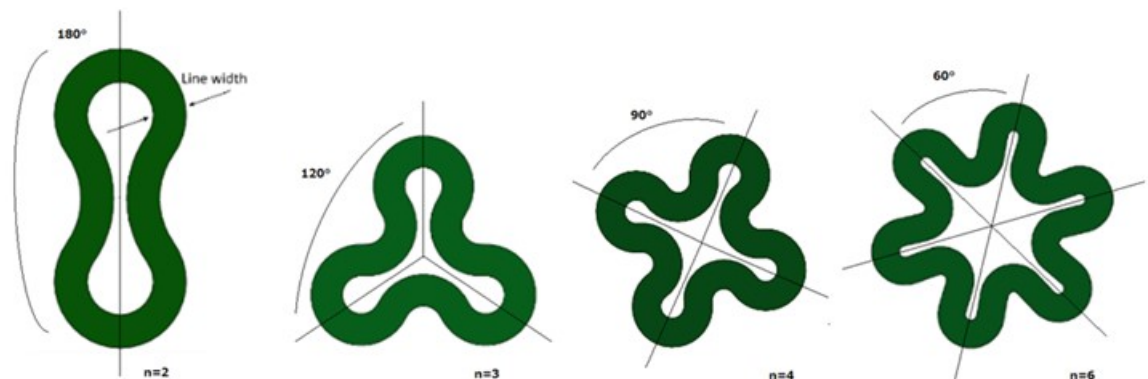
Keywords: Meshed Gum Metal plates, High flexibility, Mechanical property, Experiment, FEM analysis

Introduction

It is interested in this study to develop mesh-structure applied Gum Metal (one kind of titanium alloy, also called Gum Titanium) plates with high biocompatibility, elastic deformability and comparatively lower elastic modulus for implant applications. Table 1 shows the mechanical properties of Gum Metal material under different working types. Sample meshed GUM METAL plate specimens with excellent 3-dimensional flexibility and light-weight performance compared to usual metal-alloy plate implants are designed parametrically using 3D CAD tools for different medical devices applications. Mechanical properties like tensile/compression and bending stiffness and volume densities of sample meshed Gum Metal plates are fabricated using laser cutting processes for experimental and analytical evaluations with respect to different design parameters like basic mesh shapes, mesh line width etc. as shown in Fig. 1.

Table 1 Material property of gum metal plates based from different working process.

Type of Working	Cold Working	Hot Working
Yong's Modulus (GPa)	30~60	85~95
0.2% Proof Strength (MPa)	900~1100	1400~1700
Tensile Strength (MPa)	1000~1200	1500~1800
Density (g/cm ³)	5.6	



(a)180° axisymmetric shape (b)120° axisymmetric shape (c)90° axisymmetric shape (d)60° axisymmetric shape

Fig. 1 Four Samples of basic mesh shapes designed for experimental evaluations.

3D models designed for meshed Gum Metal plate specimens

Three dimensional models for sample meshed GUM METAL plate specimens with higher flexibility and light-weight performance are designed parametrically using CAD software Solidworks. Fig. 2 shows the meshed plate shape models for tensile property evaluations with 0.8 mm mesh line width. Fig.3 shows four types of meshed plate shape models for compressive and bending property evaluations with 1.0 mm mesh line width.

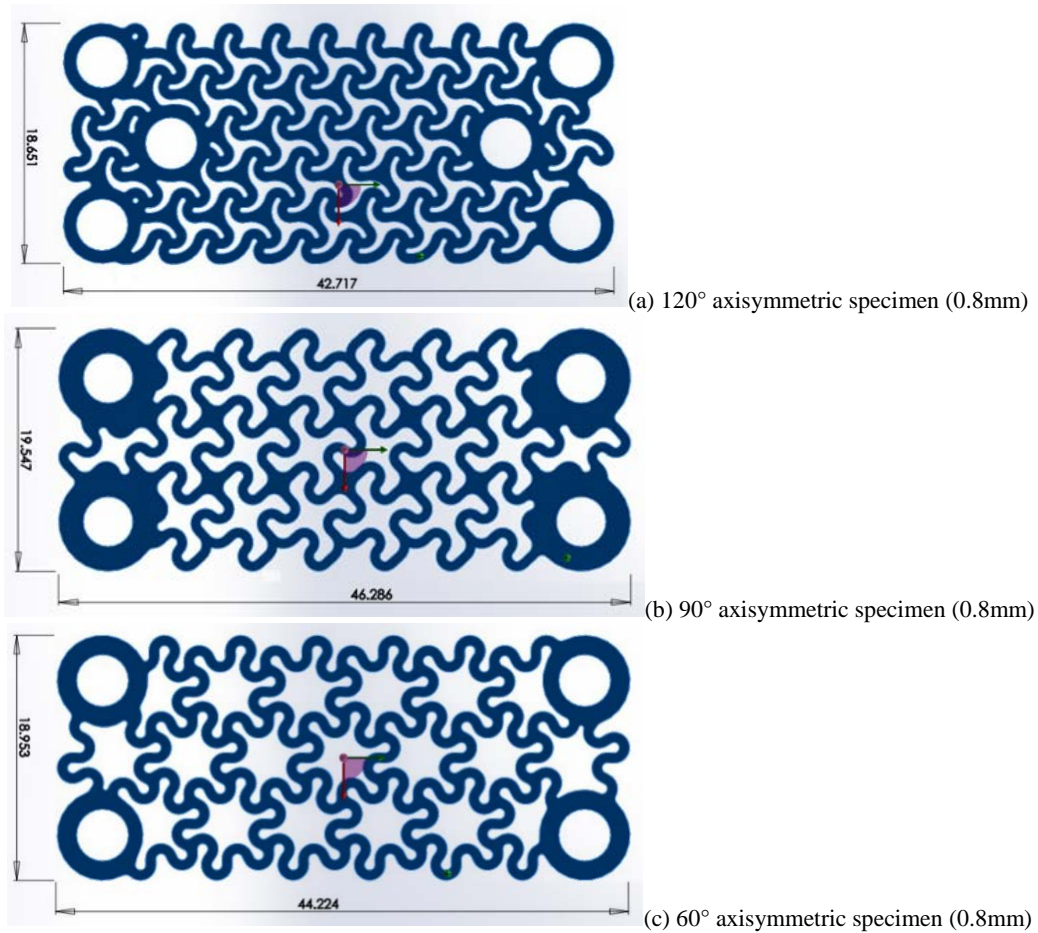


Fig. 2 Meshed plate shape models for sample specimen evaluations (Tensile specimens)

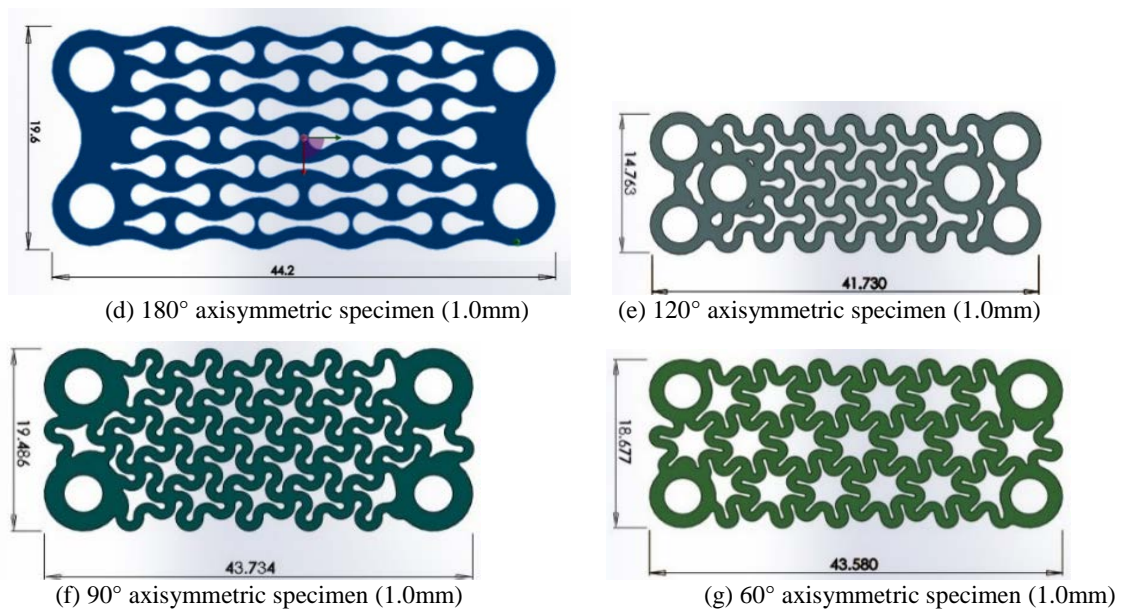


Fig. 3 Meshed plate shape models for sample specimen evaluations (Compressional and bending specimens)

Evaluation on mechanical properties of sample meshed Gum Metal plate specimens

Experimental evaluation

Sample meshed Gum Metal plate specimens are fabricated using laser cutting process and shown in Fig. 4. Fig.5 shows the examined volume densities of different sample meshed Gum Metal plate specimens compared with original Gum Metal material. One can see that sample meshed Gum Metal plate specimens with different basic mesh shapes are resulted in light-weight structures compared with original Gum Metal plates.

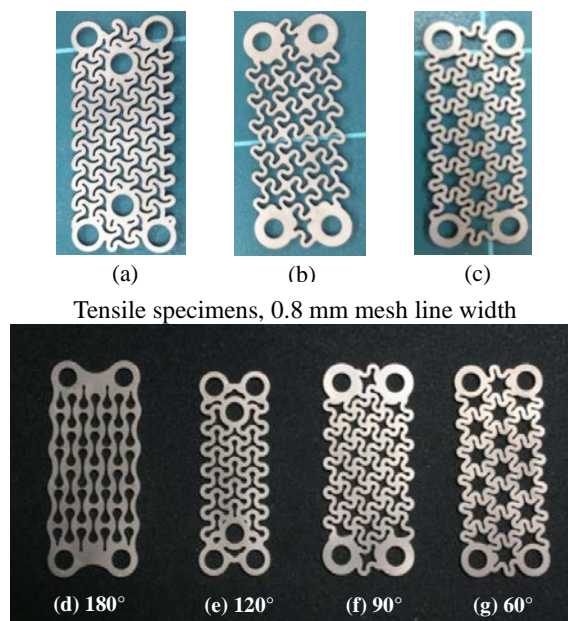


Fig.4 Meshed gum metal plate specimens for mechanical property evaluation

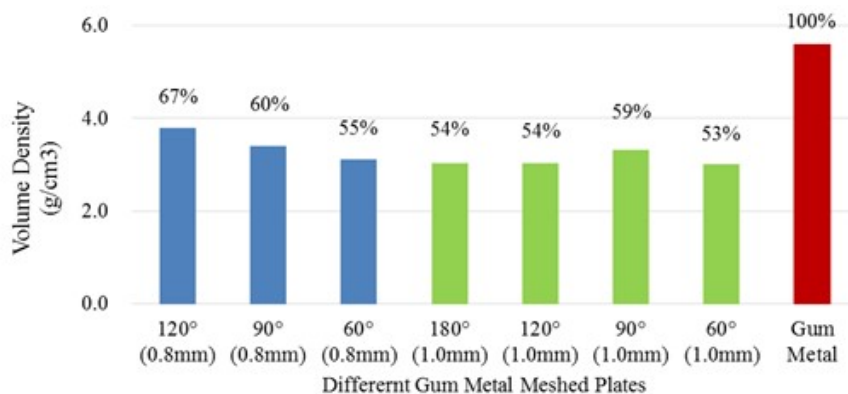


Fig. 5 Volume density of sample meshed gum metal plate specimens

Analytical evaluation

Based on the three dimensional models for sample meshed GUM METAL plate specimens shown in Fig. 2, analytical evaluation on tensile, compressional and 3-point bending experiments on those sample meshed Gum Metal plate specimens are executed for comparison with experimental results. Fig. 6 shows the analytical models for three experiments of meshed Gum Metal plate specimens and Fig.7 shows the sample image of finite element mesh for compressive analysis of meshed gum titanium plates. Table 2 shows the material properties of Gum Metal for analytical inputs.

Table2. Material property of Gum Metal for analytical approach

Density (kg/m ³)	5600
Young's Modulus (GPa)	40.0
Poisson's Ratio	0.32

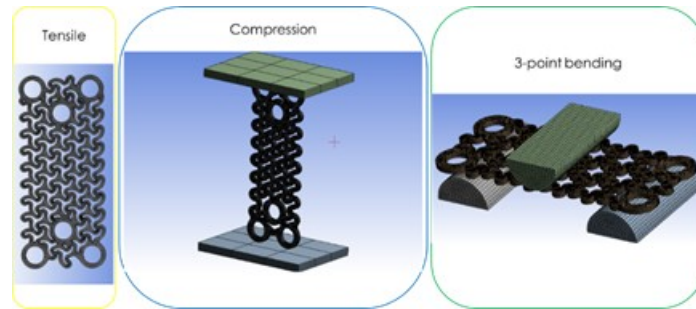


Fig. 6 Analytical approaches on mechanical properties of meshed Gum Metal plates

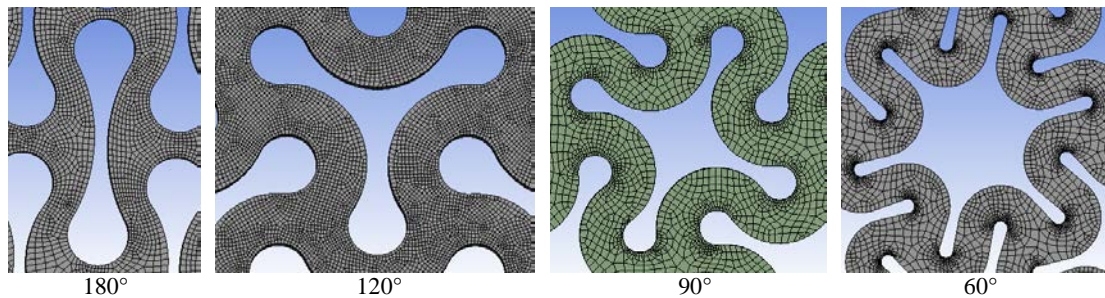


Fig.7 Image of finite element mesh for compressive analysis of meshed gum titanium plates

Results and Discussion

Fig. 8 shows the typical loading-displacement results obtained from tensile, compression and 3-point bending experiments of sample meshed Gum Metal plate specimens based on different JIS standards. Fig. 9 shows the comparison on quasi-tensile and compressional elastic modulus of sample meshed gum titanium plates. From these results, quasi-tensile, compressional and bending elastic moduli are evaluated and the radar chart of mechanical properties of sample meshed Gum Metal plate specimens are shown in Fig. 10. From these experimental results, sample meshed Gum Metal plate specimens introduced here with different basic mesh shapes are resulted in tensile, compressive and bending flexible plate structures.

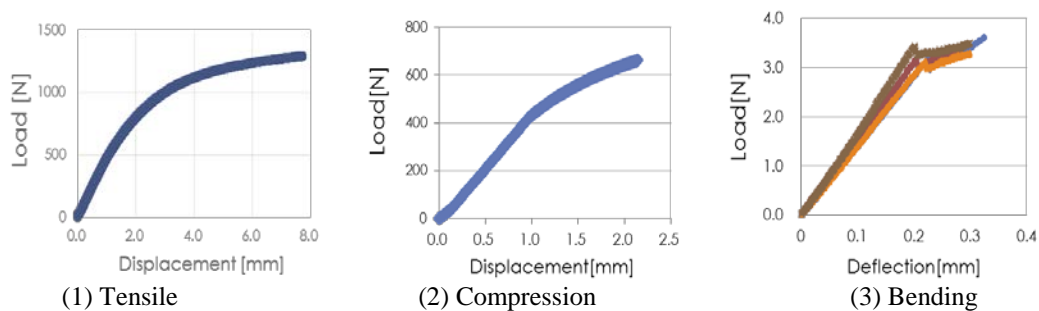


Fig. 8 Typical experiment results for mechanical property evaluation of meshed Gum Metal plate specimens

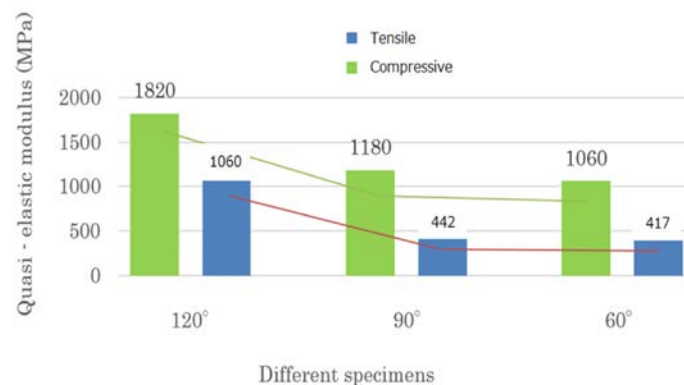


Fig. 9 Comparison on tensile and compressive properties of meshed Gum Metal plate specimens

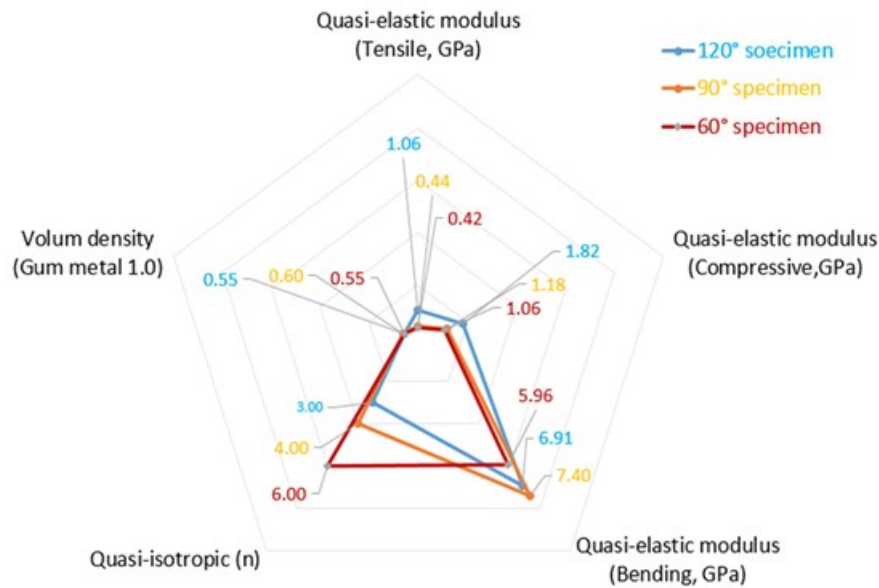


Fig. 10 Radar chart on mechanical properties of sample meshed Gum Metal plate specimens

Fig. 11 shows typical analytical Von Mises stress result obtained for tensile experiment of meshed Gum Metal plate specimens. From these analytical results, comparison between analytical and experimental tensile, compressive quasi-elastic modulus and bending deflections are shown in Fig. 12 to Fig. 14. These comparison on analytically obtained pseudo-tensile elastic modulus, pseudo-compression elastic modulus and bending rigidity of meshed Gum Metal plate specimens with experimental results validate the analytical approach method adopted in this study.

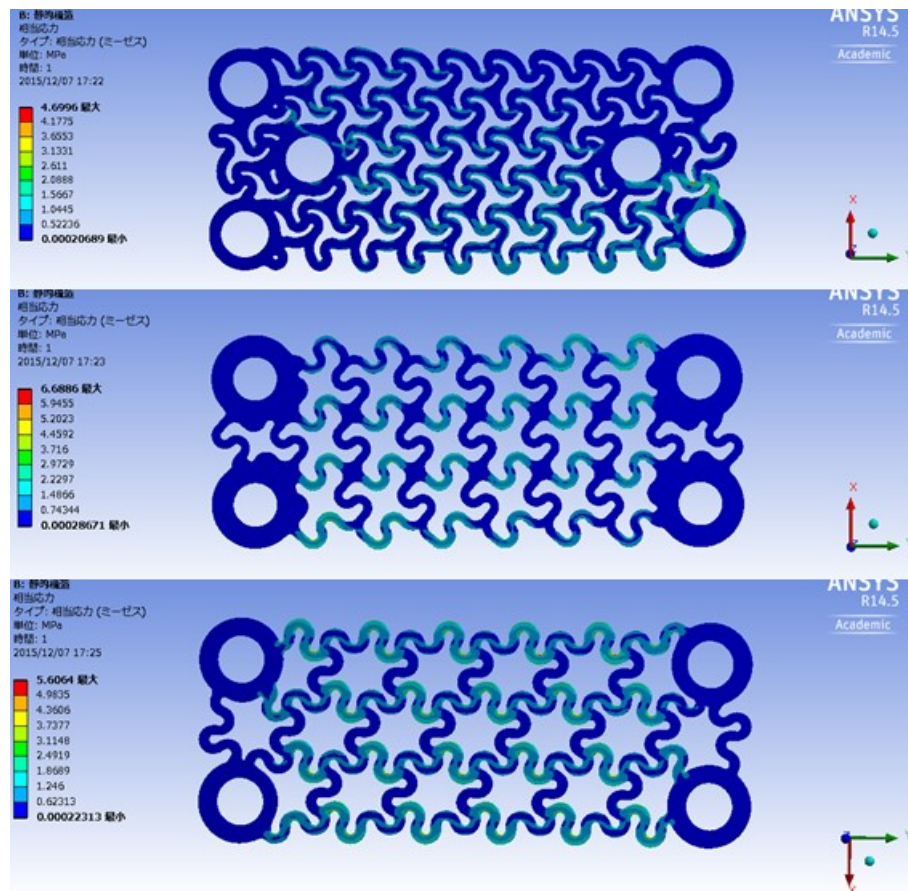


Fig. 11 Analytical results of tensile meshed gum titanium plate specimens (Von Mises Stress).

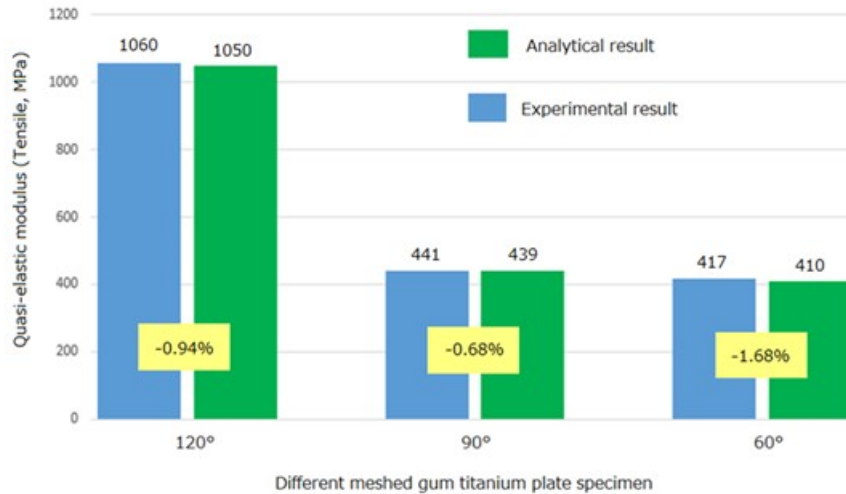


Fig. 12 Comparison between experimental and analytical results of tensile quasi-elastic modulus

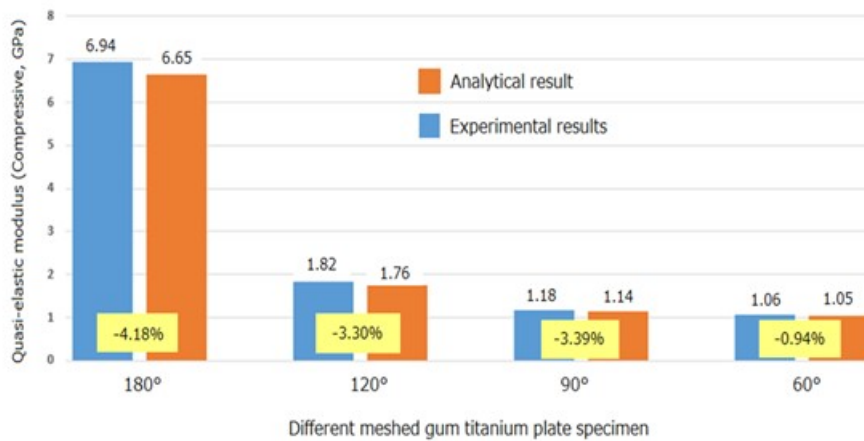


Fig. 13 Comparison between experimental and analytical results of compressive quasi-elastic modulus

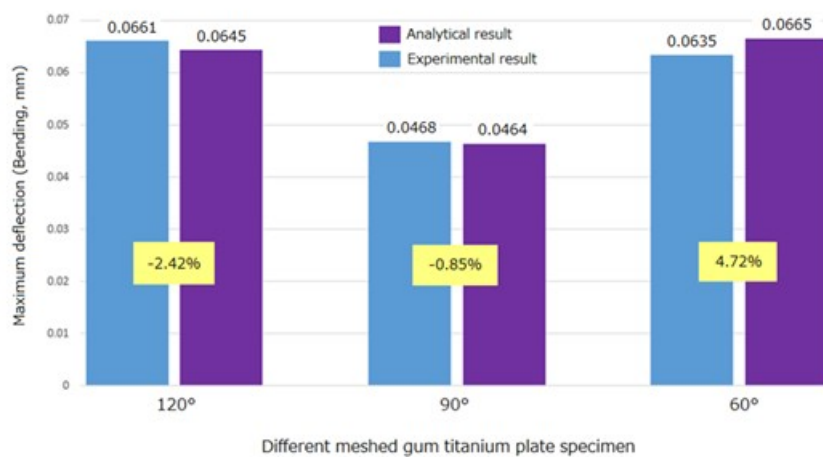


Fig. 14 Comparison between experimental and analytical results of bending deflection

Conclusion

Mechanical properties of meshed Gum Metal plates designed for medical devices applications were experimentally and analytically evaluated and the following points were clarified.

- (1) Sample meshed Gum Metal plate specimens with different basic mesh shapes are fabricated through

- laser cutting process, resulting in light-weight and flexible plate structures
- (2) In order to improve the structural flexibility of meshed Gum Metal plates, it is considered better to design the basic mesh shape with higher priority.
 - (3) It is considered that the in-plane pseudo-tensile elastic modulus and the in-plane pseudo-compressive elastic modulus of meshed Gum Metal plates are greatly affected by pseudo-isotropy (rotational axis-symmetry) due to the basic mesh shapes.
 - (4) For out-of-plane bending rigidity and pseudo-bending modulus, the influence of pseudo-isotropy due to due to the basic mesh shapes is considered to be small.
 - (5) Comparison on analytically obtained pseudo-tensile elastic modulus, pseudo-compression elastic modulus and bending rigidity of meshed Gum Metal plate specimens with experimental results validate the analytical approach method adopted in this study.

Parametrical investigations on mechanical properties of meshed plate models can be carried out analytically due to different design variables to develop databases dealing with different medical devices applications.

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DIFFERENTIATION OF BUILDING WITH THE COMMUNITY CONCEPT FROM EXISTING MODELS, AND ITS IMPLEMENTATION IN PROJECTS IN AFRICA

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Abstract: Building with the community, which is starting to construction with training of labors to construct their vernacular in larger scale, became a trend in 80s and 90s in Africa in order to not only to construct building but also to develop society and it drew apart a different path from existing models. This research examines the rationale of this architectural trend by focusing on mostly projects which won Aga Khan Architectural Award (AKAA) like Halawa House by Abdel Wahed El-Wakil, Yaama Mosque by El Hadji Falke Barmou and Gando Primary School Francis Diebedo Kere and socio-economic and cultural backgrounds of their locations. The preliminary results of the research show that this technic gave chance to society both to survive in such a bad condition by gaining necessary skills and to implement these skills in other buildings forms like schools and hospitals which have a great importance for the development of the society with low-cost solutions. The conclusion can also be drawn that how the way of implementing architecture helps communities in the form of sociological, psychological and economical aspects.

Keywords: Building with the community, Traditional African Architecture, Aga Khan Award for Architecture, Diebedo Francis Kere, local materials

Introduction

For centuries, communities had played an important role in terms of shaping their environment by inventing new techniques or implementing the old ones. This role of communities has been forgotten for a while. With the emergence of co-design concept communities started to find part by their ideas in creating or rearranging the environment. In Africa, this implementation moved one step further by involvement of community to every stage of building life cycle because of the distinctive features of Africa. Many architects have tried this method for providing necessary artificial environment. Furthermore, building with community makes great contribution of well-being of community and its economy. It also provides competitive advantages to architect to gain prestige via awarding by prestigious foundations. In this paper, firstly differentiation of building with the community from existing models will be indicated. After that, implementation on some buildings will mention. Lastly, its benefits and effects on winning prestigious awards will be explained.

Differentiation of Building with The Community Concept (Commin-Arch) From Existing Models

Designing for users

Traditional method of design is about disintegration of professionals who focus only their professions. In this type, design team takes all responsibility of design and makes all design decisions considering the needs and expectations of end-users. Ideas of end-users cannot take part in the design process. After the completion of design, other professions like stakeholders and construction teams practice their duties and building become ready for end-users. Considering only the needs and expectations of end-users give rise to some problems especially in public buildings. Inferences of design team is more likely to fail to correspond changing needs and expectations of societies. This possibility leads to think different about the role of end-users in design process. Direct relations of users to design can prevent some problems which traditional method fails to prevent. These processes make way for designing with users also called as co-design or participatory design.

Designing with users

Participatory design is a methodology which aims to bring together all participants of building life cycle such as employees, partners, customers, citizens and end-users in design process. Origin of participatory design arise from advanced technological developments. Especially in public building design contribution of users are substantial resource for designer (Kanga, Choob, & Watters, 2015). Instead of relying on the personal creativity of designers

to puzzle out design problems in an identified context, the collective generativity of stakeholder is a main source of a participatory design process. In other words, it develops thoughts and imaginings by the collective ability of stakeholders. It can be revealed by designers that the tacit needs of users which are the needs that are indicated but not virtually pointed out by examining what users create with generative toolkits (Joon & Kun, 2008).



Figure 1. Meeting with users (Amstel, 2012)



Figure 2. Co-design activities (AIGA Chicago, 2011)

Building with the community (Commin-arch)

Commin-arch, which is starting to construction with training of labors to construct their vernacular in larger scale, became a trend in 80s and 90s in Africa in order to not only to construct building but also to develop society. Community can find part almost during every stage of building life cycle. Training of labors is not the only thing about commin-arch. Usage of local materials and traditional construction techniques make contribution to these type of buildings. Commin-arch differs greatly from participatory design and traditional method in terms of participation of the community which is only contribution of idea in co-design.

There are numerous reasons such as poverty and high unemployment rate why this concept has developed in Africa. This technic gave chance to society both to survive in such a bad condition by gaining necessary skills and to implement these skills in other buildings forms like schools and hospitals which have a great importance for the development of the society with low-cost solutions.

Three Buildings in Africa with Constructed with Commin-Arch

Halawa House by Abdel Wahed El-Wakil

Halawa House was built in Tahoua, Niger according to traditional Islamic or Egyptian prototypes by involving the courtyard and its fountain. The house has a loggia, a wind catch, alcoves, masonry benches and a belvedere. Most of the labor except for the master mason, plasterer and carpenter, who were skilled craftsmen, was local unskilled Bedouins that trained before construction. Selection of materials and construction techniques reflect sociocultural structure of community.

All materials used in construction is local, and there are no imported materials used in. The basic wall structures are of undressed local limestone and cement mortar. Burnt red bricks and mud mortar are used for all arches, vaults and domes and for the claustra work. All renderings, inside and out, consist of three coats of traditional sand-lime-cement plaster which is called as Alexandrine plastering. Other finishing materials are; sandstone paving from Muqattam, near Cairo, for courtyard, stairs and backyard, Egyptian marble, from Aswan, for living areas, locally made tiles in other rooms, and zân wood joinery for doors and windows including mashrabiyya which is the Arabic

term given to a type of projecting oriel window enclosed with carved wood latticework located on the second storey of a building or higher, often lined with stained glass. The project was awarded by Aga Khan Trust for Culture in 1978-1980 cycle.



Figure 3. View from the secondary court to the domed living room and loggia (AKTC)



Figure 4. Using mud brick construction techniques, a mason builds an inclined barrel vault (AKTC)

Yaama Mosque by El Hadji Falke Barmou

Yaama Mosque is Friday Mosque nearby Tahoua, Niger. Idea of building Friday Mosque came from the elderly people of community. They assigned the role of building to Mr. Falke Barmou who is a local architect-mason. The major characteristics of the mosque were defined by also village elders, mainly by giving an indication of the dimensions and by discussing models which were or were not to be used as example. After several discussions mud brick structure with local characteristics but in larger scale was agreed on. Mud brick structures require cyclical maintenance, alterations and repairs. For the Yaama Mosque this activity was from the beginning an act of religious devotion in which the entire community participates, and so it continues to be. Everyone contributes to the caretaking of the mosque in proportion to his or her ability to do so. Some make mud bricks; others carry them to the building site. Women carry water for brick and mortar production while others cut and gather wood. Structural materials are the sun-dried brick and wood. The wood is of all possible kinds because of being scarce. Mortar for renderings is made of mud into various agricultural and/or animal waste products are mixed for various purposes. The project was awarded by Aga Khan Trust for culture in 1984-1986 cycle.



Figure 5. Yaama Mosque and its surroundings (AKTC)



Figure 6. Front Façade of Yaama Mosque (AKTC)

Primary School by Diebedo Francis Kere

As a native of Burkina Faso, childhood of Francis Kere had many challenges and few resources. His primary school was 40 kilometers away from hometown in another village with poor lighting and ventilation. This experiences inspired him to become an architect and build primary school in his village with adequate psychical conditions. To do so, he established a foundation which named as Schulbausteine fuer Gando, Bricks for Gando, in university to collect funds to start the construction of his primary school. cost, climate, resource availability, and construction feasibility were main parameters for the design of Primary School. In this project, these parameters were not only negated but also embraced. Building with the clay is traditional construction technique for housing in Gando. For maximizing results with the minimal resources available and for being known by community, a clay/mud hybrid construction was primarily used. Natural ventilation was provided by pulling away the roof from learning space of interior and by using dry stacked brick ceiling. In turn, the ecological footprint of the school is vastly reduced by alleviating the need for air-conditioning (Archdaily, 2016).

Although Francis Kere is an architect of the project, the success of it can associated to the close involvement of the local villagers. Every members of community made contribution according to their skills and capability. Traditionally, members of a whole village community work together to build and repair homes in rural Burkina Faso. In keeping with this cultural practice, low-tech and sustainable techniques were developed and improved so that the Gando villagers could participate in the process. Children gathered stones for the school foundation and women brought water for the brick manufacturing. In this way, traditional building techniques were utilized alongside modern engineering methods in order to produce the best quality building solution while simplifying construction and maintenance for the workers. The Primary School was completed in 2001 and received the Aga Khan Award for Architecture in 2004. More importantly, however, the Primary School became a landmark of community pride and collectivity. As the collective knowledge of construction began to spread and inspire Gando, new cultural and educational projects have since been introduced to further support sustainable development in the village (Archdaily, 2016).



Figure 7. Exterior view of Primary School, Photographer, Özgür Basak Alkan



Figure 8. Workers assembling roof trusses, Photographer, Özgür Basak Alkan

Conclusion

Commin-arch give community the benefits of gaining necessary skills to survive such a bad condition, and chance to build necessary infrastructures and educational, and cultural structures with low-budget, and chance to continue their vernacular in advanced ways. In terms of construction process, it provides acceleration by building with the labor knowing implementation of traditional techniques, usage of local materials, and surrounding environment, and available labor-force for all day long, and coalescence of labors. In the field of economy low-budget solution compared to skilled labor costs and reducing or eliminating transportation cost and spent time for it by using local materials can be gained.

Based on the research above, it seems building with the community in Africa helps community by enhancing the way of their life. Also, it has clearly distinguishable advantages in terms of construction process and economy. Furthermore, by the benefits of commin-arch concept architects can earn reputation and become famous.

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DYNAMIC MIXING OF ADIPRENE® L-100

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Abstract: This project used a dynamic mixing system purchased from BDTronics to investigate automatic mixing and dispensing of polyurethane formulations to replace archaic hand mixing techniques at Pantex Plant that resulted in poor quality parts and inability to have good repeatability between results on lots of material. Over the course of approximately 18 months several curing agents and secondary extenders were evaluated but Ethacure® 300 and 1,4 butandiol were found to be the most similar to the previous curatives. Room temperature and heat cured formulations were identified to meet the needs of Pantex Plant Plastics Shop. By varying the formulation using the plasticizer benzylbutylphthalate (BBP), Ethacure® 300, and 1,4 butanediol, and adjusting the curing time and temperature, to the final physical properties were adjusted to include compression, tear, hardness, and tensile strength. A modeling study evaluated molds using a software package called Moldflow®. Moldflow® software helped determine the best points to place injection holes, vent holes and identified if damming issues or void formations would occur. This study determined that the new formulations as well as new colorants identified would be a good replacement for the production tools used at Pantex Plant.

Keywords: Dynamic Mixing; Plastics; Moldflow

Introduction

This paper summarizes a joint endeavor between West Texas A & M University (WTAMU) Engineering and Computer Sciences Department and Pantex. The project establishes a process for dynamic mixing system purchased from BDTronics to include investigating formulations and automatic mixing of polyurethane formulations replacing archaic hand mixing techniques to increase quality, safety, and efficiency.

The focus of the project includes the development of formulations using liquid curing agents to replace the solid curing agents Cyanacure™ and trimethylolpropane (TMP). Cyanacure™ is an amine curing agent used with the pre-polymer Adiprene® L-100 in various hand mixed polyurethane formulations at Pantex Plant. TMP is a solid hydroxyl terminated curing agent that when coupled at various levels acts synergistically with Cyanacure™ to soften final products. To convert from hand mixing to dynamic mixing, two alternate liquid curing agents were evaluated. Ethacure® 300 (E300) and 1, 4 butandiol (BD) are both liquids at room temperature and have similar properties to TMP and Cyanacure™. The materials developed in the Pantex plastics shop is used for coatings, seals, cushions, tool covers, table covers, sealing rings, and many other applications.

As part of the conversion, Pantex requested formulations and curing parameters that meet the following expectations:

- Targeted hardness reached and stable within 24 hours
- Less voids, warping, shrinking and rework
- Repeatable and reproducible results between batches
- Ability to have Adiprene® formulations cured at room temperature for coating applications
- More flexibility in curing temperatures and times
- Better color differentiation between mixes
- Help with mold designs to minimize warping, void volumes and under filling

After a laboratory evaluation at the manufacturer's site, principle investigators determined that the Cyanacure™ and TMP would not work in a dynamic mixer due to the elevated temperatures needed to melt TMP and Cyanacure™.

Further investigation revealed that consideration of Ethacure® 300 as a possible replacement for the MBCA occurred before Cyanacure™ was adopted at Pantex Plant. Based on this information, investigators conducted a second laboratory trial where Ethacure® 300 worked as an alternative to Cyanacure™. The plasticizer BBP did not have synergy with E300 at the previous loading levels used with Cyanacure™ for creating soft polyurethane segments. Reformulation using the new mixer needed to encompass the entire range of hardnesses. Several plasticizers with similar functionality were evaluated to attempt to find L-100 based polymers with the same functionality and physical properties as the current mixes with increased tear. The Manufacturing Division agreed to purchase a dynamic mixer and requested development assistance to identify appropriate formulations, curing parameters, and develop the new colorant system.

The experimental design refined the composition of each formulation to achieve the hardness ranges. The second aspect of the experiment determined the proper curing parameters that result in a cured and post annealed sample where the hardness did not change over time. In some formulations, the change in cure parameter results in variations of the hardness by several points. Identifying formulations that meet each hardness range is accomplished by development of stoichiometric ratios to produce materials within a few points of the targeted hardness. Cure parameters are adjusted and if that does not result in a final hardness that meets the requirements, the mixture ratios are adjusted and then the material reformulated. A study at Pantex Plant in 2007 resulted in four formulations with colors identifying the ranges. This process entailed a hand mixing procedure and while the formulations worked well, the hand mixing process led to problems with batch to batch variations as well as issues with parts shrinking due to high temperature cures which occurs in most unfilled polyurethanes cured at anything above room temperature. The higher the temperature the more shrinkage occurs (Szycher, 1999), voids form due to the introduction of air into the molds during filling, lengthy fill times are necessary, and locations of vents and injection are based on trial and error.

The experiments conducted during this research project with the new L-100 formulations examined the effects of curing with different ratios E300 and BD, as well as the effects of cure temperature and time on hardness. The use of the plasticizer BBP with Ethacure® 300 was used in formulation for the grey material. The project scope included: Screening experiments

- Determining best temperature and time for curing in order to stop creep from occurring
- Physical and chemical reactivity testing of the new L-100 formulations with the best results
- Analysis of molds using Moldflow® software.

Methods, Assumptions And Procedures

Current Mixing Process

The Plastics Shop currently uses a blend of Adiprene® L-100 and the curatives Cyanacure and trimethylolpropanol (TMP), with BBP, a phthalate plasticizer, used to adjust hardness as needed. The current process works well if only the formulation contained two constituents. Currently all mixing is done using an antiquated process by hand in paper buckets that is lengthy and takes 2-3 hours to prepare materials and the mold. The first step includes reconstitution of the prepolymer to a pourable liquid. Paper buckets are weighed and the large bucket is marked for an approximate amount to add. Kits with the dyes, extenders, and curing agents are weighed based on the amount of L-100 required. The curing agents are heated in an oven. L-100 is placed in a steam kettle and degassed. L-100 is removed, reweighed and the curatives are adjusted based on the amount of L-100 lost in transfer. The technician verifies the amounts in use before mixing. After hand mixing the final mixture is degassed again then injected into the mold and multiple injections may be needed depending on the mold size. The mold is then placed into a walk-in oven to cure.

Dynamic Mixer Overview

Dynamic mixing is used for dispensing multi-component formulation directly into molds and commonly referred to as a one shot method. Vacuum for degassing as well as mixing formulation is done by equipment. Mixing in the mix head does not introduce air. Dispensing is very accurate with variability measured in the hundredths of a gram. With the right curatives, extenders, and prepolymers a polyurethane elastomer is produced in a single step and dispensed directly into the mold. While many polyurethanes use a static mixing setup, a dynamic mixer allows for an unlimited pot life. This allows fast curing agents to be explored if desired. These dynamic mixing systems are common to the polyurethane industry but typically are two part mixers. When building a system like this, the formulation is already determined and the process is defined. Based on the chemistry of the components and the final mixture, the system is designed to create a repeatable, controlled and automated dispensing process. The machine design is based on expected stoichiometry in

the future mixes. In the dynamic mixer introduction of moisture or air is limited to transferring from the five gallon container into the Adiprene® tank. Employing an automatic pump system further minimizes moisture and air contamination. The material is then degassed under vacuum and placed under an inert nitrogen blanket. The material is pushed through the system using cavitation pumps and nitrogen gas for pressure. Design aspects include:

- vacuum degassing
- temperature control
- agitation
- controlled temperature conditions
- adjustable and precise dispensing



Figure 1: Forward View of the Dynamic Mixer



Figure 2: Dynamic mix head with valves

Positive displacement volumetric gear pumps achieve the desired dispensing mix ratios. The pumps and valves are readily changed if a change in formulation is desired. The dynamic mixing occurs at the dispensing head (Figure 2) to homogeneously mix components in the product it dispenses after a preset “wait” time. This results in an unlimited pot life during mixing. With the dispensing rate of 12 grams per second the largest mold at Pantex Plant fills in less than 5 minutes versus the previous 15-20 minutes.

System identification and system performance is based on the following: 3 shifts per day 7.5 hours per shift, 250 days per year. Original custom formulation was based on these starting criteria. Dispensing rate was at 15 grams per second capable of filling the largest mold in 6 minutes (5.44kg). The large Adiprene® tank is double jacketed with two discharge ports. It has an agitator and vacuum system and is heated. The equipment is controlled using a Beckhoff-CX PLU logic controller to regulate dispensing, heating, degassing. The controller contains digital I/Os, USB, Ethernet connection for internet, and flash memory. The software uses programmable logic control with Windows XP embedded security. The dynamic mix head is made of stainless steel which has five exchangeable dispensing valves for the Adiprene®, Ethacure®, plasticizers and cleaning solvent. The mix head is removable for cleaning as well as replacing with other size mixing heads. The dynamic mix head has an adjustable servomotor with the ability to run between 100-5000 rpms. The pumps are DC motor driven and each independently controls the dispensing flow rates for the curing agent and plasticizer. These are volumetric gear pumps. The original design used a progressive cavity metering pump for the Adiprene® L-100 that was changed to a gear pump after several pump failures due to the crimp and the stator covered in FKM. These failures will be discussed later. Six pressure transducers (from 0-40 bar) monitor the working pressure between the dispensing pump and valve. This provides online monitoring of the process and ensures the process is under control. Each of the extender tanks included a full set of tank, hoses, pressure sensor, pump motor and valve. This is an advantage because there is no waste material from changing hoses when a color change or hardness change is made since the components are directly dispensed into the mix head. Temperature regulation for the L-100 includes a fluid cooling unit with water circulation control pump and a distribution manifold to maintain constant temperature (tolerance of ± 2 in range of 0 to 30°C) for the hoses and vessel for L-100 as well as the dynamic mix head.

The machine frame is made of tubular aluminum and is on casters and has a self-supported cantilever articulating arm. It is manually operated for free movement in the X, Y, and Z planes. It has a footprint of four foot wide by eight foot long and weighs 2800 pounds. The tubing on the valves and pumps is color coded to match the dispensed formulations to minimize possible mistakes. The large tank contains the Adiprene® the smaller tank to the left is for E300 and the

four tanks along the back are for the extenders BBP, BD which also contain the colorants.

As part of the project a comprehensive operating aid was created that includes startup, operation, shut down, troubleshooting, cleaning, and preventative maintenance processes to facilitate startup process at the plant. With the new dynamic mixer the PU flowing into the mold (assisted by pressure injection of the polymer) displaces the air inside the mold. Proper air vents placed in proper areas must be part of the mold design or voids will form within the molded part. Using complex geometric shapes with varying wall thickness exacerbates air entrapment. To overcome this obstacle, tall shapes or complex shapes containing thin and thick portions should be filled from the bottom, not from the top to ensure proper filling and air displacement. For these molds a delivery tube system reaching the bottom of the mold should be employed instead of using a small injection port at the top of the mold. As the mold is filled the tube is removed before the PU begins to set. (Clemitsen, Castable Polyurethanes, 2008)

Equipment Difficulties

When evaluating equipment in an R & D process, challenges occur. For example, within the first week of operation the main pump delivering Adiprene® to the mixing chamber seized and ceased functioning. The pump was disassembled and failure of a crimp was determined to be the culprit. A new stator with FKM (a fluoroelastomer usually considered chemically inert) was installed. At the beginning of the experiment the manufacturer of L-100 said the typical mixing temperature for L-100 is 165°F. The material was stored at 145°F between mixes. During the next two months of the experiment no issues were experienced. After this time interval, pump failure occurred again with the failure caused by the pump type. Replacement of the pump did not solve the problem. Further consultation with a technical person at Chemtura determined prolonged heating of Adiprene® at the low temperature of 130°F affects the prepolymer causing crosslinking and gel formation that raise the viscosity of the material.

Inconsistencies in Adiprene® flow prompted viscosity testing. Based on the results this issue resulted from two possible scenarios. Either the material reacted with the air used to pressurize the tanks or dimerization occurred. The tank was emptied, cleaned and refilled with fresh material. A nitrogen blanketing system pressurized the tanks. Attempts to dispense the new Adiprene® failed when a clog between the pump and valve occurred. After the hose was cleaned and reassembled, L-100 dispensed with poor consistency resulting in high variations in the test weights. During viscosity tests, the L-100 flow slowed to a few grams per second versus the set point of 11 grams per second. The cause was found to be a clog in the L-100 hose between the storage tank and the pump. While attempting to clear the clog, a leak formed between the Adiprene® hose and the coolant sleeve. Since water acts as a blowing agent in polyurethanes, cured material formed in the hose. To address the ongoing issues, a less precise gear pump was ordered that still gave better precision than hand mixing processes.

Because of the elevated temperature for storage, two hoses clogged resulting in extended downtime waiting on new hoses to arrive. To overcome this setback a local manufacturer of high pressure hoses used the fittings from the clogged hose and fabricated a high pressure hose that worked with the current system. Another stator was ordered with polytetrafluoroethylene (PTFE) and installed, operations proceeded, and then maximum pressure errors occurred during dispensing. Due to schedule conflicts, the material sat in the mixer and aged at higher than expected temperatures. L-100 has active sites that react with other materials or with itself causing the formation of dimers and trimers. In both cases, an increased viscosity (doubled when measured at WTAMU) results. The specification for the high precision stator pump identified in the original design was not for higher viscosity material which caused one failure. The pump was disassembled where it was found that the crimp on the rotor (that had failed during the first week of operations) had failed again. A new rotor was purchased and installed with the pump operating as normal.

While cleaning the dynamic mix head, an attempt to remove the agitator resulted in a sheared shaft. Once the problems were corrected and the machine was operational, small black pieces of the stator sloughed off during dispensing into the molds. This was most likely a reaction between the TDI ends of the prepolymer and the stator. Liquid urethane prepolymers react with themselves through the isocyanate and form allophanate branching. This occurs from excessive heat history. Even though the initial contact with Chemtura suggested storing at temperatures at or near 120°F, mixing at 160°F was thought to present any special obstacles; multiple problems with hoses suggested that even at 140°F within 40 days, the allophanate reaction occurs. Testing with GPC verified a dimerization reaction occurred and a doubling to tripling of the molecular weight of the prepolymer while resident in the hose. Heat history is one of most common causes of substandard physical properties in polyurethane part production and explains why there was lot to lot variation in the hand mixing. This over heating or reheating results in the TDI levels decreasing, gelled material in the tank and is a cumulative process. Reheating the same tank of material causes irreversible damage. Containers of

the L-100 should be protected from excessive heat and kept tightly closed under dry nitrogen or dry air. At a temperature of 122°F about 2000 hours produce a loss of 5% NCO content. If raised to 175°F the prepolymer degrades after 82 hours; At 212°F, it fully degrades after 14 hours. Heat history shows itself in the dynamic mixer as increased pressure in the L-100 line and issues with consistent dispensing. The L-100 requires slow heat to get it into liquid form before adding to the dynamic mixer with dispensing at the lowest temperature possible. To dispense the correct amount of material requires the adjustment of pump speeds and the weight of the amount dispensed. To facilitate an easy way to identify correct pump speeds, an Excel pump speed calculation spreadsheet was created.

Dye Experiment

Dyes are added to the polyurethane formulations at Pantex Plant as a visual tool to differentiate between hardness ranges. The machine design includes four tanks dedicated to different plasticizers or an alternate curing agent where each tank uses a specific dye color. The following dye assignments define each hardness range:

80-90 black **65-80 grey** **50-65 red** **35-50 green**

To determine the amount of dye, each were tested in their respective mixes via hand mixes. When evaluating the dyes, the resin was added last in appropriate amounts. To evaluate the effect of curing process on dye and color, two molds are filled with one curing at room temperature and the other at an elevated temperature. Initial tests indicate that the dye mixed much better with the curing agent or plasticizer rather than the prepolymer.

Table 1: Grams of Color in Extender

Color	g	Curative (1000g)
red	118.58	in BD
green	38.61	in BD
black	24.365	in E300
grey	0.327	in BBP

Initial testing indicated when using 2 and 4 parts of colorant, colors were so opaque they were difficult to distinguish between the green, grey, and black. Several other types of powder dyes proved ineffective in improving material results. Further tests conducted on the liquid dyes found that reducing the added amounts by a factor of ten resulted in the sample colors becoming translucent and distinguishable. The new level of colorant is in the range of 0.4 parts for every 100 parts of Adiprene®. The color levels result in a slight change in the shade of the color as parts become thicker or when the cure temperature changes. The red and green pigments used at Pantex are immiscible in the BD and formed micelles. Alternate colorants were found from Polytek. This pigment shows to easily dissolve in the BD and result in translucent polymers as well. Manufacturing personnel liked the produced translucent parts which allows for easy identification of voids.

Testing Procedures

Samples were tested using ASTM D-2240 Standard method of Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer. This method uses a specific indenter forced into the material and is based on the penetration of the indenter under ambient conditions. This is an empirical test and was the screening test for the experiments. An Instron Shore Conveloader Shore A durometer tester was used. All samples were tested at room temperature. The samples were dispensed directly into preheated 6061 aluminum plaque molds with molded part dimensions of 2" x 2" x 1/4". The molds were then cured at various temperatures and times to evaluate the hardness of the test plaques at 1 day, 7 day and 30 days. A Thermal Production Solutions Blue M oven Series DC 146 with a temperature range of 15°C to 350°C and accuracy of ±0.1°C was used to cure the parts.

After meeting the hardness criteria, formulation samples were prepared for tensile, tear C and compression testing. Samples were tested in accordance with ASTM D-624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers using the Die C geometry using five un-nicked samples punched from a slab of cured 1/8 inch thick PU and tested using a Model Sintech 10/D from MTS Systems Corporation at a crosshead speed of 20 inches per minute.

Four tensile testing samples were prepared and tested in accordance with ASTM D-412-06 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension using the dumbbell geometry. Five samples were punched

from the same slab used for tear testing then loaded into the Sintech machine using a crosshead speed of 20 inches per minute measuring the tensile strength (the maximum tensile stress applied in stretching a specimen to rupture) and peak load.

Compression testing is a historical test for Adiprene® at the Pantex Plant. Compression samples were cured and tested in accordance with ASTM D-575 Standard Test Methods for Rubber Properties in Compression using the 40% deflection test method. Five samples were cut from a ½ inch thick slab and tested in the Sintech machine. While this test method is good for polyurethane foams it is not a valid method when evaluating set occurring in the elastomeric material. The applicable test to use is the compression set. Additionally for the softer PU materials (grey, red, green) the samples should be molded instead of cut, with the softer material and high modulus cutting results in parts that do not meet the criteria set forth in the ASTM method.

Viscosity of a fluid is a measurement of the friction of a fluid when it moves in relation to another layer as measured through the shear stress and rate of shear. Viscosity is molecular weight and time dependent. Many of the formulations were tested for viscosity as a quality control tool and to determine physical values for use in the Moldflow® experiments. Viscosity testing was done on material dispensed from the dynamic mix head using a Brookfield viscometer following ASTM D2196 Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer. The compounded formulation was dispensed into a 600 mL beaker and placed in the viscometer. The torque percentage is maintained between 10 – 100% until the temperature of the material reaches 40°C. The LV2 spindle was used for testing and the temperature was 120°F.

Results And Discussion

Formulation, Cure, and Hardness Results

Black

A formulation of 10.97 E300 showed the best hardness results for the black formulation with a range from 80-90 Shore A. At room temperature this formulation cures to the mid-range of the black formulation. A temperature of 93°C for two hours sufficiently cures this material without significant creep. All cure temperatures result in a final Shore A hardness of 84. If a harder material is needed, adjusting the amount of Cyanacure added gives a higher stoichiometric cure ratio resulting a Shore A hardness in the range of 88-92. Preparation of this formulation the A & B tanks on the dynamic mixer results in a clear formulation.

Grey

Grey formulations were varied and multiple formulations were identified for room temperature as well as heated cures. Room temperature cures experience creep in all formulations. With the multiple formulations available, if different physical properties are needed for the same hardness range there is flexibility based on end use. Testing of these formulations' physical properties determine if different grey formulations work better for specific applications. Since a BBP based formulation was picked for the heated cure, the most likely formulation for a room temperature cure is 8.9 parts E300 extended with 40 parts of BBP. This will result in a 75 Shore A hardness. Moisture affects room temperature cures, so humidity plays a role in consistency between batches if cured at room temperature. As expected, inconsistency increases with room temperature cures. When curing at 93°C, the two hour and four hour cure had identical results. When comparing all three curing times, the standard deviation is 0.57 with a 95% confidence range of 68 to 71 suggesting that these three cures are indistinguishable.

Red

Red formulations comprised the range from 50 to 65 Shore A and gave the most flexibility in formulation for both room temperature and heated cures. Many of the formulations targeted green but the results placed the formulations in the red range. While attempting to find a room temperature cure for green and red, several formulations worked with low levels of BD and 100% level of E300. Based on these formulations the 3BD provides the best solution for a room temperature cure. However, if better tear resistance is needed, the higher hardness formulations require evaluation.

Red formulations were evaluated at three different temperatures for a heated cure. These included 71, 80, 93 and 120°C. The BD was kept constant and the E300 was dropped to below 95% stoichiometric cure. The best blend in this situation was the 7 pbw E300 cured for six hours. When E300 was increased to 10.97 pbw and blended with 2.7 BD resulting in higher creep. The six hour cure showed the least amount of creep but also resulted in hardness at the high end of the red scale. When three parts of E300 were blended with 3 parts of BD and the temperature increased to 140°C to force the urethane cure, substantial creep of hardness was observed with a final targeted hardness between 60-62 for all cure

times. When varying the amount of BD used at 80°C, the result shifted the final hardness towards the upper limits of the red range. None of these were considered a target even though several of them are adequate for red at the upper end of the hardness range. When applying various formulations at 120°C, three of the formulations had very consistent start and finish hardness falling in the middle of the red range. Four parts of BD resulted in a higher amount of creep.

Green

Green formulations were the most difficult to obtain consistent results. The best formulations for heat cured green were determined by varying the E300 and keeping BD at 4 parts and curing at 140°C with the five hour and seven hour cures giving consistent with minimal creep experienced. Early in experimentation one of the molds evaluated produced an explosives vacuum lifting fixture. This part has the seal leak rate tested in the Plastics Shop so that vacuum decay does not exceed 2 inches of mercury over a minute period. Based on the new formulation with a hardness of 40 Shore A, it was determined the new formulation sealed better than the old formulation. When introducing irregularities into the surface of the test piece the seal held and formed better to the part with no decay for over two minutes. It is possible to get a green formulation but it is at the upper end of the green range (50 Shore A). One hour at 71°C showed a creep stop at 7 days. However the initial hardness started below the current material requirements at 24 hours.

Mechanical and chemical properties

Table 2: Final Formulation Hardness Results

Final Formulations (L-100/E300/Extender)	Color Code	Cure Temp and Time	1 Day Hardness	7 Day Hardness	30 Day Hardness
100/3.5/3 BD	R1	120°C 5H	59	60	60
100/8.88/50 BBP	Grey 1	93°C 4H	70	71	69
100/10.97/0	Black	93°C 4H	83	84	84
100/4/4 BD	Green 2	140°C 7H	40	40	40

Hardness results are shown in Table 2. The tear strength (resistance to tear) in units of pounds per linear inch is calculated from the maximum load divided by the thickness of the specimen (Table 3). Tear results were higher in all of the formulations except grey. Tensile strength is a measurement of the force required to break the specimen as it is pulled apart. It is expressed in pounds per square inch (psi). The tensile testing is summarized in Table 4 for the specimens tested. For many of the red specimens the elongation stretched beyond the maximum vertical travel of the UTM, so the highest value is reported and explains the 95% confidence for the red formulation. All tensile testing results were higher on the new formulations. Tensile testing is not a good measurement for the red formulation due to the high modulus of the material.

Table 3: Tear Results on Final Formulations

Color	Tear(1b/in)	S.D	95% Conf
Black	430	25	50
Grey	248	5	9
Red	122	2	5
Green	52	2	4

Table 4: Tensile Results on Final Formulations

Color	Tensile (psi)	S.D	95% Conf
Black	4388	249	487
Grey	963	67	131
Red	2320	862	1690
Green	211	5	9

Compression at a load deflection of 40% is a measurement of firmness in pounds per square inch giving the spring force of the rubber. It compares to squeezing a piece of rubber between the thumb and forefinger to determine if the rubber works in the application. It provides a better way of determining what elastomer to use in an application instead of a Shore A hardness since Shore A hardness is more of a surface test whereas compression testing is a measurement of the polymers ability to compress and resist compression. This helps identify materials that will be too rigid or may compress too much in a seal application.

Table 5: Compression Results of Final Formulations

	Compression	S.D.	95% Confidence
Black	2342	157	308
Grey	1084	27	24
Red	901	10	9
Green	275	6.8	6

The viscosity data are presented in Table 6. Viscosity results provided data into the Moldflow CAD analysis.

Table 6: Viscosity Testing of Formulated Compounds

Color	Material/Composition	Fluid Temp. (°C)	Viscosity (cP)	% Torque	RPM
Green	100/4/4BD	55.0	2768	92.3	10
Green	100/4/4BD	53.6	2738	91.3	10
Red	100/3/3BD	54.0	2783	92.8	10
Red	100/3/3BD	53.4	2615	87.2	10
Black	100/10.97/0	54.6	2888	96.3	10
Grey	100/8.88/55BBP	45.7	1141	76.1	20
Grey	100/8.88/55BBP	46.0	1089	72.6	20
Black	100/10.97/0	56.3	2840	94.7	10
Green	100/10/5BD	52.4	3371	89.9	8
Green	100/10/5BD	54.0	3086	82.3	8
Green	100/10/5BD	54.0	2954	78.8	8
Green	100/5/4BD	54.0	2872	76.6	8
Green	100/5/4BD	54.0	2962	79.0	8
Red	100/3.5/3BD	54.0	2932	78.2	8
Red	100/3.5/3BD	54.0	2969	79.2	8
Grey	100/8.88/50BBP	44.0	1386	92.4	20
Grey	100/8.88/50BBP	44.0	1342	89.5	20

Moldflow® Study

Autodesk Simulation Moldflow® is a software suite designed to simulate the plastic injection molding process and provides a quick, simple method to prepare, run and post-process analyze an injection mold. It also has fast, easy-to-use wizards for creating multiple cavities, runner systems and cooling circuits. Included with Autodesk Simulation Moldflow® is an extensive material database. Material creation tools exist to import, change/modify and create materials to be used for any analysis and a report generator to create reports to contain any of the results derived from the analysis. The reports can contain images of the part(s) analyzed, including animations. Moldflow® uses finite element analysis (FEA) and the finite element method (FEM) for understanding plastic injection molding. The computer simulation software predicts how material flows during the injection portion of the molding cycle by analyzing a mesh of the 3D part model. The program simulates flow by calculating the flow front growth from the first node to connecting node, starting at the injection node. The cycle continues until the flow front expands to fill the last node. There are several models used in the software, the following were included in this study, and a select few of these are detailed below:

- Nominal wall thickness
- Draft angle
- Under cut
- Molding window analysis
- Flow resistance
- Gate suitability
- Fill time
- Plastic flow

Autodesk Simulation Moldflow® requires accurate material-property data in order to generate the best predictions. It

contains a materials database holding rheological information required to perform analysis for more than 8000 polymers. A personal database is used to store material-property information custom created by the user. The following is a brief sampling of some of the results obtained from Moldflow and utilized to refine mold designs.

The Design Advisor within Moldflow analysis is the initial experiment which provides feedback on the design of the part including: nominal thickness, draft angle and undercuts. The nominal wall thickness result calculates the nominal wall thickness of the part, and then displays the thicknesses in bands relative to the nominal wall (Figure 3). The wall thickness is expressed as a percentage of the nominal wall (colored legend left in Figure 3) or as values. Ideally the part thickness should be as uniform as possible. Lower variance from the nominal wall thickness reduces filling and packing problems to avoid warping or surface defects such as weld lines or voids. Variations in part thickness may cause flow variation such as race-tracking or hesitation and may also result in excessive part warping.

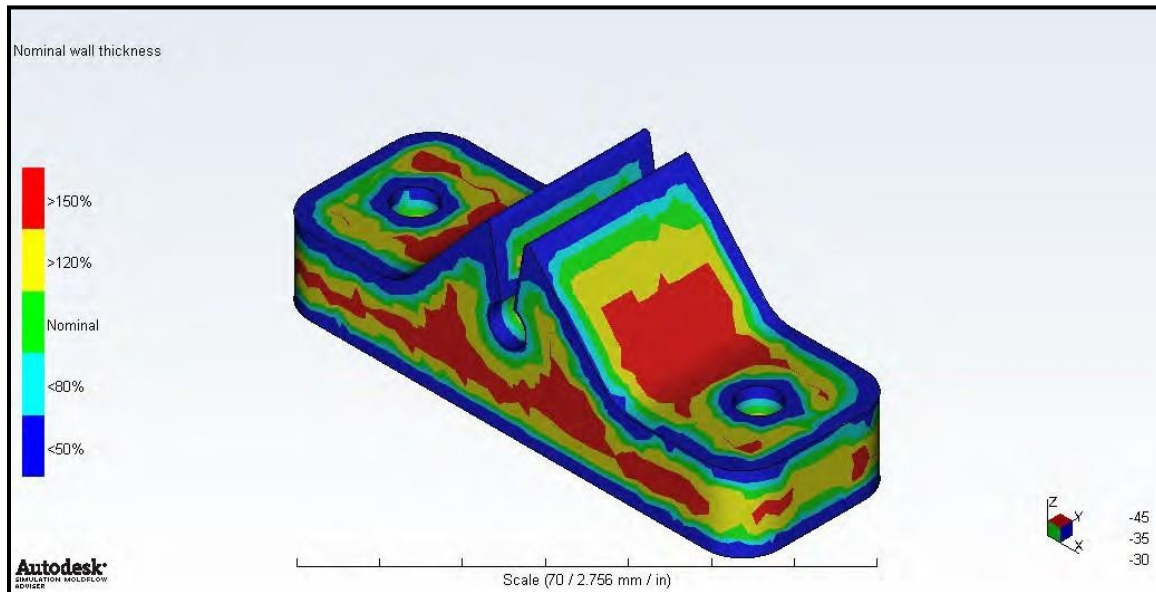


Figure 3: Nominal Wall Thickness

Autodesk Moldflow® Advisor has the capability to determine if a part will fill completely under specific processing conditions. If the plastic does not completely fill the cavity, then the part is short shot. A short shot occurs when the flow of plastic freezes off before all of the flow paths have filled. A part can short shot due to many different or combined factors such as flow restrictions due to long or complex flow paths, low melt and/or mold temperature, slow injection speed, or hesitation in thin sections, or fast curing.

Moldflow® Advisor helps determine what materials work best for the part with regards to mold filling such as pressure, shear stress, or temperature distribution. By using Moldflow® as an early evaluation tool in the design cycle of molds, the finalization of the mold design are accomplished quickly instead of by trial and error. Advisor helps narrow down processing conditions to mold a part. Suitable molding conditions are determined from a Molding Window analysis, and used, perhaps with slight modification, in subsequent filling analyses. In addition to optimizing the molding conditions, a Molding Window analysis is used as a quick initial analysis to compare materials or gate locations. Significant analysis time is saved by determining good processing conditions before running filling analyses.

Advisor has algorithms to determine where the gate (injection location) is located or if multiple gates are required. The Gating Suitability result is produced by the Gate Location analysis when the Advanced Gate Locator algorithm is used. The Advanced Gate Locator algorithm minimizes the flow resistance when determining the best gate position for the first and only injection location. The user can specify prohibited gate regions to block the solver from placing an injection location in the prohibited areas such as critical mating surfaces or surfaces requiring visual aesthetics. The Gate Location analysis produces a Flow resistance indicator plot and a Gating suitability plot. The Flow resistance indicator result (Figure 4) shows the resistance to the flow front from the gate(s). If the flow resistance is not evenly distributed from the injection location(s) to the end of the flow paths, defects or filling problems may arise.

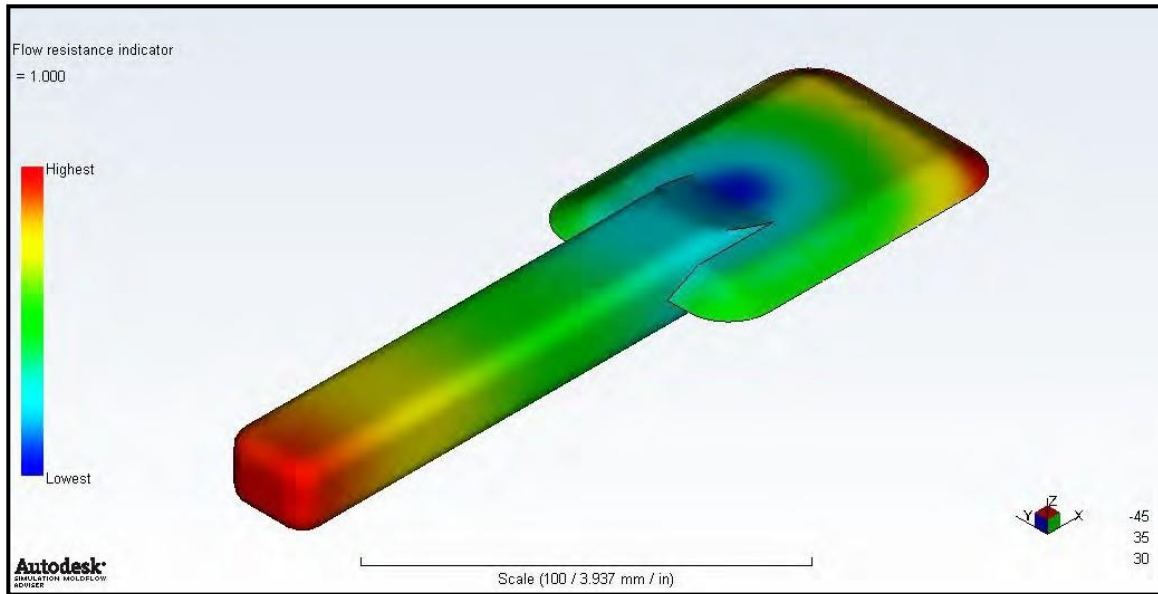


Figure 4: Flow Resistance Indicator

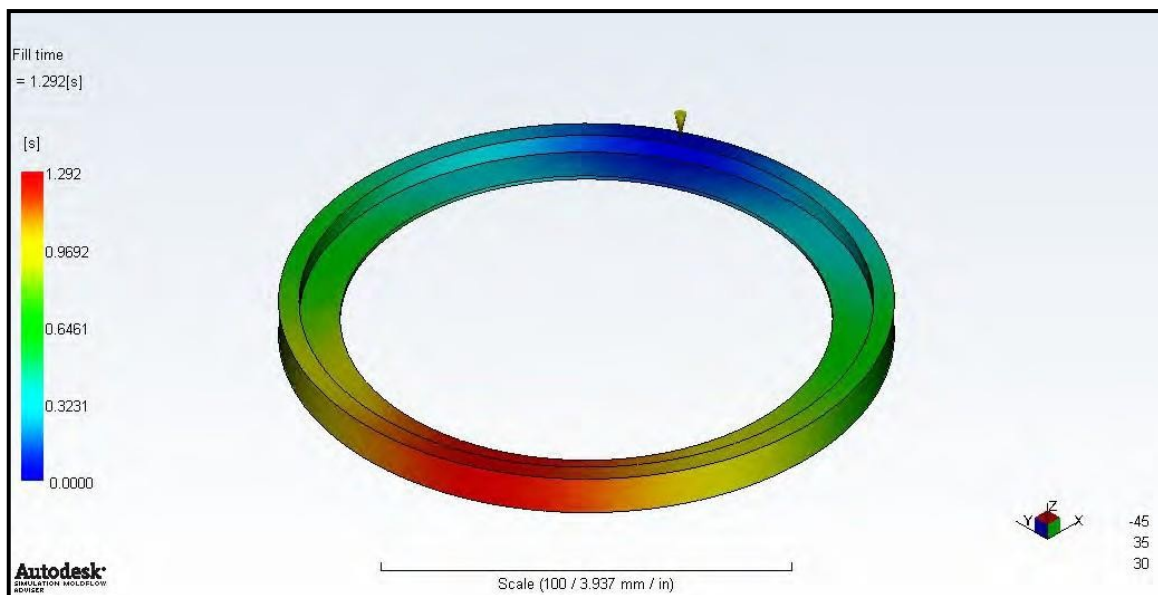


Figure 5: Fill time result.

The Gating Suitability analysis quantifies each place on the model for its suitability for an injection location. The suitable areas shown in this result are worth pursuing as potential injection locations. The best areas shown on the result do not necessarily represent a good solution for a high quality part or high confidence of fill, but rather the best one for the specific case at hand using the selected material.

Some of the most important and most used results are generated from a Fill analysis. The Fill analysis predicts the plastic polymer flow inside the mold in the filling phase. This analysis is often run as the first part of a Fill+Pack analysis sequence. A Fill analysis calculates the flow front growing through the part incrementally from the injection location, and continues until the velocity/pressure switch-over point has been reached. Results generated from a Fill analysis include the Confidence of Fill and Quality Prediction results, as well as Fill Time, Injection Pressure, Pressure Drop and Flow Front Temperature results. The Fill time result (Figure 5) shows the position of the flow front at regular intervals as the cavity fills. It also shows how the material will flow around part features which are the cause of weld lines and possible gas traps. By ensuring all extremities of the mold fill at the same time this minimizes issues with the end product.

The Fill analysis also generates a Plastic flow result plot. The plastic flow result is a different representation of the fill time result. The fill time and plastic flow results can be animated to visually show how the plastic flows from the injection location to the end of fill. The Confidence of Fill result displays the probability of plastic filling a region within the mold cavity under the conditions set for the analysis. This result derives from the pressure and temperature results. The Confidence of Fill result uses four colors (green, yellow, red and translucent) to indicate whether the part will definitely fill, may/will be difficult to fill or may have quality problems, or will not fill and results in a short shot. If the part is all green, the part is easily filled and part quality should be acceptable. If yellow is displayed, the part may be difficult to mold or quality may not be acceptable. As the percentage of yellow increases, the difficulty in molding the part increases and the part quality decreases. If yellow and red is displayed, the part is extremely difficult to fill or quality is more likely unacceptable. If the part displays any translucent, the part cannot be molded because a short shot will occur. The confidence of fill result is determined by both material melt temperature and injection pressure. A medium quality prediction may be caused by low or high flow front temperatures, cooling times, shear rates, or shear stresses. Autodesk Simulation Moldflow® Advisor contains features to help determine the cause of quality problems as well as suggestions and procedures on how to correct these problems.

The average temperature result (Figure 6) shows the velocity-weighted temperature average through the thickness of the part at the end of fill. Because of the velocity weighting, areas of low temperature have a very low velocity and areas of high temperature have a high velocity. If the average temperature is too low in a thin area, hesitation or a short shot may occur. If there is also a weld line in this area, the weld line will be more visually obvious. If the average temperature is too high, material degradation or surface defects may occur.

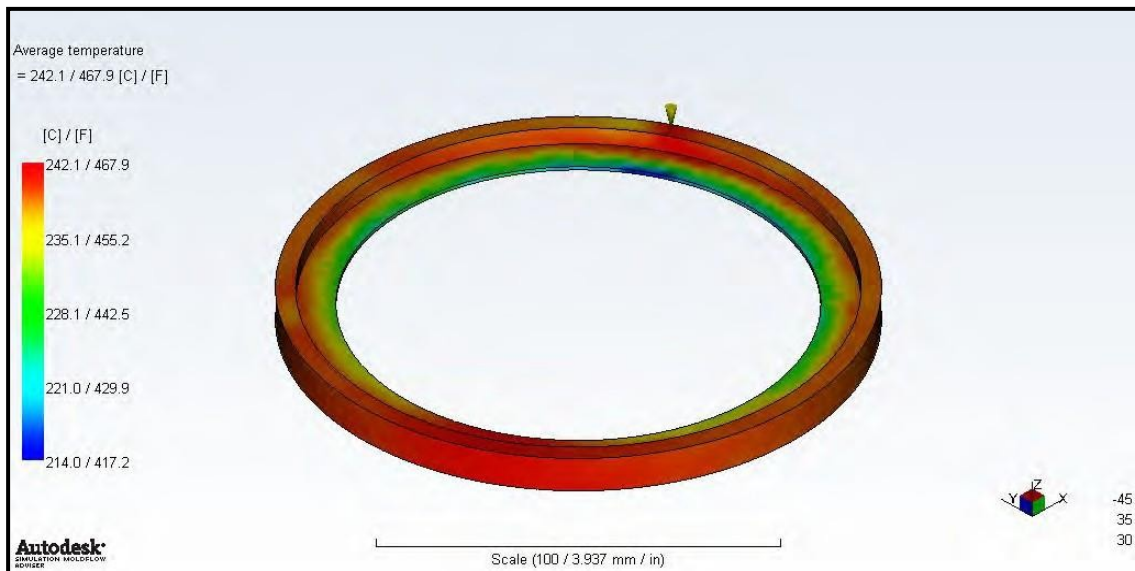


Figure 6: Average Temperature

The Temperature at flow front result shows the temperature of the polymer when the flow front reaches a specified point in the center of the plastic cross-section. The Temperature at flow front result uses a range of colors to indicate the region of lowest temperature (in blue) through to the region of highest temperature (in red). The flow front temperature should not drop more than 2°C to 5°C during the filling phase as a general rule. A large drop in flow front temperature indicates the injection time is too slow, or areas of hesitation exist in the mold design. When the confidence of fill result is poor, the temperature at flow front result determines whether the problems are caused by low melt temperatures.

Similar to the Air trap result, Moldflow® Advisor can predict the formation of weld lines. A weld line (which refers to either a weld or a meld line) is a weakness or visible flaw created when two or more flow paths meet during the filling process. A meld line is typically formed by parallel flows and weld lines are formed by flows meeting at higher angles, often head on. Weld lines can be caused by holes or inserts in the part, multiple injection gates, or variable wall thickness where hesitation or race tracking can occur. The quality of the weld line is dependent on the material type, the type and amount of fillers, and the pressure and temperature at the weld line. Weld lines should be moved to areas

where strength is of less importance and visual appearance less obvious. The Weld lines result displays the angle of convergence as two flow fronts meet.

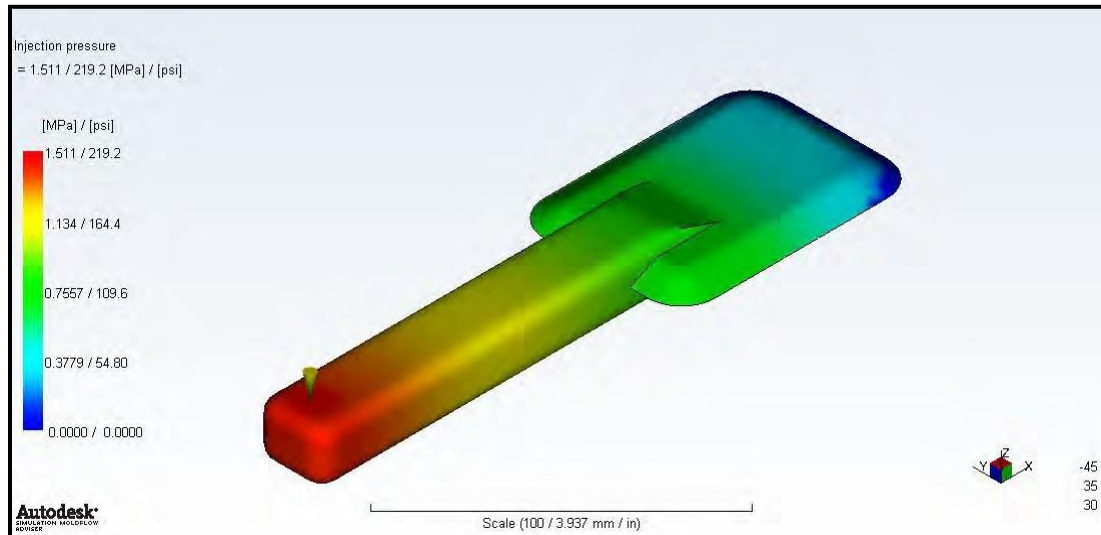


Figure 7: Injection Pressure

The Injection pressure result (Figure 7), is produced by the fill analysis and shows the maximum injection pressure value obtained before the velocity/pressure switch-over occurs during the filling phase. The pressure at a specific location starts to increase after the melt front reaches the location, and continues to increase as the melt front moves past, due to the increasing flow length between this specific location and the melt front. The pressure difference from one location to another is the force pushing the polymer melt to flow during filling. The maximum pressure occurs at the polymer injection locations and the minimum pressure occurs at the melt front during the filling stage. The magnitude of the pressure or pressure gradient depends on the resistance of the polymer in the mold. This is because a polymer with high viscosity requires more pressure to fill the cavity. Restricted areas in the mold, such as thin sections, small runners, and long flow lengths, also require a larger pressure gradient and, therefore, a higher pressure to fill.

The final two analyses from Autodesk Simulation Moldflow® Advisor are "fill+pack" analysis and warp analysis. The "fill+pack" analysis generates the fill analysis results and performs a packing analysis. This analysis is run as the second stage of a "fill+pack" analysis sequence. A pack analysis calculates flow front growing from the filled locations in the model when the velocity/pressure switch-over point was reached. This analysis simulates the stage of the injection molding cycle when pressure is applied to the polymer melt to compress the polymer and to force more material into the mold. This compensates for the shrinkage occurring as the polymer cools from the melt temperature to ambient temperature. A pack analysis generates a volumetric shrinkage at ejection result that shows the volumetric shrinkage for each area expressed as a percent of the original modeled volume. A warp analysis is used to diagnose the cause of warping and recommend a solution, such as gate location changes, design parameter changes, or reduction of wall thickness variations. The Warpage indicator, all effects result highlights those areas of the part where the out-of-plane deflections are approaching or exceeding the specific nominal maximum deflection (NMD) value. This result is based on a "best fit" technique where the original geometry and the deformed geometry are overlaid showing the original size and the warped part.

Health and Safety - Vertecbio™ Citrus 120 as a Replacement for Toluene

The Plastics Shop uses toluene for cleanup after polyurethane mixing. Steam vessels are cleaned with heated toluene and the technicians wear a respirator in order to protect themselves from toluene vapors as well as the isocyanates released from heating. The process takes approximately 240 ml of toluene for cleaning. The new system uses VertecBio™ Citrus 120. It removes the cured and uncured polyurethane faster, will require less solvent, and is derived from renewable resources (100% biodegradable and recyclable through distillation). Its flashpoint is 105°F with a boiling point of 226°F. It does not contain hazardous air pollutants (HAP) and is an Environmental Protection Agency approved SNAP solvent (alternate to aerosol type solvents no ozone depleting constituents). VertecBio™ Citrus 120 is a non-SARA (Superfund Amendment and Reauthorization Act) 313 reportable chemical and is approved for plant

site use. Toluene is considered a hazardous air pollutant (HAP) and is a SARA 313 chemical. The VertecBio™ Citrus solvent is also less expensive than toluene. The Plastics Shop uses toluene at the rate of 15.8 gallons emissions and 5 gallons of liquid toluene waste per year. None of this is recoverable. The new system uses a 5 second cleanout cycle. The system dispenses solvent at the rate of 25-30 ml/second with an average use of 125-140 ml per cleanout cycle. Table 7 compares the chemical and physical properties of the two solvents. The evaporation rate for the new solvent is substantially lower than toluene and will result in minimum emissions.

Table 7: Comparison of VertecBio™ Citrus 120 and Toluene

	VertecBio™ Citrus 120	Toluene
Flash Point (closed cup)	105°F ASTM D93	39.2°F
Vapor Pressure	4 mmHg @68°F	28.5 @68°F
Specific Gravity	0.91 @ 77°F	0.867 @ 68°F
Evaporation Rate (compared to Ether)	0.3	4.5
Vapor Density	3	3.1
Boiling Point	226°F	231°F

Based on current practices and the rate at which parts are fabricated this would decrease air emissions 100% and, if the solvent was recycled, decrease liquid waste stream by five gallons. Even if the solvent is not recycled, it is biodegradable since it is based on ethyl lactate and the only waste associated with the system is the solid polymer caught in the solvent filter. The solvent filtrate system allows the same batch of the VertecBio™ Citrus solvent to be used for upwards of a month before a change in solvent is needed. There have not been any toxicological issues with this product.

According to the technical datasheet, Ethacure® 300 (DMTDA) has undergone toxicological testing. No mutagenic or carcinogenic risks are expected. It was found to be slightly toxic orally to rats (LD50 >2000 mg/kg) and nontoxic dermally to rabbits (LD50 > 2000 mg/kg. Eye irritation was experienced in observations with rabbits (Albemare Corporation, 2000).

Efficiencies

The new system is more efficient and results in significant cost savings. Tables 8 through 11 document the expected cost and time benefits associated with switching to the new system. In Table 8 the overall cost is unknown due to the need to base estimates on the number of mixes for each color completed in a year.

Table 8: Colorant Change and Cost (\$) per 100 grams dispensed

	Black	Grey	Red	Green
Old cost per mix	0.14	0.09	0.08	0.08
New cost per mix	0.03	0.01	0.05	0.05
Cost savings per 100 g	0.11	0.08	0.03	0.03

Table 9 documents the time and costs to currently hand mix the PU in the Plastics Shop based on the man hours used and a conservative estimate of rejected parts overall in the 30% range (it has been estimated on some parts rejection is as high as 80%). There is a possible cost savings of approximately \$130k.

Table 9: Mix time and Costs (\$)

	Hours	Cost per Mix (Burdened)	Cost per Mix with 30% rejection rate	Cost per year
Manual	2.5	\$208.95	\$271.6	\$141,250
Dynamic	0.25	\$20.90	\$20.90	\$10,868
Annual cost savings				\$130,382

Current plastics mixing requires packaging as five gallon bulk kits. Approximately 22 bulk kits are prepared annually.

Each time a kit is created, the Plastics Shop mixes the appropriate material and sends it for testing. Based on past consumption of kits and the new Adiprene® tank holds approximately the same amount of material in 3 Adiprene® kits testing is expected to decrease by approximately 66%. This would result in a cost savings of approximately \$41k annually.

Table 10: Annual Packaging and Testing Costs(\$) All Colors

	Current Hours	Current Cost per Year	Expected Hours	Expected Cost per year
Packaging 22 five gallon kits	120	\$10,029	0	0
Testing kits	528*	\$44,130	156	\$13,039
Total		\$54,159		\$13,039
Total Savings per year				\$41,120

The final area savings area is from switching to a biodegradable solvent. Toluene is 5-½ times more expensive than the VertecBio™Citrus 120. This will result in approximately a \$4k saving per year. However, cost savings from establishing a safer solvent alternative are hard to estimate.

Table 11: Solvent Cost (\$) Savings

	VertecBio™ Citrus 120	Toluene
Cost per liter	\$8.95	\$49.25
Amount Used per year (liters)	55(expected)	\$95
Annual Cost	\$492.25	\$4678.75
Cost Savings per year	\$4186.5	

Conclusions

The new dynamic mixer was demonstrated successfully when formulation studies were conducted at West Texas A & M University. The project was successful in meeting the following objectives:

- targeted hardness reached and stable within a 24 hour time frame
- less voids, warping, shrinking and rework
- repeatable and reproducible results between batches
- ability to have Adiprene® formulations cured at room temperature for coating applications
- more flexibility in curing temperatures and times
- better color differentiation between mixes
- more efficient mold designs to minimize warping, void volumes and under filling

When compared to current production lot testing, an increase in physical testing values for all four heat cured formulations occurred except in tear resistance for the grey formulation. The experiment identified room temperature cure formulations that would work within each range as well.

The new dynamic mixer reduces cycle time: a 15 minute cycle versus a 2-3 hour cycle per mix. Cleanup is safer, costs less and no longer requires respirator or exposure to toluene. Total cost savings per year is estimated at approximately \$176K annually.

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EDGE INTERPRETATION USING HORIZONTAL GRADIENT MAGNITUDE, TILT ANGLE AND CONTINUOUS WAVELET TRANSFORM OF MAGNETIC ANOMALIES OF THE SAROS BAY AND SURROUNDINGS, TURKEY

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Abstract: The magnetic anomalies caused by variations in the magnetic susceptibilities of the causative sources at different depth levels provide the key information regarding faults or structural trends. This paper attempts to map the subtle linear features of Saros bay and surroundings, western Marmara region, Turkey using Horizontal Gradient Magnitude (HGM), Tilt Angle (TA) and 1D Continuous Wavelet Transform (CWT). The HGM from magnetic anomalies reduced to pole emphasizes the boundaries of the causative sources, reducing the unwanted interference effects with enhancement. The HGM maxima track the subtle linear features which are approximately correlated with Ganos fault and southern flank of the Gallipoli block by NE-SW trending lineaments. The TA method is also used to map geological discontinuities, lineaments and structural trends of the region. Both methods are well correlated with each other. The modulus of wavelet coefficients obtained from CWT of magnetic anomalies exhibit cone like structure. The modulus maxima lines are located in the area where geological discontinuities are extended in any direction. Thus all methods confirm possible new lineaments and structural trends of Saros bay and surroundings.

Keywords: magnetic anomalies, edge detection, geological discontinuities, wavelet transform

Introduction

Magnetic anomalies contain complicated wavelengths from various anomalous sources. Subtle linear features in total magnetic anomalies are observed as linear anomalies. The anomalies may arise from faults and/or geological contacts that correspond to lithological boundaries at different susceptibility contrasts caused by tectonic juxtaposition of sedimentary units. The edge detection provides key information on structural discontinuities and trends.

Enhancement of linear features in magnetic data was studied by various researchers (Hsu et al., 1996; Thurston et al., 1997; Pilkington and Keating, 2004; Dentith et al., 2000; Oruç, 2010). Miller and Singh (1994) was firstly developed the TA, and Verduzco et al. (2004) have presented an alternative method as the total horizontal derivative of TA. Salem et al. (2007) have shown the tilt derivative method can be used for estimating the basement depths. Reid et al. (1990) used the Euler deconvolution as an interpretive tool in the magnetic anomalies in order to locate causative bodies and the estimation of their depths. Cordell and Grauch (1985) proposed a method for locating the horizontal locations of the bodies from the maxima of the horizontal gradient of the pseudogravity data. Holschneider (1995) and Moreau (1995) have developed the wavelet transform (WT) as a powerful analysis tool. Then wavelets have become a significant research approach because of their large range of applications. Because wavelets are well localized in space and frequency, WT are used in a wide range of applications in signal processing. The WT was used to locate and characterize homogeneous causative sources point in 1D for potential field data (Moreau et al, 1997). On the otherhand, the methods based on the CWT have becoming a very useful tool in geophysics (Hornby et al., 1999; Sailhac, 2000; Ouadfeul, 2006; Ouadfeul and Aliouane, 2010; Oruç, 2013).

The efficiency of the HGM and TA data obtained from the magnetic anomalies reduced to pole in determining buried faults or magnetic contacts of Saros bay and surroundings, western Marmara region was investigated. I also present a new edge detection method based on the modulus maxima of wavelet coefficients of CWT of total field magnetic anomalies to exhibit subtle linear features of the region.

Materials And Methods

The key component of this study involved image enhancement of existing total field magnetic data acquired by the General Directorate of Mineral Research & Exploration. After correcting the temporal variations of the magnetic field, the total field magnetic anomaly data were deduced by subtracting the theoretical geomagnetic field or IGRF (International Geomagnetic Reference Field) at each station.

The basic theory of the CWT was defined by Moreau et al. (1997, 1999). In 2D the CWT can be applied to a physical space along the profile x . The term a is the dilation with positive upward. Accordingly, the CWT of a function $f(x)$ is defined as a convolution product

$$\begin{aligned} W_{\psi|f}(b, a) &= \int_{-\infty}^{\infty} \frac{1}{a} \psi\left(\frac{x-b}{a}\right) f(x) dx \\ &= (D_a \psi * f)(b) \end{aligned} \quad (1)$$

where ψ is the analyzing wavelet or mother wavelet, b is a position parameter is a position parameter, and the dilation operator D_a is written as

$$D_a \psi(x) = \frac{1}{a} \psi\left(\frac{x}{a}\right). \quad (2)$$

As a result the complex wavelet transform of the $f(x)$ is given by Moreau et al. (1997, 1999):

$$W_{\psi_c|f}(x, a) = W_{\psi_x|f}(x, a) - i W_{\psi_z|f}(x, a). \quad (3)$$

The HGM and TA methods were applied to enhance buried faults and other structural discontinuities. The HGM from pseudogravity field was firstly developed by Cordell and Grauch (1985) in order to locate the edges of magnetic sources. The HGM maxima obtained from steepest gradients of the magnetic anomalies are located over the edges of the vertical or nearly vertical geological contacts, faults or magnetized blocks. Philips (1998) showed the biggest advantage of the HGM is its low sensitivity to the noise in the field data since the method only requires calculations of the two first-order horizontal derivatives of the potential field data. However, the method assumes both magnetic field and magnetization are vertical in addition to the vertical dipping and isolated contacts, and thick causative sources. The HGM of the total field magnetic anomaly (T) for grid data is given by Philips (1998):

$$HGM(x, y) = \sqrt{\left(\frac{\partial T(x, y)}{\partial x}\right)^2 + \left(\frac{\partial T(x, y)}{\partial y}\right)^2} \quad (4)$$

where $\partial T/\partial x$ and $\partial T/\partial y$ are the first-order derivatives of the magnetic anomaly (T) in the x and y direction, respectively.

The TA method was first proposed by Miller and Singh (1994) to locate magnetic sources for profile data. Verduzco et al. (2004) generalized the TA to grid magnetic data. The TA is simply defined as

$$TA = \tan^{-1} \left(\frac{\frac{\partial T}{\partial z}}{HGM} \right) \quad (5)$$

where $\partial T/\partial z$ is the first vertical derivative of the field T . Salem et al. (2007) and Oruç (2010) have showed that Eq. 5 can be written for vertical contact model (Salem et al., 2007), as follows:

$$TA = \tan^{-1} \left(\frac{x - x_0}{z_0} \right) \quad (6)$$

where x_0 and z_0 are horizontal location and depth of the model. Eq. 6 indicates that the TA value above the edges of the contact is equal to 0 Radian. Salem et al (2007) have shown that half-distance between $\pm\pi/4$ contours estimate source depths or the distance between zero and $\pi/4$ or $-\pi/4$ contours of the TA. In addition, the negative contours suggest the outside of the source region while the positive contours are above the source bodies.

Figure 1 shows the structural geology and tectonic setting of the study area, located on the northwestern strand of the North Anatolian Fault Zone (NAFZ). It is clear that the study area is divided into various tectonic zones delimited by structural discontinuities. These zones are marked by Enez graben, Saros graben, Mecidiye uplift and Korudağ uplift. Enez graben which is infilled by the Miocene sediments is bordered by Hisarlıdağ uplift, a normal fault (Çağatay et al., 1998). Saros graben is bordered by two ENE strike slip faults having a normal component (Figure 1). Saner (1985) has shown that the Saros graben walls leading into deep basin are the scarps of NEE-trending normal faults. Korudağ uplift is an antiform and its southern flank is steeply dipping (Çağatay et al. 1998). The uplift is separated from the Gallipoli peninsula by the Ganos fault with strike slip faulting having a vertical-slip component (Çağatay et al. 1998). The central part of the Gallipoli peninsula is formed a NE trending with asymmetric antiform as a result of Anafartalar fault, and northern part is cutted by vertical faults (Çağatay et al., 1998).

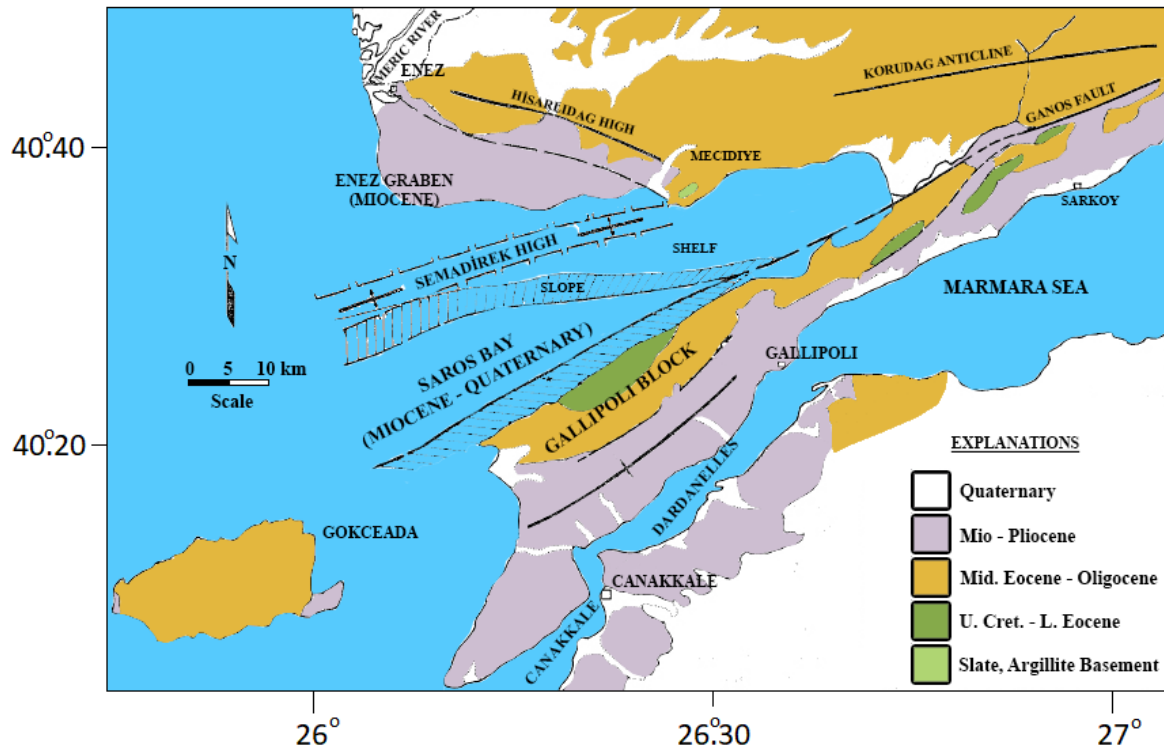


Figure 1. The main structural features and sedimentary sequences in the Saros bay and surroundings (modified after Saner, 1985).

Figure 2a shows the total field magnetic anomalies from Saros bay and surroundings. Firstly, a technique with the reduction-to-the-pole (RTP) was adopted. The RTP signature of the region is observed by a rugged relief with positive and negative anomalies of different wavelengths and amplitudes (Figure 2b). The RTP anomaly, in the eastern part of the region, shows an important gradient zone elongated approximately in NE-SW direction, specified by positive amplitude and various wavelengths. The third-order polynomial surface was subtracted from the RTP anomaly to produce residual magnetic anomaly map (Figure 2c). The processing and additional filtering with the residual anomalies are needed to remove unwanted wavelengths. Accordingly the residual magnetic anomalies were filtered to reduce the interference effects using Butterworth filtering process with wavenumber 0.045 km^{-1} (Figure 2d) and will thus enhance a more precise delineation of lineaments.

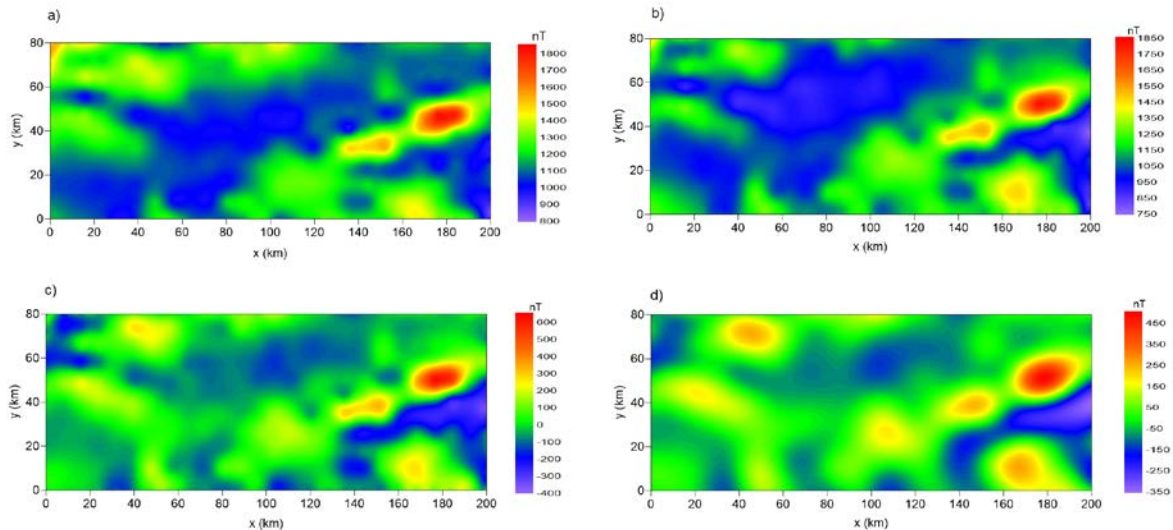


Figure 2. a) Total field magnetic anomaly map of the Saros bay and surroundings. b) Magnetic anomaly reduced to pole. c) Residual magnetic anomaly map obtained from third-order polynomial surface which was subtracted from the magnetic anomaly reduced to pole.

Results And Discussion

In this section, I presented an interpretation of the magnetic anomalies at Saros bay and surroundings, caused by the distribution of the subtle linear features at different depth levels.

The CWT analysis for anomaly profiles extracted from residual anomalies in order to better understand the behaviour of the magnetic anomalies caused by subtle features (Figure 3). The reason for introducing the CWT of magnetic anomalies is that the efficiency of the CWT can be expressed for imaging the structural/trends and verifying with the lineaments obtained from the HGM and TA. The wavelet coefficients are computed by applying CWT to anomalies using first order complex Gaussian mother wavelet or Haar wavelet. Indeed the reason for using of the Haar wavelet is that it conserves the energies of signals. Figure 4a, 4b, 4c and 4d show image of CWT coefficients of magnetic anomaly profiles for different dilations or scales (1-100) of mother wavelet. The modulus of coefficients shows cone structure and local maxima zones.

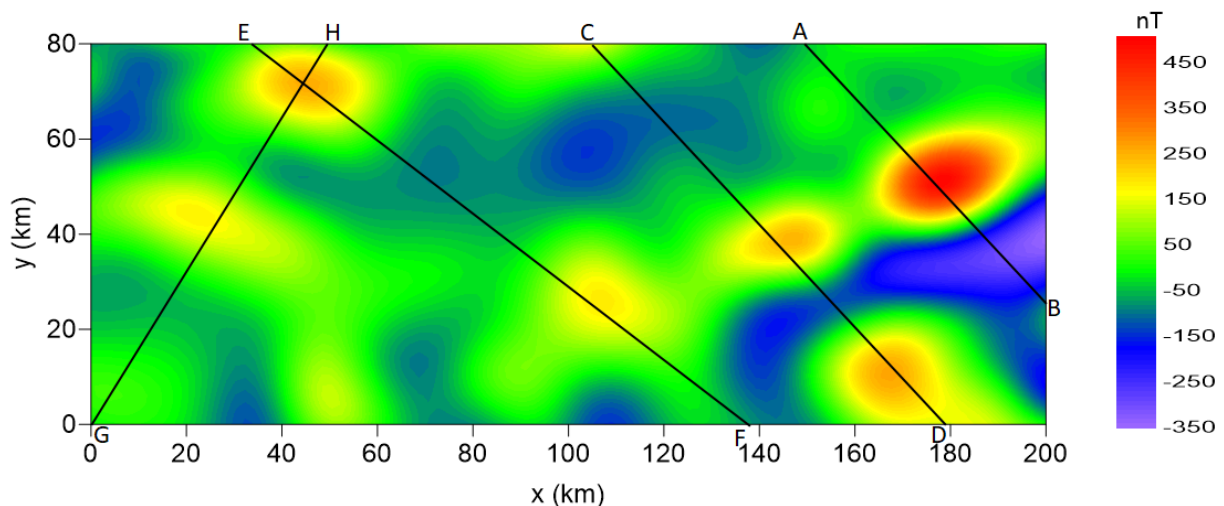


Figure 3. Section lines (AB, CD, EF and GH) on residual magnetic anomaly map of the region. The direction of the section lines is chosen perpendicular to the magnetic anomaly contours.

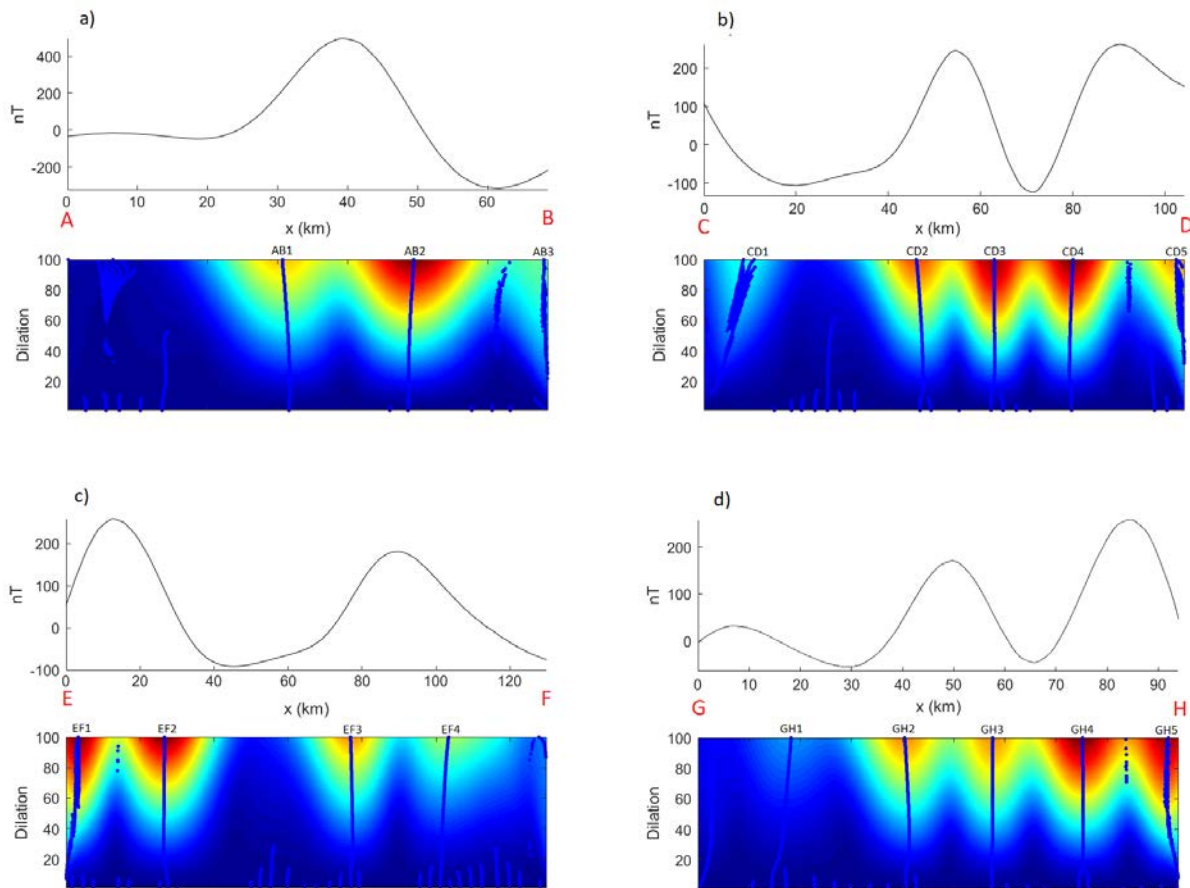


Figure 4. Magnetic anomaly profiles obtained from section lines in Figure 4 and solutions of CWT modulus. a) Magnetic anomaly profile extracted from magnetic anomaly map along AB section line and local maxima of CWT modulus. AB1, AB2 and AB3 marked along the local maxima are points which intersect the x-axis. b) Magnetic anomaly profile extracted from magnetic anomaly map along CD section line and local maxima of CWT modulus. CD1, CD2, CD3, CD4 and CD5 marked along the local maxima are points which intersect the x-axis. c) Magnetic anomaly profile extracted from magnetic anomaly map along EF section line and local maxima of CWT modulus. EF1, EF2, EF3 and EF4 marked along the local maxima are points which intersect the x-axis. d) Magnetic anomaly profile extracted from magnetic anomaly map along GH section line and local maxima of CWT modulus. GH1, GH2, GH3, GH4 and GH5 marked along the local maxima are points which intersect the x-axis.

As shown on Figure 5a, the tracks of HGM maxima follow the subtle linear features. These are approximately correlated with Ganos fault and southern flank of the Gallipoli block by NE-SW trending lineaments in the eastern part of the region. Possible new /lineaments to onshore NW-SE trending structural discontinuities which may have controlled the orientation of the independent faults or bounding the north and south flank of Semadirek uplift are depicted. In addition, the possible structural edges were also indicated in the northern and southern part of the Saros bay. These lineaments which are not included in Figure 1 have been imaged the concern map of HGM maxima. Note that the zero contours of TA (Figure 5b) are well correlated with those obtained from HGM maxima. The TA map reveals the boundaries of magnetic sources as with the HGM method. It should also be noted that the zero contours of TA are enhanced abrupt change between positive and negative magnetic anomalies or sharp gradient in Figure 2d. It is clear that NE-SW trending lineaments with zero contours correspond to a zone along the Ganos fault. On the otherhand, the half distance between $\pm\pi/4$ contours is used to estimate the depth of the boundaries of the causative sources. Thus the depths range between 4 and 9 km (Figure 5b).

It is important to note that all local maxima points in Figure 4 are located over structural edges obtained from the HGM maxima and zero contours of TA. This feature of the CWT does not confirm the results of the edge detection methods, but it also emerges as a new method. The CWT analysis also identifies the gradient zones of the anomalies in terms of sharpening with local maxima which can easily be imaged in the modulus section.

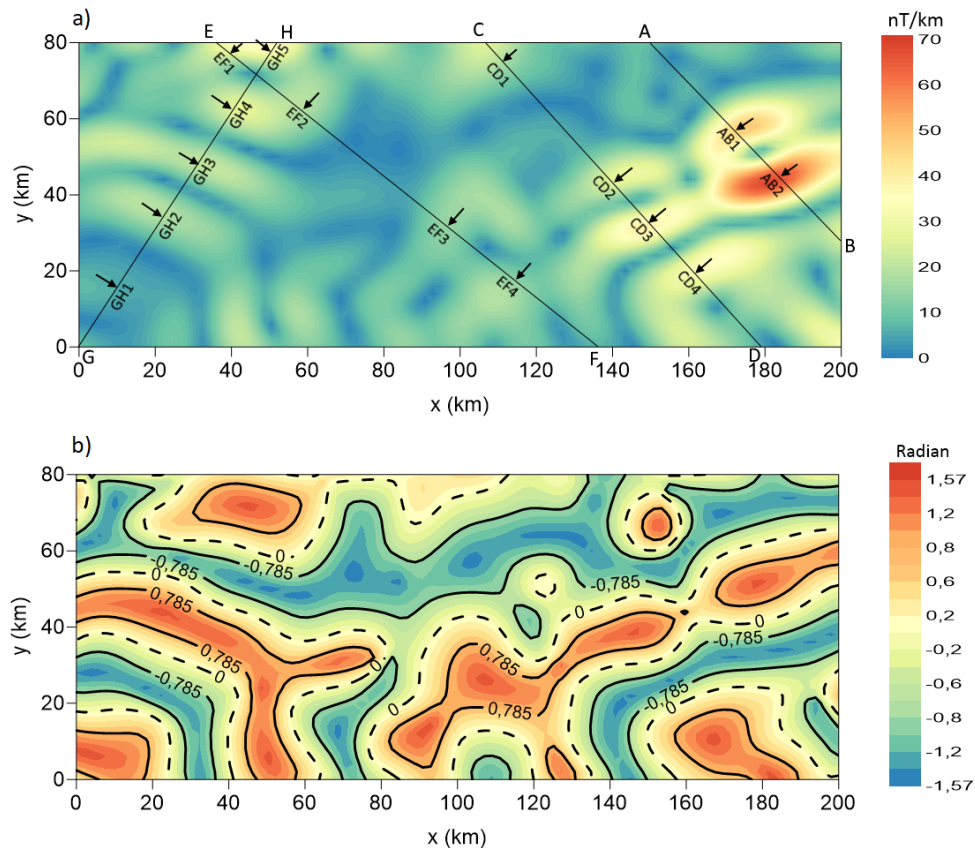


Figure 5. The boundaries of causative sources obtained from the HGM and TA techniques. a) HGM map from the residual magnetic anomalies in Fig.2d. Note that HGM maxima are enhanced in determining lineaments. Note that all local maxima points in Figure 4 are located over structural edges obtained from the HGM maxima b) TA map from the residual magnetic anomalies in Fig.2d. Dashed lines represent the zero contours which are crucial to follow the lineaments and solid line shows $\pm\pi/4$ contours which is needed for calculation the upper depth to causative sources. It is clear that all local maxima points are similarly located over zero contours with those produced on HGM maxima. For this reason, it is not shown again on the sections for TA map.

Conclusion

In Saroz bay and surroundings, the structural elements are enhanced by inspecting the alignment of magnetic anomalies using edge detection methods as well known HGM and TA. Indeed, the HGM and TA of magnetic anomalies reduced to pole allows estimating the horizontal locations the subtle linear features. The results have shown that boundaries of the anomalous sources are more precisely imaged in Saros bay and surroundings. On the otherhand, the CWT modulus provide cone like structure in which local maxima can easily be imaged. The local maxima are well correlated with the HGM maxima and zero values of TA. The results were that, all methods are well correlated in imaging the lineaments of the study area. In addition, the fact that the local maxima of CWT modulus are located the HGM maxima and zero values of the TA, makes wavelet transform an ideal tool for determining geological discontinuous. As a result, all methods provide key information apart from the presence of already known onshore faults but also identify unknown as offshore faults.

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EFFECT OF PRANDTL NUMBER ON TURBULENT HEAT TRANSFER OF CORRUGATED TRAPEZOIDAL PLATE HEAT EXCHANGERS USING NANOFLUIDS

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Abstract: In this study, fully developed turbulent flow and heat transfer behavior of water, ethylene glycol, mercury and propane based nanofluids in a corrugated trapezoidal plate heat exchanger have been numerically investigated. A constant heat flux was applied to the heat exchanger and the constant heat flux was chosen to be $6 \text{ kW} / \text{m}^2$, volume fractions $\phi=0\%-4\%$, diameter $d = 20 \text{ nm}$ and Al_2O_3 was selected as nanoparticle. The Reynolds number varies from 6000 to 20000. Geometric parameters of the corrugated trapezoidal channel, trapezoidal height $e=5\text{mm}$, trapezoidal pitch $Pe=12\text{mm}$, width of the top trapezoidal channel $w=3\text{mm}$. Executive equations have been solved with Ansys Fluent programme. The velocity distribution, temperature contours, pressure drop, average Nu number and thermal-hydraulic performance have been analyzed and presented. The effects of nanofluids have been examined on heat and flow fields and it has been observed that the heat transfer increases together with the nanoparticle volume concentration. When the nanofluid is used in a forced convection, the amount of heat transfer increases as the Prandtl number increases. The highest value of the average Nusselt number was obtained in the ethylene glycol-based nanofluid, and the lowest value was obtained in the mercury-based nano-fluid. Results show that the use of nanofluid in the corrugated trapezoidal channel increases the thermal performance of systems and thus contributes to the design of more compact heat exchanger.

Key words: Heat exchanger, corrugated trapezoidal plate, nanofluid, Prandtl number, CFD

Introduction

Heat transfer by means of a fluid is used in many areas, such as heat exchangers, solar collectors, refrigerators, automobiles, cooling of electronic devices, power plants, and many other engineering fields. There is a need to develop advanced heat transfer fluids to improve compact and performance heat exchangers with high thermal conductivity and to meet needs of industry. However, since the base fluids such as air, water, oil, ethylene glycol used for convective heat transfer have very low thermal conductivity, they can not meet the desired properties in today's technology. One of the techniques used for increasing the heat transfer characteristics of heat transfer fluids is the addition of solid particles whose thermal conductivities are higher than base fluids. (Lee and Choi, 1999). The discovery of nanofluids, a new type of suspension in which less than 100 nanometers of solid particles (metal, metal oxide, carbon nanotube) are concerned, have recently increased their use as heat transfer fluids as a result of recent work. The reason for this increase is that nanoparticles have high thermal conductivity values even at very small nanoparticle concentrations (Choi, 1995). Copper, silver, copper oxide, titanium oxide and aluminum oxide are usually used as the nanoparticle. Keblinski et al. (2002) the significant increase in the heat transfer ability of nanofluids is due to factors such as the Brownian motion of the solid particles, the liquid layer at the molecular level at the liquid solid common surface, the nature of the heat transfer mechanism, and nanoparticle collapse. The most important parameter related to the heat transfer in nanofluids is heat conduction ability.

The use of corrugated plate can increase appropriately thermal performance and compactness. The use of a corrugated channel results in a more complex flow structure and improves heat transfer to two or three times that of a conventional straight channel. (Islamoğlu, 2003). Many researchers have developed strategies to reduce the system size of traditional fluid passing through a various cross-section-shaped channel and to improve system performance. They pointed out that wave angle and channel height affect temperature distribution and flow rate significantly. Tanda (2007) has made an experimental study on forced convection in a rectangular channel and V-shaped broken ribbed and transverse rectangular channels. Kwon et al. (2008) have made experimental and numerical studies on various wave-angle rectangular wave pipes. When the performance factor (1.8) and Reynolds number were 1000, the highest level was found at 100. Naphon (2009), has expressed that corrugated channel

arrangements and channel geometries have improved heat transfer performance by increasing surface area and accelerating vortex formation in the flow.

There are many studies in the literature on the thermal performance of water-based nanofluids for plate heat (PHE) exchangers. Pantzali et al. (2009) studied experimentally the effects of 4% CuO nanofluids on the performance of commercial herring-one-type plate heat exchanger (PHE). The experimental data confirmed that besides the physical properties, the type of flow inside the heat exchanging equipment also affects the efficacy of a nanofluid as coolant. The fluid viscosity seems also to be a crucial factor for the heat exchanger performance. Heidary ve Kermani (2010) reported that the addition of 10% Cu-nanoparticles enhances the heat exchange by 25%. Suspension of solid particles in a traditional fluid is another effective passive technique because it effectively enhances the thermophysical properties of the fluid. For this reason, the effect of various types of nanofluids on the performance of different geometries has been tested experimentally and numerically compared to that of the base fluids. Ahmed et al. (2011), explored numerically the laminar forced convection of flow and heat transfer enhancement in a wavy and trapezoidal channel using a Cu–water nanofluid with nanoparticle volume fraction from 0% to 5%. The friction coefficient and Nusselt number increase as the amplitude of the wavy channel increases. As the nanoparticle volume fraction increases, the Nusselt number significantly increases along with a slight increase in the friction coefficient. It was found that the trapezoidal channel has the highest Nusselt number and followed by the sinusoidal, triangular and straight channel. Tiwari et al. (2014) studied numerically fluid flow characteristics of CeO_2 -water and Al_2O_3 -water nanofluids flowing in a chevron corrugated-plate heat exchanger (PHE). It was found that the use of nanofluid as alternate coolant reduces the pumping cost as it delivers more heat transfer for the same pressure drop as that in the case of water as coolant. Ahmed et al. (2014), convective heat transfer of SiO_2 -water nanofluid flow in channels with different shapes is numerically and experimentally have studied over Reynolds number ranges of 400–4000, it is observed that the trapezoidal-corrugated channel has the highest average Nusselt number, pressure drop and heat transfer enhancement followed by the sinusoidal-corrugated channel and straight channel. Rostami (2015) numerically investigated the convective heat transfer of nanofluid flow in a sinusoidal-wavy channel under constant heat flux. Numerical results were obtained for Reynolds numbers range of 100–250 and nanoparticle volume fraction range of 0–10%. The two types of the base fluids such as water and ethylene glycol with Al_2O_3 nanoparticles were considered. Nusselt number and friction factor increased with the increasing of Reynolds number and nanoparticles volume fraction. In addition, the Nusselt number and friction factor of Al_2O_3 -ethylene glycol nanofluid were higher than those of the Al_2O_3 -water nanofluid. Esmaeili et al. (2010) focused on the alumina nanofluid flow in sinusoidal wavy channel. In this study, the boundary condition was applied as a constant heat flux on the channel walls. The governing equations were solved using finite volume method. The results showed that the nanoparticles addition to the base fluid may significantly increase the heat transfer enhancement, but the wall shear stress also increased. It was also found that at a given nanoparticle fractions, the Nusselt number values at high Reynolds number was higher than those at low Reynolds number. Heidary and Kermani (2012) have studied the laminar flow and heat transfer of nanofluid in sinusoidal-wall channel using finite volume approach. The results indicated that the heat transfer is enhanced by 50% with the increasing of nanofluid volume concentrations of copper as compared to water. On other hand, there was a slight effect of nanoparticles suspension on the skin friction coefficient. Ozbolat and Sahin (2007) have studied the thermal flow of Al_2O_3 in eight wave channel. The wavelength and the amplitude of the wavy channel were 28 mm and 3.5 mm, respectively. The upper and the lower walls of the wavy channel were maintained at uniform wall temperature condition. Tanda (2010) investigated the effect of four different pitch-to-height ratios (p/e) including 6.66, 10.0, 13.33, and 20.0, on heat transfer in a rectangular channel with one-ribbed wall and two-ribbed wall. Results showed that $p/e = 13.33$ was slightly preferable for the 1RW case (especially at the highest Re values) while a smaller p/e value ($p/e = 6.66$ –10) gave the best performance for the 2RW case. Singh et al. carried out an investigation on the effect of flow-attack-angle (α) on thermo-hydraulic performance of rectangular ducts roughened with a new configuration of ‘V-down rib having gap’ on one wide wall. The results showed the best flow-attack-angle (α) was from 30° to 75° .

In this study, fully developed turbulent flow and heat transfer behavior of water, ethylene glycol, mercury and propane based nanofluids in a corrugated trapezoidal plate heat exchanger have been numerically investigated. The effects of Prandtl number on the turbulent flow and heat transfer of the effects of Al_2O_3 nanoparticles at different volume fractions ($\phi = 0\% - 4\%$) under constant heat flow ($6 \text{ kW} / \text{m}^2$).

Physical Model

In this study, the two-dimensional geometry of the trapezoidal channel plate examined in the analyzes is shown in Fig 1. Selected geometric parameters; the channel height is $H = 12.5 \text{ mm}$, the channel length is $L = 95 \text{ mm}$, the floor height of trapeze channel is $b = 4 \text{ mm}$, trapezoidal height is $e = 5 \text{ mm}$, trapezoidal pitch is $Pe = 12 \text{ mm}$, width of the top trapezoidal channel is $w = Pe/4 = 3 \text{ mm}$. To ensure a fully-developed flow, the length of each adiabatic wall

section before and after the corrugated section is set to be 250 and 100 mm, respectively. In the analyses, the nanoparticle and the fluid are assumed to be at the same velocity and thermodynamic equilibrium. Water, ethylene glycol, mercury and propane are used as the base fluid, and also Al_2O_3 is used as the nanoparticle. Nanofluid suspension was obtained by adding Al_2O_3 nanoparticles at 20 nm diameter and different volume fractions 0%, 1%, 2%, 3%, 4% in water, ethylene glycol, mercury and propane base fluids. The thermophysical properties of the base fluids and nanoparticle are given in Table 1.

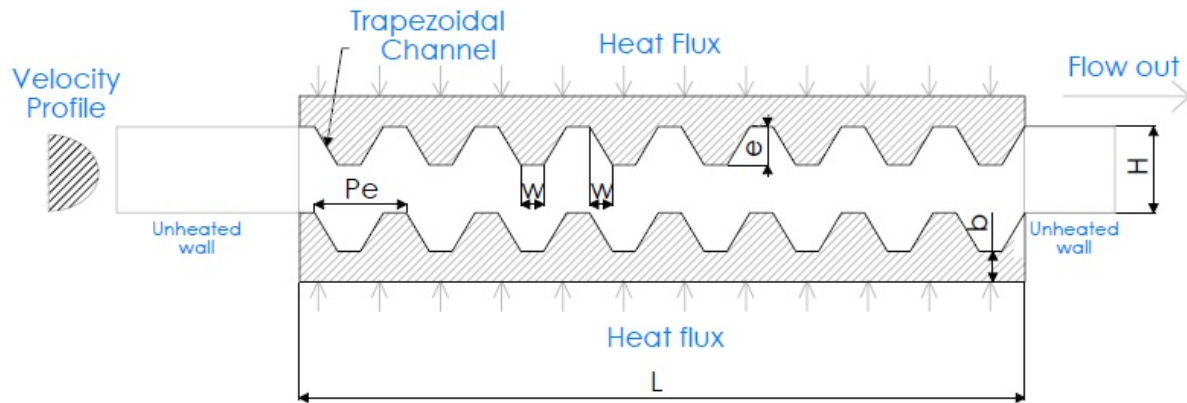


Fig.1. Schematic diagram of the corrugated trapezoidal channel.

Table 1. Thermophysical properties of base fluids and nanoparticle.

Properties	Mercury	Propane	Water	EG	Al ₂ O ₃
ρ (kg/m ³)	13534	492,2	997,1	1132	3970
C _p (J/kgK)	139,4	2742	4180	2349	765
k (W/mK)	8,52	0,0928	0,613	0,258	40
μ kg/m.s)	0,00153	0,000097	0,000891	0,0151	--
β(1/K)	0,000181	0,00337	0,00021	0,00057	0,000024
Pr	0.0251	2.87	6.07	137.48	-

Mathematical Model

In this study, the single-phase and the $k-\epsilon$ standard turbulence model have been used to solve the turbulent heat transfer and flow characteristics. The executive equations can be written in the following form;

The continuity equation is;

$$\frac{\partial}{\partial x_i}(\rho u_i) = 0 \quad (1)$$

The momentum equation is;

$$\frac{\partial}{\partial x_i}(\rho u_i u_j) = -\frac{\partial p}{\partial x_i} + \frac{\partial}{\partial x_i} \left[\mu \left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i} - \frac{2}{3} \delta_{ij} \frac{\partial u_i}{\partial x_i} \right) \right] + \frac{\partial}{\partial x_i} (-\rho \overline{u_i' u_j'}) \quad (2)$$

The energy equation is;

$$\frac{\partial}{\partial x_i} [u_i (\rho E + p)] = \frac{\partial}{\partial x_j} \left[\left(k + \frac{C_p \mu_t}{Pr_t} \right) \frac{\partial T}{\partial x_j} + u_i (\tau_{ij})_{\text{eff}} \right] \quad (3)$$

The symbols ρ , μ , u' , u_i , u_j , are fluid density, viscosity, fluctuated velocity, axial velocity and the velocity in vertical direction respectively. The term $\overline{\rho u_i' u_j'}$ is turbulent shear stress where Pr_t is the turbulent Prandtl number (0.85) and $(\tau_{ij})_{eff}$ is the deviatoric stress tensor.

Boundary Conditions

The boundary conditions imposed at the external corrugated channel are no-slip, and with constant heat flux, whereas the flat walls are thermally insulated. The velocity boundary condition is applied at the inlet, whereas the pressure boundary condition is used at the outlet. The boundary conditions for a steady-state, 2D flow rate are as follows:

At the wall; $u = 0, v = 0, q = q_{wall}$ (4)

At the inlet; $u = u_{in}, v = 0, T = T_{in}$ (5)

The average heat transfer coefficient along the corrugated trapezoidal channel h_c , can be calculated from the average heat transfer rate obtained from;

$$Q_{ave} = h_c A_c (\Delta T_{LMTD}) \quad (6)$$

$$\Delta T_{LMTD} = \left[\frac{(T_{s,ave} - T_{nf,ave,in}) - (T_{s,ave} - T_{nf,ave,out})}{\ln(T_{s,ave} - T_{nf,ave,in} / T_{s,ave} - T_{nf,ave,out})} \right] \quad (7)$$

The average Nusselt number is;

$$Nu_{ave} = \frac{h_c H_{\bar{x}}}{k L_{corr}} \quad (8)$$

The inlet velocity and Reynolds number is;

$$u_{in} = \frac{Re \mu}{\rho D_H}, \quad Re = \frac{\rho D_H u_{in}}{\mu} \quad (9)$$

The hydraulic diameter is;

$$D_H = \frac{4 A_{cross}}{P} \quad (10)$$

The Fanning friction factor is;

$$C_{fx} = \frac{2 \tau_s}{\rho u_{in}^2} \quad (11)$$

The Darcy friction factor is;

$$f = 4 C_{fx} \quad (12)$$

The pressure drop is;

$$\Delta p = f \frac{L \rho u_{in}^2}{2 D_H} \quad (13)$$

The values used in analyzes are taken as $A_c=0.278m^2$, $H=0.0125m$, $L_{corr}=0.095m$, $\bar{x}=0.05m$, $D_H=0.025m$.

Models used for thermophysical properties of nanofluid

The proposed models for viscosity and thermal conductivity of the nanofluid are as follows. In these equations ϕ is the volumetric ratios of the solid particles, while the subindices nf, f and p represent the nanofluid, base fluid and solid nanoparticles, respectively.

The effective density is;

$$\rho_{nf} = (1 - \phi) \rho_f + \phi \rho_p \quad (14)$$

The heat capacity is;

$$(\rho C_p)_{nf} = (1-\phi)(\rho C_p)_f + \phi(\rho C_p)_p \quad (15)$$

The effective thermal conductivity is;

$$\frac{k_{nf}}{k_f} = \frac{k_p + 2k_f + 2(k_p - k_f)(1+\eta)^3\phi}{k_p + 2k_f - (k_p - k_f)(1+\eta)^3} \quad (16)$$

The Yu and Choi model was used for the thermal conductivity of the nanofluid. Parameter value in the equation; the ratio of the thickness of the liquid layer to the radius is taken as $\eta = 0.1$.

The viscosity is;

$$\mu_{nf} = \frac{\mu_f}{(1-\phi)^{2.5}} \quad (17)$$

The Brinkman model was used to determine the viscosity of the nanofluid.

Numerical Solution Method

In this study, the continuity, momentum and energy equations are solved using ANSYS FLUENT CFD software, which is based on the finite volume method. The problem is considered as two-dimensional and the flow is accepted to be turbulent and the k- ϵ standard turbulent model is used. The finite volume method has been used to discretize the executive equations of flow, using the SIMPLEC algorithm to couple the pressure-velocity system. Second order upwind scheme and structure, uniform grid system have been employed to discretize the executive equation. The solutions are considered converged when the normalized residual values reach (10^{-5}) for all variables.

Compared with the results of the numerical and experimental study done by Abed et al. (2015). The comparison of the results of analysis of the present and reference study of Nusselt number with the different Re numbers of Al_2O_3 -water nanofluid with solid volume ratio of $\phi = 0.04$ is presented in Table 2. It has been found that there is a good fit between the results obtained.

Table 2. Comparison of present and literature results of average Nusselt value for different Reynolds numbers.

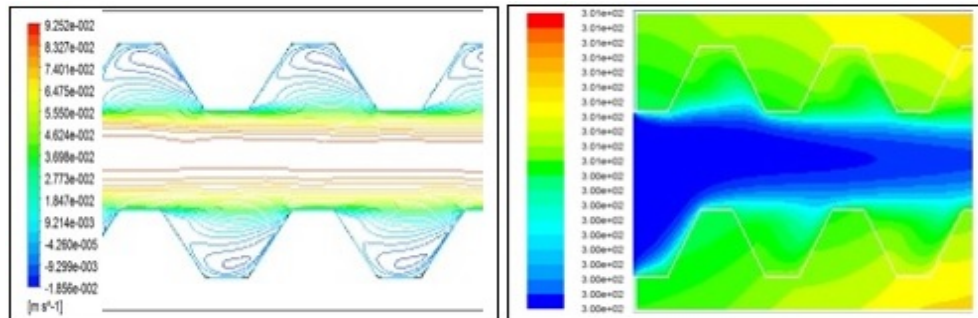
Re	6000	8000	12000	16000	20000
Mevcut	44.61	48.94	65.23	84.68	102.41
Abed vd. [15]	75.13	83.80	95.96	105.53	117.39

Results and Discussion

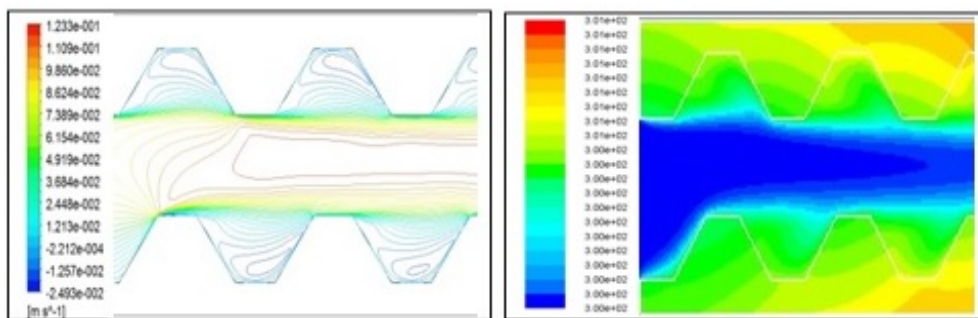
As working intervals in numerical analysis; the effects of Al_2O_3 nanoparticles with different base fluids (water, ethylene glycol, mercury and propane) and diameter $d = 20$ nm at different solid volume ratios ($\phi = 0\% - 4\%$) under constant heat flow ($q = 6 \text{ kW} / \text{m}^2$). Geometric parameters of the trapezoidal channel; trapezoidal height is $e = 5$ mm, trapezoidal pitch is $Pe = 12$ mm, width of the top trapezoidal channel is $w = Pe/4 = 3$ mm. The length of the heat source ($w = L$) and total width of channel was used as the non-dimensional distance $D / L = 0.21$ ($D = 20.5$ mm) of the heat source from the right and left adiabatic walls.

Fig.2 shows that velocity distributions on the left and isotherm contours on the right of the mercury based nanofluid at different Reynolds numbers and $\phi = 0.04$ volume fraction. As the number of Reynolds increases, the circulation increases and flow velocity profiles appear in the vortex appearance in the regions near the wall of the corrugated trapezoidal channel. As the Reynolds number and the solid volume ratios increase, the velocity increases. Accordingly, as the velocity increases, the circulation regions begin to grow laterally along the corrugated channel cavities, and flow structures is not disturbed by corrugated channel. In terms of isotherm countours, it increases the flow temperature of the corrugated channel walls more because of the low velocity value due to the viscosity of the nanofluid. It is observed that the cold fluid is uniform at the lower boundary of the channel grooves in the central region. As the Reynolds number increases, thermal boundary layers develop near the walls. The nanofluid supports the mixing of the hot fluid near the thermal boundary layer and the cold fluid in the central region. The beginning and growth of the circulation flow allows mixing of the fluid in the central region with the hot fluid near the boundary layer. The flow is determined in a groove which forms a secondary circulation flow. As the Reynolds

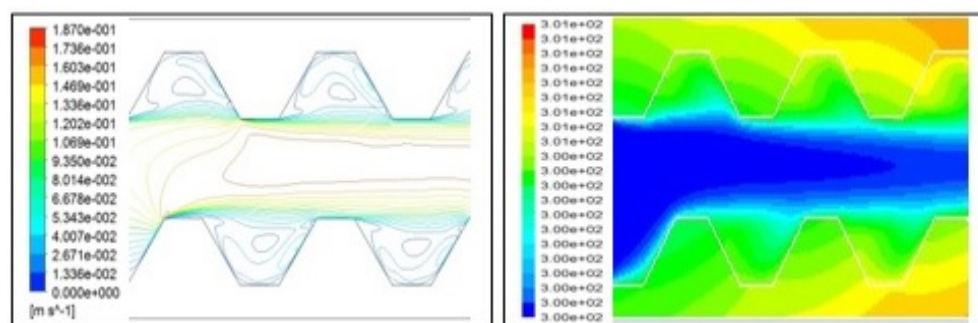
number increases, the thermal boundary layer thickness decrease. The reverse flow occurs in the groove near the upper and lower walls of the corrugated channel. As the Reynolds number increases, the velocity in the groove near the walls in the opposite direction of the main flow increases. The density of secondary flow increases for main flow and the size of the circulation region increases. Then, the circulation flow becomes even more turbulent. Temperature gradients increase with increasing Reynolds number due to the circulation flow occurred near the corrugated wall.



$Re=6000$



$Re=8000$



$Re=12000$

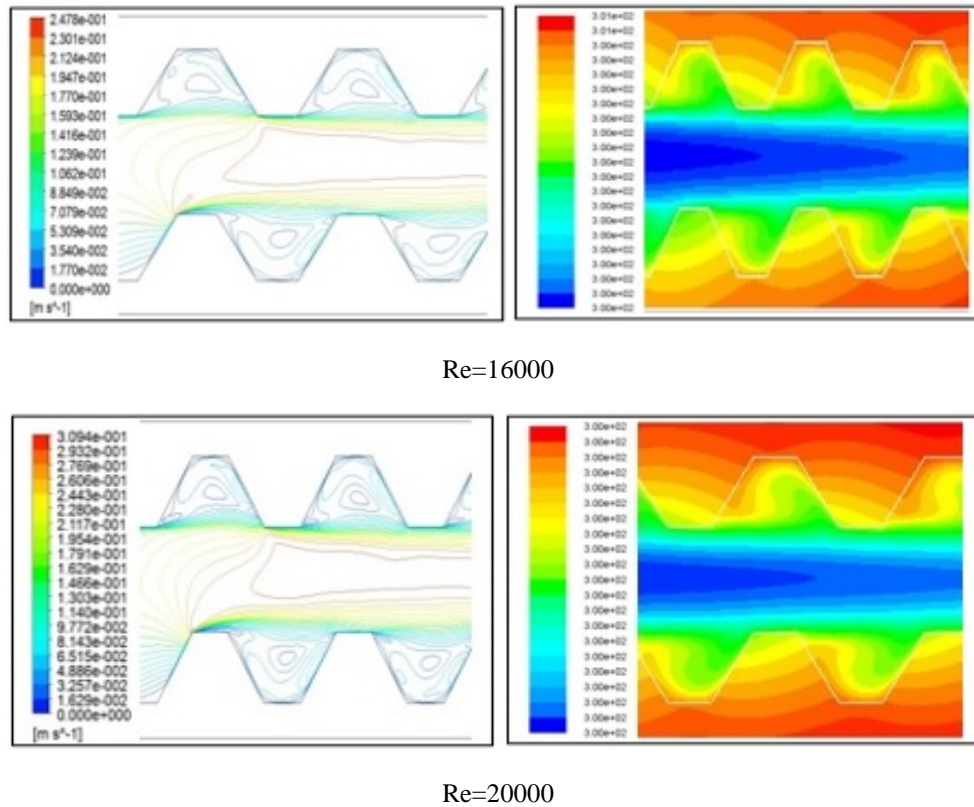
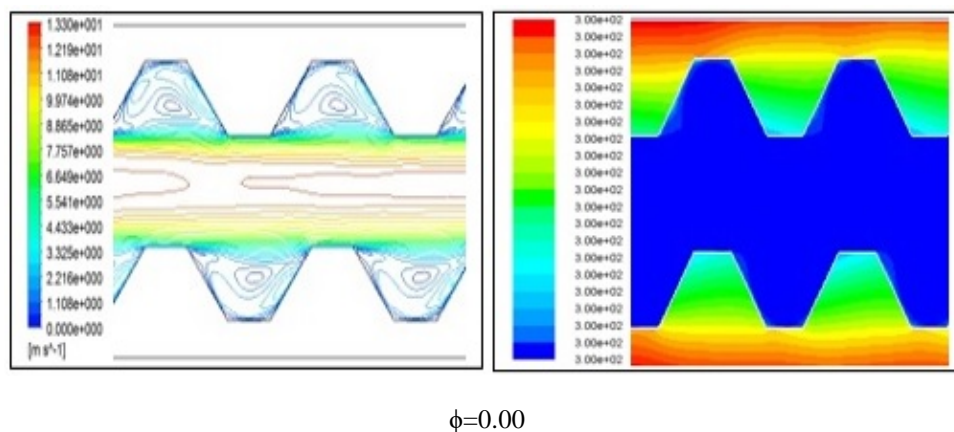
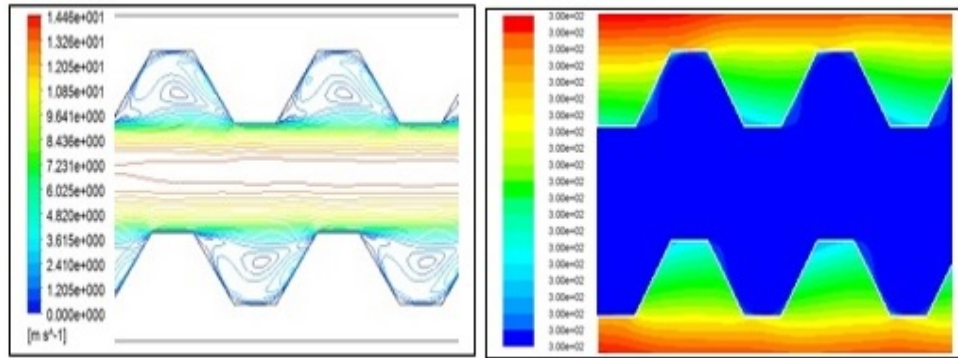


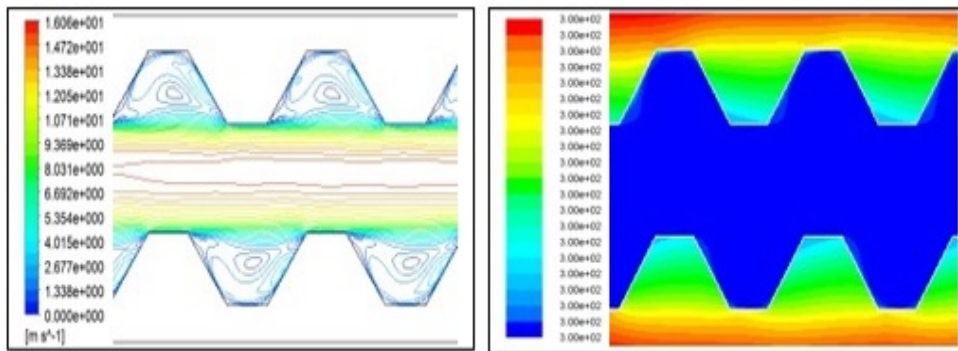
Fig. 2. Velocity distribution (left) and isotherms (right) contours of the mercury based nanofluid at different Reynolds numbers and volume fraction $\phi=0.04$.

Fig.3 shows that velocity distribution on the left and isotherm contours on the right of the ethylene glycol based nanofluid at $Re=12000$ and different volume fractions. With the Brownian action, the rates of nanoparticles added to the base fluid ethylene glycol increase, increasing volume fraction. In terms of isotherm contours, the temperature gradient increases with the increase of volume fraction by the addition of nanoparticles having high thermal conductivity with respect to the base fluid. When the velocity distribution and isotherm contours are compared to ethylene glycol with a high Prandtl number and mercury with a lower Prandtl number; as the Prandtl number increases, the inlet velocities of the fluid increase, so the circulation increases and the thermal boundary layers become thinner.

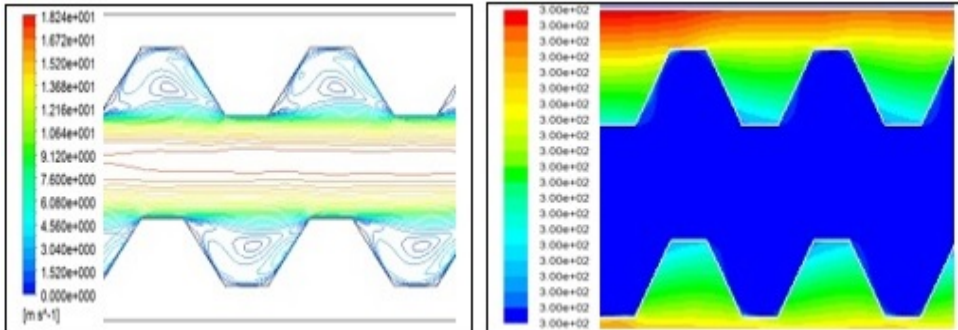




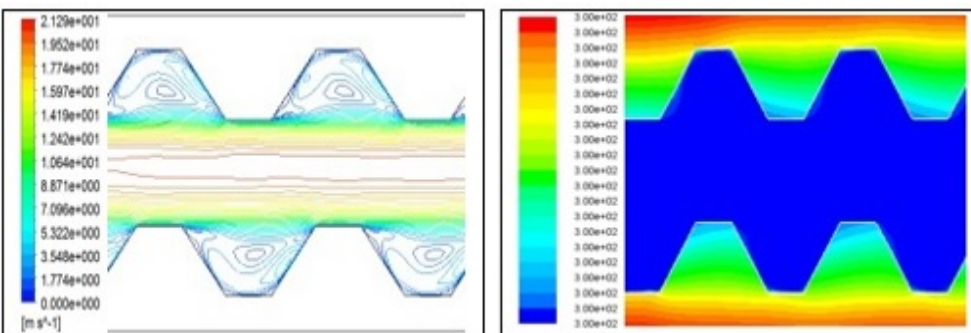
$\phi=0.01$



$\phi=0.02$



$\phi=0.03$



$\phi=0.04$

Fig. 3. Velocity distribution (left) and isotherms (right) contours of the ethylene glycol based nanofluid at $Re=12000$ and different volume fractions.

Fig.4. shows that the average Nusselt number on the left and pressure drops on the right of water, ethylene glycol, mercury, propane based fluids at different Reynolds numbers and volume fraction $\phi=0.04$. Since the viscosity of the ethylene glycol based nanofluid is higher than water, mercury and propane based nanofluids, the velocity values and hence the temperature change are increasing. In this case, both the average Nu number and the pressure drops higher values were obtained.

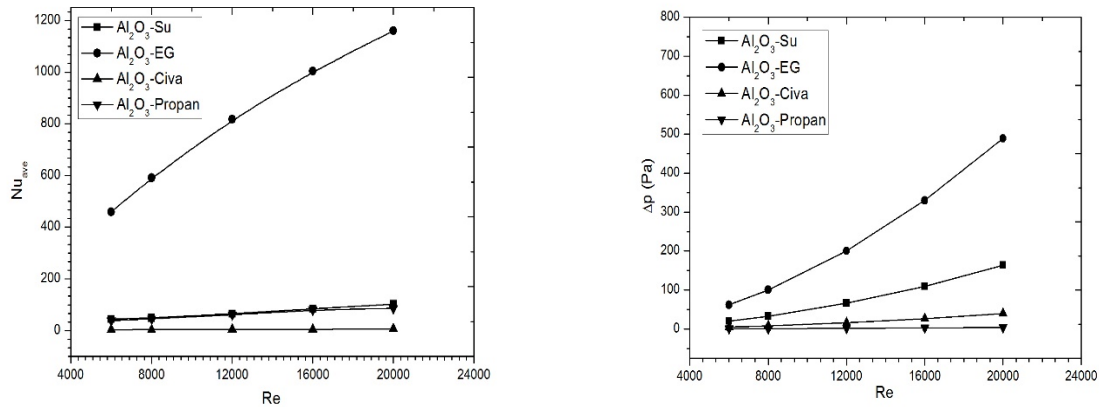


Fig. 4. Effect of various base fluids with different Reynolds numbers on the average Nusselt number (left) and the pressure drops (right) volume fraction $\phi=0.04$.

Fig.5. shows that the average Nusselt number on the left and pressure drops on the right of Al_2O_3 -water nanofluid at different Reynolds numbers and volume fractions. Accordingly, both the average Nusselt number and the pressure drop increase with increasing Reynolds number and volume fraction.

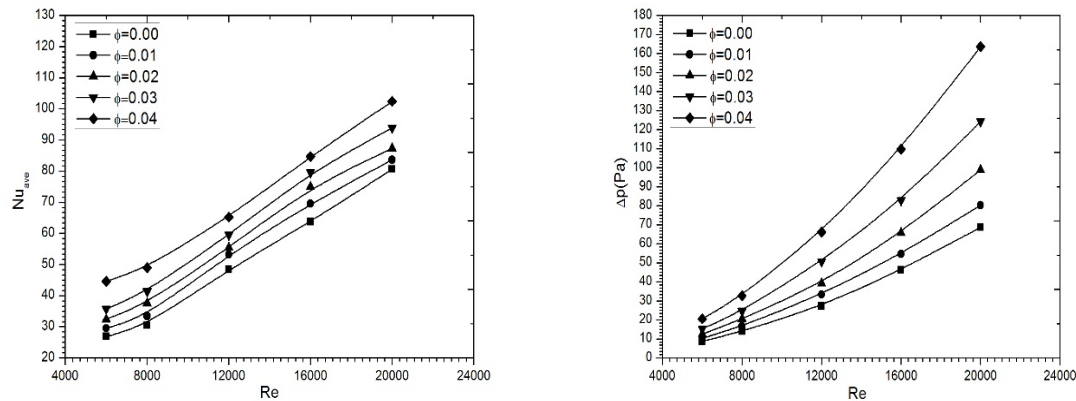


Fig. 5. Effect of Al_2O_3 -water nanofluid on the average Nusselt number (left) and the pressure drops (right) at different Reynolds number and volume fractions

The average Nusselt values of the different base fluids and nanofluids with different volume fractions obtained from the studies in the numerical analyzes are presented in Table 3. Accordingly, the average Nusselt number, increases as the solid volume ratio of the nanoparticles increases. As a result of increasing Reynolds number, high velocity values are obtained and the average Nusselt values increase. The temperature difference from the analyzes affects the average h_c heat transfer coefficient along the corrugated trapezoidal channel. When different base fluid of nanofluids were compared, the highest average Nusselt value was obtained with ethylene glycol based nanofluid

and the lowest the average Nusselt value was obtained with mercury based nanofluid. The propane based nanofluid has been observed to be close to the water based nanofluid. That is, as Prandtl number increases, the average amount of heat transfer increases.

Table 3. Comparison of the average Nu numbers of different Reynolds numbers, Prandtl numbers and volume fractions

Re	ϕ	Al ₂ O ₃ -Mercury (Pr=0.0251)	Al ₂ O ₃ -Propane (Pr=2.87)	Al ₂ O ₃ -water (Pr=6.07)	Al ₂ O ₃ -EG (Pr=137.48)
6000	0.00	3.23	25.85	26.89	385.22
	0.01	3.26	27.57	29.52	393.93
	0.02	3.28	29.92	32.43	407.38
	0.03	3.33	31.32	35.71	429.72
	0.04	3.42	38.17	44.61	458.82
8000	0.00	3.37	26.68	30.45	492.76
	0.01	3.42	32.88	33.45	510.09
	0.02	3.50	36.74	37.47	527.30
	0.03	3.61	39.25	41.35	553.59
	0.04	3.77	45.71	48.95	590.86
12000	0.00	3.78	39.01	48.42	702.46
	0.01	3.90	40.03	53.18	716.15
	0.02	4.03	52.76	55.39	749.60
	0.03	4.23	54.61	59.47	771.33
	0.04	4.48	61.23	65.23	817.49
16000	0.00	4.23	50.26	63.72	873.65
	0.01	4.39	57.74	69.54	889.46
	0.02	4.59	63.12	74.96	915.14
	0.03	4.84	70.92	79.62	953.29
	0.04	5.16	79.65	84.69	1003.51
20000	0.00	4.69	69.20	80.61	1018.67
	0.01	4.87	77.57	83.64	1037.54
	0.02	5.09	78.63	87.24	1064.45
	0.03	5.40	84.95	93.88	1106.48
	0.04	5.80	86.92	102.41	1159.49

Conclusions

In this study, fully developed turbulent forced convective flow and heat transfer behavior of the nanofluid containing water, ethylene glycol, mercury and propane based Al_2O_3 nanoparticles in a two-dimensional corrugated trapezoidal plate heat exchanger have been numerically investigated. Corrugated trapezoidal channel constant heat flow boundary condition was applied. According to the results obtained; adding nanoparticles to base fluids increases heat transfer. It is also seen that the heat transfer is increased by increasing the volume fraction of the nanofluid. As the concentration of nanoparticles increases, the average Nusselt number and pressure drop increase. When the base fluids were compared, the highest average Nu and pressure drop were obtained with ethylene glycol based nanofluid and the lowest value with mercury based nanofluid. On the other hand, the increase of Prandtl number causes the heat to spread more slowly than the momentum. The heat transfer is significantly affected. Compared analyzes made with pure water as the base fluid, the increase in pressure loss in the case where volume fraction of the water-based nanofluid is 4% and the Reynolds number is 20000 is about 2.4 times as high. The average Nusselt number has improved by around 13%. It was observed that the water-based nanofluid is higher but close to the propane-based nanofluidic values. The following findings can be written:

- There is no study that has focused on convective heat transfer by nanofluid through corrugated trapezoidal channel step.
- The utilization of nanofluids in the corrugated channels has augmented the heat transfer with slight pressure drop.
- The enhancement of heat transfer potential of the base fluids in the corrugated trapezoidal channels will offer an opportunity for engineers to develop highly compact and effective heat transfer equipment for many industrial applications.
- The benefit of the utilization of nanofluids in the new channels is used in many applications including transportation, the electronic cooling systems, the chemical processes, the combustion chambers, the cooling of turbine blades, the environmental control systems and the high performance heat exchangers.
- It is necessary to study the development of correlations of friction factor and Nusselt number in the corrugated trapezoidal channels with nanofluids.

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EFFECTS OF EARTHQUAKES ON HUMAN LIFE IN TURKEY AND THE PRECAUTIONS THAT SHOULD BE IMPLEMENTED

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Abstract

Earthquake is a natural disaster, in which the vibrations, which are formed as a result of the deep layers of the earth's crust's being broken after the sudden discharge of the tensile energy that is accumulated in the earth's crust due to the movements of the tectonic plaques, and that radiate in waves, shake the Earth's surface and cause great damage even in remote places.

Turkey is an earthquake country, therefore, a large part of Turkey is threatened by earthquakes. In Turkey, numerous large-scale earthquakes have occurred and thousands of people lost their lives. As a result of these earthquakes, life and property losses have been experienced, the economy has suffered severe damage and these earthquakes have left negative results in social memory. The main problems are not fulfilling the responsibilities, not taking the necessary precautions, and the society's not being sufficiently conscious about living with the earthquake reality. When the literature on the subject was searched, it was seen that the academic studies carried out on the subject were not enough.

As well as the large-scale earthquakes occurred in Turkey, which is located in one of the world's major seismic zones, small earthquakes have also been endangering the human life. In this context, the purpose of this study has been determining the effects of earthquakes on human life in Turkey and find out measures to be taken in order to reduce these effects. In the study, the primary effects that occur due to earthquakes in Turkey were identified as the changes in topography, tsunami risk, major damage and destruction of residential areas, and these issues were discussed. In addition, fire, epidemics, floods, social and economic damages, which are secondary effects of earthquakes, are also explained. In addition, in order to raise people's consciousness, the processes to be followed in the pre-earthquake, during the earthquake and after the earthquake periods have been determined. As the result, prior to the earthquakes to occur in Turkey, increasing the earthquakes awareness and sensitivity has emerged as a necessity, and in this respect, the measures to be taken both in technical and practical terms were determined.

Keywords: Turkey, Effects of Earthquake, Earthquake Awareness

EFFECTS OF LOW DOSE CAPSAICIN (CAP) ON OVARIAN FOLLICLE DEVELOPMENT IN PREPUBERTAL RAT

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Abstract: The study was carried out to investigate the effect of CAP level equal to the level getting from hot pepper in daily diet on follicular development and follicular atresia in the rat ovary. In this study, 80 immature female Sprague-Dawley rats (21 days old) were used. The rats were randomly divided into 4 groups according to injection periods (6, 9, 12, 15 days). Each group was subdivided into three groups. The first subgroup (control A n:5) was not under enjection. The second subgroup (experiment, n:10) received subcutaneous injection of CAP (0.5mg/kg/d; prepared in solvent consisting of 10% ethanol, 10% Tween 80 and 80% distilled water) and the third subgroup animals (control B, n:5) received an equal volume of solvent (10% ethanol, 10% Tween 80 and 80% distilled water) in the same way used for CAP. Rats were given daily s.c. injections of either solvent (control B) and CAP dissolved in solvent (experiment groups) for 6, 9, 12, and 15 days. At the end of the experiment, ovarian sections were immunohistochemically stained with Ki 67 (marker of cell proliferation), active caspase-3 (marker of apoptosis), and also TDT- mediated dUTP-biotin nick end labeling (TUNEL) was applied on these sections. Follicular atresia was observed in the antral follicles (types D and E) of all ovary sections but, in the CAP-treated group, the apoptotic indexes coupled to atresia were significantly lower compared to controls particularly on Days 9 and 15 and the active caspase 3 accumulation in cytoplasm was also significantly depressed. By contrast, follicle proliferation indexes were increased in treated rodents compared to controls on days 12 and 15. The results indicate that the administration of low dose CAP may play an important role in the regulation of ovarian follicular development. As a result, it could concluded that administration of low dose capsaicin may stimulate neuropeptides present in the capsaicin-sensitive sensory neurons which may be involved in the regulation of female reproductive function.

Key Words: Capsaicin, rat ovary, ovary follicle, neuropeptide

Introduction

Ovarian folliculogenesis and atresia is regulated by an interaction among endocrine (Smith, 1975), immune (Oliveros, 2001), paracrine-autocrine factors (Olson, 1996), and nervous system (Sosa, 2000). The ovaries of the rat receive neural information through sympathetic, cholinergic, peptidergic and sensory nerve fibers. There is general agreement that both the sympathetic and sensory extrinsic nerves are associated with the control of growing follicles, interstitial tissue, and ovarian vasculature (Burden, 1978, Mayerhofer, 1997). Sensory innervations play a role in the regulation of ovarian function and the afferent sensory nerves are involved in the regulation of ovarian folliculogenesis/atresia responses to gonadotropins (Moran, 2003).

Capsaicin (CAP) (8-methyl-N-vanillyl-6-nonenamide), the main ingredient of hot chili peppers, selectively activates the peripheral terminal of sensory C and A δ fibers, generally referred as polymodal nociceptors (Surh, 1995). It is currently being utilized for therapeutic treatment of various peripheral conditions such as rheumatoid arthritis and diabetic neuropathy (Surh, 1995). These therapeutic effects of capsaicin are believed to be due to the modification of sensory nerve endings. Vanilloid receptor subtype 1 (VR1), a receptor responsible for capsaicin action, has been cloned by Caterina *et al.* (1997) from rat dorsal root ganglia and recognized as a common molecular target for protons and noxious heat ($> 43^{\circ}\text{C}$) as well as vanilloid compounds. The effects of CAP are dependent on the concentration of capsaicin and the mode of application. Capsaicin at a low dose stimulates release of neuropeptides such as catecholamines, neurokinin A (NKA), vasoactive intestinal polypeptide (VIP), calcitonin gene-related peptide (CGRP), and substance P (SP) from sensory neurons endings (Holzer, 1991, Surh, 1996). In contrast, high dose capsaicin shows neurotoxic effect and induces an irreversible long-standing inactivation of the capsaicin-sensitive nerve endings with a loss of their sensory-afferent functions and their ability to release sensory neuropeptides (Holzer, 1998). Because of neurotoxic properties, high dose capsaicin is used widely as a specific tool to examine the function of sensory neurons. The effects of high doses of capsaicin are well-established on the ovary. Sensory nerves innervating the ovary have been shown to contain SP (Dees, 1985, Ojeda, 1985), CGRP and VIP (Calka, 1988, Klein, 1988). SP fibers predominate around the ovarian blood vessels, but it also has been noted that some fibers are involved in modulating different stages of follicle development (Kannisto, 1986). Several studies have demonstrated that in female reproductive organs, SP-immunoreactivity, NKA, CGRP, galanin, VIP, and somatostatin, show a marked decrease following high doses capsaicin injection to neonatal rats (Cotton, 1983, Holzer, 1991). Also, neonatal capsaicin treatment destroyed the SP containing primary afferent nerves innervating the female rat reproductive tract and resulted in marked infertility in subsequent adult life (Traurig, 1984). In a recent publication, Pintado *et al.* (2003) reported

that the neonatal treatment with high doses capsaicin in female rats and mice resulted in a decreased reproductive success as compared with control rats. These researchers have suggested that capsaicin-sensitive sensory nerves could play a role in regulating of the fertility and follicle development in females (Pintado, 2003, Traurig, 1984). Capsaicin is not only used as a research tool or topical ointments for the treatment of pain but also is consumed regularly by many people as hot chili pepper. The amount varies between the ethnical groups but most people are exposed to low levels of capsaicin through diet. Although the effects of high doses of capsaicin are well-established on the ovary, the effect of repeated exposure to low doses of capsaicin is not known. In the present study, we investigated the effects of low dose of CAP on ovarian follicular growth and atresia in the prepubertal rats.

Material and Methods

Animals

Eighty immature female Sprague-Dawley rats (21 d old rats) obtained from the Experimental Animals Breeding and Research Center, Uludag University, Turkey were used throughout the experiments. The animals were housed five per cage in temperature (20-24 °C), humidity (60-70%), and lighting (12 h light/dark cycle) controlled conditions and were provided with feed and water *ad libitum*. The experimental protocols were approved by the Animal Care and Use Committee of the Uludag University and were in accordance with the National Institute of Health Guide for the Care and Use of Laboratory Animals.

Experimental Protocol

Rats were divided at random into 3 groups. The first group (control A, n: 5) remained without any treatment. The second group (experimental-CAP treated, n: 10) received daily subcutaneous injections of CAP (Sigma, St. Louis, MO, USA) (0.5 mg/kg/d), prepared in a solvent consisting of 10% ethanol, 10% Tween 80, and 80% distilled water, and the third group (vehicle treated-control B, n:5) received an equal volume of the solvent in the same way used for CAP. All animals were weighed daily. Animals from each group were euthanized by ether inhalation after 6, 9, 12 and 15 d of vehicle and CAP treatment. One ovary from each rat was weighed and the ovary was fixed in 10% neutral buffered formalin and processed routinely for immunohistochemical studies. After deparaffinization and rehydration, sections were stained for cell proliferation (Ki 67) (NeoMarkers, Fremont, CA, USA). Active caspase 3 (Alexis, San Diego, CA, USA) by immunohistochemistry and *in situ* terminal deoxynucleotidyl transferase-mediated dUTP-biotin end labelling (TUNEL) was used to determine the apoptotic cells.

Immunohistochemistry For Active Caspase 3 And Ki 67

Standard streptavidin biotin peroxidase complex technique was carried out by using Histostain Plus Kit (Zymed, South San Francisco, CA). Antigen retrieval was carried out by boiling sections in microwave oven at 750 W in sodium citrate buffer (1 M, pH 6.1) for Ki 67 staining, and in 0.1 M Tris-HCl buffer with 5% urea (pH 10.0) for active caspase 3 (3 x 5 min). After cooling, slides were rinsed with PBS and endogenous peroxidase activity was blocked by 10 min incubation in 3% H₂O₂ solution in distilled water. After blocking with non-immune serum for 1 h to reduce nonspecific antibody binding, sections were incubated with rabbit monoclonal antibody to Ki 67 (Clone SP6, 1:1000 diluted) and rabbit polyclonal antibody to active (cleaved) caspase 3 (ALX-210-807, 1:50 diluted) for overnight at 4 °C. Sections were then incubated with biotinylated secondary antibody for 10 min followed by application of streptavidin conjugated to horseradish peroxidase for 10 min. Finally, 3,3'-diaminobenzidine (DAB) was used for colour development and counterstaining was performed with haematoxylin. Slides processed without primary antibodies were included for each staining as negative control.

In Situ Localization of Apoptotic Cells

To visualize apoptotic cells, serial sections from each specimen were stained with TUNEL method using an ApopTag *in situ* apoptosis detection kit (Chemicon, CA, USA) according to the manufacturer's protocol. Briefly, the sections were deparaffinized, hydrated, and then washed in PBS and treated with 20 µg/ml proteinase K for 20 min. Specimens rinsed in PBS were immersed in 3% H₂O₂ for 5 min to inhibit endogenous peroxidase activity. After rinsing in distilled water for 10 min, the sections were applied equilibration buffer for 10 min and then incubated at 37 °C with working buffer containing reaction buffer and terminal deoxynucleotidyl transferase (TdT) enzyme in a humidified chamber for one hour. The reaction was stopped by soaking sections in wash buffer, followed by rinsing in PBS. The samples were later incubated in anti-digoxigenin peroxidase conjugate for 30 min. After washing in PBS, sections were immersed for 10 min in DAB for peroxidase colouring reaction. Sections were then counterstained with methyl green (0.5% in 0.1 M sodium acetate, pH 4.0), rinsed in distilled water, and examined under microscope (Nikon Eclipse 80i; Tokyo, Japan). As negative controls, sections were incubated with TUNEL label only by omitting either TdT or anti-digoxigenin antibody.

Positive control sections received the same treatment but were pretreated with DNase I (Roche, Indianapolis, USA) for 30 min at 37°C prior to TUNEL.

Evaluation of Immunostaining and TUNEL

Intensity of immunostaining and TUNEL was rated independently by two observers after the examination of all the follicles at the largest section under direct visualization at x400 magnification. The apoptotic index was determined with evaluation of TUNEL stained sections on a scale between 0-2, where a follicle that contained 5% or less labeled granulosa cells was scored as 0. Follicles with 5-10% labeled granulosa cells received a score of 1, and follicles with more than 10% labeled granulosa cells were scored as 2. Follicles with a score of 2 were classified as atretic. The percentage of atretic follicles was defined as the ratio of atretic follicles to total follicle number (Garrett, 1996). The proliferation index (PI) was determined with Ki 67 score evaluation on a 2-point scale. A follicle that contained less than 10% labeled granulosa cells was scored 0; follicles containing 10-50% labeled granulosa cells was scored 1, and follicles with a majority of labeled granulosa cells received a score of 2. Follicles scored with 1 or 2 were classified as proliferating follicles. The percentage of proliferating follicles was defined as the ratio of proliferative follicles to total follicle number (Garrett, 1996). Active caspase 3 immunostaining was evaluated according to the staining intensity as follows: -: no staining, +: 1 slight, ++: 2 medium, +++: strong (Vaskivuo, 2002).

Classification of Follicles

Classification of follicles was done according to Pedersen & Peters (1968) and Byskov (1974). Follicles were classified into the general categories listed in Table 1.

Table 1: The classification of follicles.

Follicle class	Name	Description
A	Primordial	A single layer of squamous granulosa cells
B	Primary	Less than two layers of cuboidal granulosa cells with no thecal layer
C	Secondary	Three to six layers of cuboidal GC
D	Small antral	≤5 layers of cuboidal GC; definitive theca layer; antral cavities began to form
E	Large antral	≤ Layers of cuboidal GC with columnar appearing GC at border of basement membrane
F	Graaf	Mature Graafian follicles with well developed granulosa, thecal, and antral elements, cumulus- oocyte complex

Statistical Analysis

Statistical significance between the groups was analyzed by one way ANOVA test followed by Dunn's post-hoc test. The level of significance was defined as follows: **a**, different from control A ($p \leq 0.05$); **b**, different from control A ($p \leq 0.001$); **c**, different from control B ($p \leq 0.001$); **d**, different from control B ($p \leq 0.01$); **e**, different from control B ($p \leq 0.01$).

Results

All stages of follicles, except for Graaf follicles (F), were observed in ovarian sections of all groups. Apoptosis was assessed by immunohistochemistry for active caspase-3 protein and *in situ* TUNEL method. While intracytoplasmic active caspase 3 staining was determined in interstitial cells localized among the follicles, in granulosa cells and in thecal cells of some follicles, no staining was observed in control sections. TUNEL staining was localized in nuclei of cells. While no staining was detected in control sections processed without TdT enzyme, staining was observed in nuclei of all cells in positive control sections pretreated with DNase. Active caspase 3 and TUNEL stainings were not observed in follicles at A, B, and C stages of development in any of the groups. Immunoreaction for active caspase 3 (+3 strong staining) and TUNEL (+) reaction ($\geq 10\%$ labeled granulosa cells, receiving score 2) was detected in D and E follicles which were considered morphologically as atretic. On the other hand, a small number of granulosa cells stained positive for TUNEL and caspase 3 in follicles which were classified as healthy.

As expected, atretic follicles were observed in all groups, however, numbers were significantly lower in the CAP treated groups than in both control A and control B groups. The results of apoptotic index (AI) indicated that CAP treated groups had lowest counts in all groups (Figures 1 and 2).

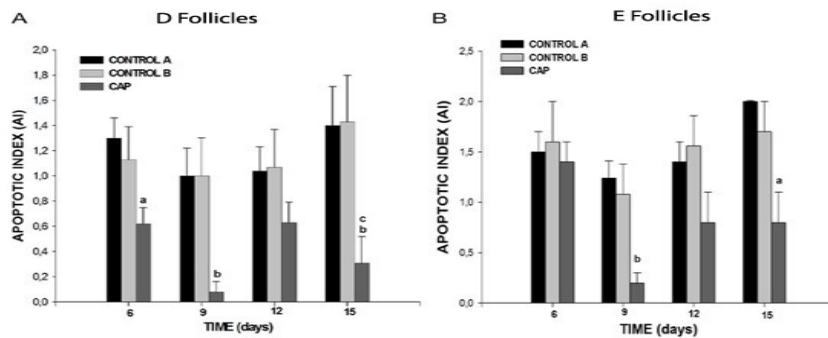


Figure 1. Apoptotic index for D (A) and E follicles (B). **a**, different from Control A ($p \leq 0,05$). **b**, different from Control A ($p \leq 0,001$). **c**, different from Control B ($p \leq 0,001$).

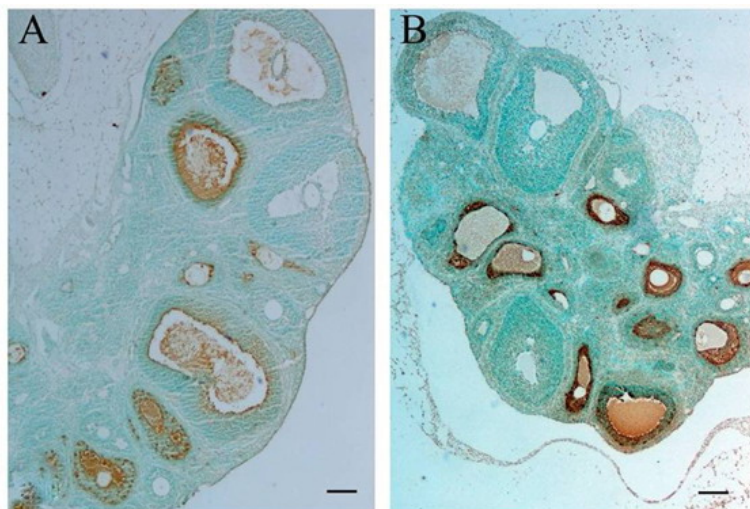


Figure 2. The TUNEL reaction on day 15. (A) CAP treatment group, (B) Control B group. Bar 100μm.

Ovarian cell proliferation was assessed by immune detection of the Ki67 antigen. Ki67 was immune localized mainly the nuclei of granulosa cells in the secondary follicles (C), small antral follicles (D) and large antral follicles (E) of all groups. However, the granulosa cells and oocytes of a few primary and primordial follicles in the CAP-treated groups were also stained. No staining was observed in the interstitial tissue, atretic follicles, and in sections processed without primary antibody.

The proportion of proliferating follicles was higher in control A group than in both control B and CAP treated animals on days 6 and 9. In contrast, the proportion of proliferation was significantly higher in the CAP-treated animals than in other groups on days 12 and 15.

Ki67 score analysis revealed that the proliferation index (PI) of follicles was higher in control A group than in other groups on days 6 and 9, but no statistical significance was detected on day 6 ($p \geq 0.05$) (Figure 3A). In contrast, on day 9, a significant difference was observed between the groups in follicle stages as seen in Figure 3B. The proliferation index of follicles at C, D and E stages of development was significantly higher in the CAP-treated groups than in other groups on days 12 and 15 (Figures 3C, D and 4).

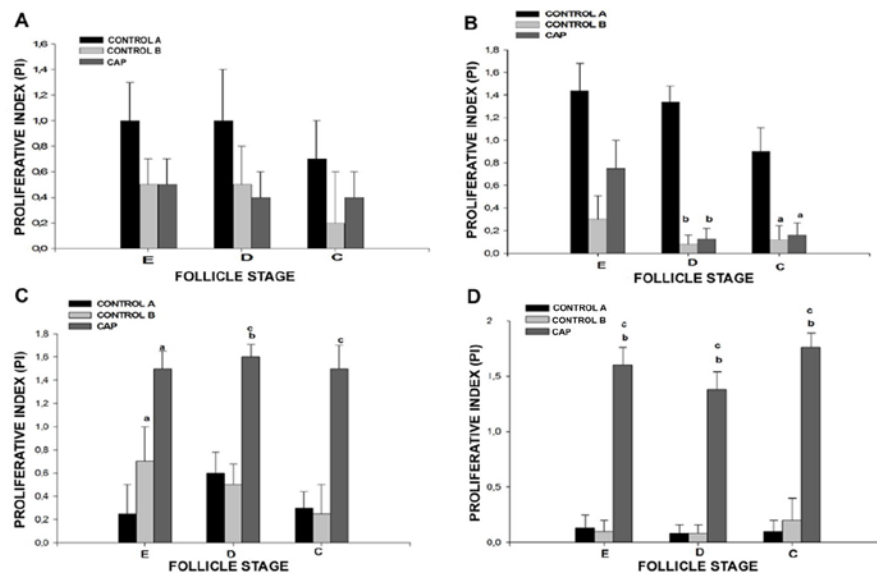


Figure 3. The proliferative index of the follicle stages (A) on day 6, (B) on day 9, (C) on day 12, (D) on day 15. a, different from Control A ($p \leq 0,05$); b, different from Control A ($p \leq 0,001$). c, different from Control B ($p \leq 0,001$) d, different from Control B ($p \leq 0,01$)

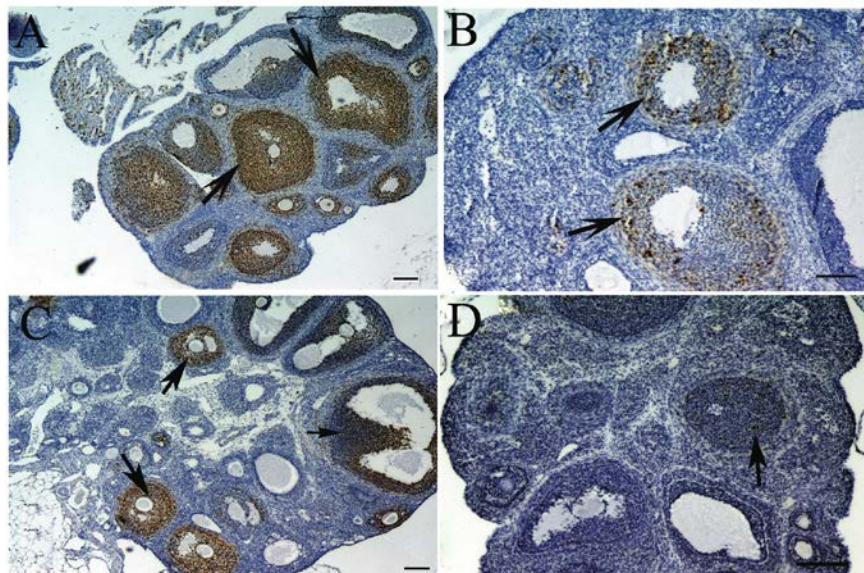


Figure 4. Immunostaining of Ki67 to show proliferating follicles (arrows) on a day 12 (A) and 15 (C) CAP treatment group. Bar 100µm; on a day 12 (B) and 15 (D) control A group. Bar 50µm.

Discussion

CAP affects many systems in the organism, including nervous, cardiovascular, respiratory, immune, and gastrointestinal systems (Biggs, 1990, Jensen, Jaorlim, 1998, Monsereenusorn, 1983). Little is known about the effects of CAP on the female reproductive system. Many researchers used high doses of CAP as a specific tool to examine the function of sensory neurons in the reproductive system (Moran, 2003, Nance, 1987). Moran *et al.* (2003) investigated the effects of high dose CAP (50mg/kg) on 3 days old denervated female rats' reproductive system. These researchers determined that CAP treated animals' follicles and ova shed numbers were significantly lower than control groups and showed an increase in the number of atretic follicles compared to control groups. Although the effects of high doses of capsaicin are well-established on the ovary, the effect of repeated exposure to low doses of capsaicin is not known. This is the first study about the effect of low dose CAP on the rat ovary. In this study, TUNEL positivity and active caspase 3 levels are assessed to determine atretic follicles, as atresia is associated with apoptosis. Consistent with this, we observed apoptotic activity (caspase 3 and TUNEL positive) both in the theca cells and granulosa cells of atretic follicles. In this study, atresia was only observed in the antral follicles (types D and E) not other follicles. In accordance with our findings, several studies showed that in the healthy human and mouse ovary, the follicular atresia was

determined only in the antral follicles but not detected in the preantral follicles (Fenwick, 2002, Matikainen, 2001). In rat ovary, follicular development and atresia are at peak during prepuberty (Hage, 1978). Large antral follicles that escape from atresia become dominant follicles and are chosen for ovulation (Cortvrindt, 2001). Our results showed that the follicular atresia was significantly lower in the CAP treated groups than in other groups, suggesting that CAP may prevent atresia formation. The low level of follicular atresia in antral follicles caused by CAP treatment may be associated with higher numbers of ovulating follicles and higher fertility rate in these animals.

Ovarian cell proliferation was assessed by immunodetection of the Ki 67 antigen. As expected, Ki67 immunoreactivity negatively correlated with TUNEL and active caspase 3 activity. Ki67 expression was observed in the granulosa cells of type C, D and E follicles of all groups. On day 12 and 15, the proliferative index of the CAP treated group was significantly higher than that of control groups. These results suggest that low dose of CAP inhibits apoptosis and stimulates the proliferation of granulosa cells. Previously, we studied the effects of red hot pepper in the reproductive system of laying hens fed with a diet containing red hot pepper (Ozer, 2005) and demonstrated that red hot pepper stimulated the follicular development and improved laying performance. Neuropeptides in CAP sensitive sensory neurons, such as CGRP, cholecystokinin, nitric oxide and SP may mediate the observed effects of CAP (Holzer, 1991, Pintado, 2003, Surh, 1996). It has been demonstrated that these peptides may increase the blood flow to the gonad and be involved in the regulation of female reproductive function (Dees, 1985, Kannisto 1986). It remains to be determined, however, whether the observed anti-apoptotic and pro-proliferative effects seen with CAP in the current study was due to the release of a neuropeptide.

In conclusion, we speculate that low dose of CAP protects the follicles from apoptosis and atresia, and stimulates follicular development.

Acknowledgements

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EĞRİLİK TEORİSİ ÜZERİNE KİNEMATİK YAKLAŞIMLAR

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Özet: Düzlem ya da bir yüzey üzerindeki bir eğrinin eğrilik değeri, o eğrinin doğrusal harekete göre sapmasını ölçer. Eğrilik kavramı, bir eğrinin bulunduğu yüzeyle ilişkisini ve dolayısıyla yüzeyin yapısı hakkındaki temel kavramların oluşturulmasını sağlar. Dolayısıyla eğrilik teorisi, düzlem ve yüzeylerin geometrisinde en temel konulardan biridir. Bu çalışmada, kinematik yaklaşımlarla teori desteklenmiş ve örneklendirilmiştir.

Anahtar Kelimeler: Eğrilik, Evolüt, Evolvent, Bobillier teoremi, Hartmann tasarımı, Sarmal yörünge

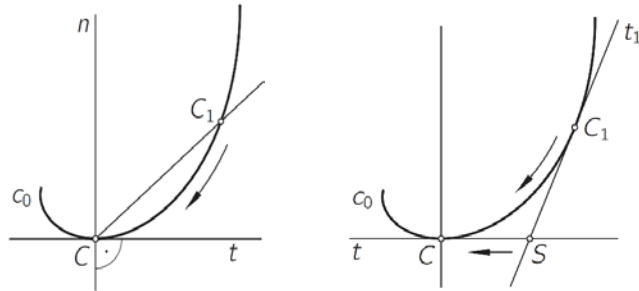
KINEMATIC APPROACHES TO THE CURVATURE THEORY

Abstract: The curvature value of a curve on a plane or a surface measures the deviation of that curve with respect to the linear motion. The term of curvature of a curve allows about the relationship to a surface and the creation of basic structure of the surface. Therefore, it is one of the most fundamental issues in the geometry of planes and surfaces. In this study, the theory is supported and illustrated by kinematic approaches.

Key words: Curvature, Evolute, Involute, Bobillier's theorem, Hartmann's rule, Enveloping curve

Giriş Ve Tanımlar

Sürekli ve en az iki kez türevlenebilen bir c_0 eğrisi $z_0(\tau) = x_0(\tau) + iy_0(\tau)$, $t \in I$ parametrik denklemleriyle verilmiş olsun. (Şekil 1)



Şekil 1. Örnek bir c_0 eğrisi

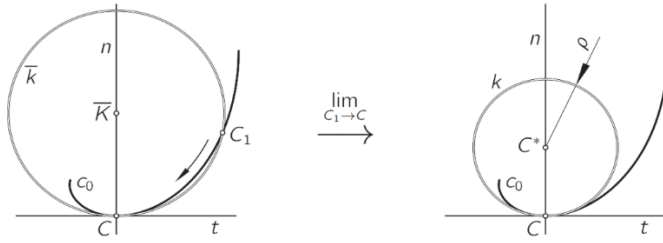
Eğrinin $C = z_0(\tau_0)$ noktasındaki t teğeti için, $\mathbf{v}(\tau_0) \neq 0$ ve $\tau_0 \in I$ olmak üzere

$$\mathbf{v}(\tau_0) = \dot{z}_0(\tau_0) = (\dot{x}_0(\tau_0) + i \dot{y}_0(\tau_0))$$

olduğunu biliyoruz.

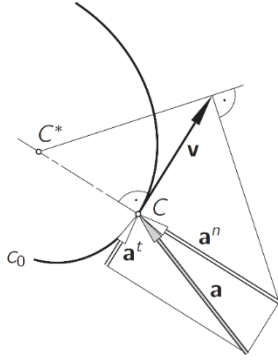
Burada; $t = \lim_{C_1 \rightarrow C} [CC_1]$ bir eğri kirişinin sınır konumudur ve t ile c_0 arasında en az iki kesişim noktası birbirine yaklaştığından bu durum t , c_0 eğrisine en az *iki noktalı* değmelidir olarak ifade edilir. $C_1 \neq C$ deki teğet t_1 için C_1 den C ye yakınsamayla $S = (t, t_1)$ kesişim noktasının sınır konumu $C = \lim_{t_1 \rightarrow t} [S]$ dir. Böylece t nin c_0 a *değme noktası*, c_0 daki t_1 teğetiyle t nin kesişim noktasının sınır konumu olarak görülebilir.

t teğeti üzerinde olmayan her $C_1 \in c_0$ noktası, t teğetine C noktasında değen \bar{k} çemberi oluşturur. Eğer $k = \lim_{C_1 \rightarrow C} \bar{k}$ ise C den geçen c_0 için kesişen en az üç nokta oluşur. Bu duruma; k , c_0 da C ye *üç noktalı* değmeye sahiptir denir.



Şekil 2. Eğrilik çemberi

k çemberine (Şekil 2) C noktasında c_0 eğrisinin *eğrilik çemberi* denir. C den geçen c_0 a değen çemberlerinin arasında k , c_0 a en çok yaklaşılandır. k nin merkezi C^* *eğriliğin merkezidir* ve tabii ki n eğri dikmeleri üzerindedir. k nin yarıçapı ρ ye *eğriliğin yarıçapı*, $\kappa = 1/\rho$ değerine de eğrinin *eğriliği* denir. c_0 ve ait olduğu eğrilik çemberi arasında, üçten daha fazla kesişme noktasıyla aynı olan c_0 in noktalarına *tepe noktaları* denir. Böylece, örneğin sürekli eğrilmiş eğrilerin tüm noktaları eğrilik yarıçapı extremum olan tepe noktalarıdır. \bar{k} nin sınır hali k bir doğru ise, yani $k = t$ ise, o zaman C ye *büküm noktası* denir. Bu durumda eğrilik merkezi C^* eğri dikmelerinin ideal noktası olur yani $\rho = \infty$ ve $\kappa = 0$ dir. t ile c_0 arasındaki en az dört noktalı değmede C ye *dip nokta* denir (Şekil 3).



Şekil 3. Dip nokta

Not: c_0 eğrisini, arabayla içinden geçtiğimiz tamamen düz bir alandaki sokak olarak düşündüğümüzde, yolculuk esnasında C noktasında direksiyon bloke olursa, $k = \lim \bar{k}$ oluşur. Direksiyon bir an dönmediğinde, araç büküm noktasından geçecektir. Eğrilik yarıçapı hesaplamasında

$$a(\tau_0) = \ddot{z}(\tau_0) = (\ddot{x}(\tau_0) + i\ddot{y}(\tau_0))$$

ivme vektörüne ihtiyaç vardır. İvme vektörü, $\mathbf{v}(\tau_0)$ a paralel *teğet hızlanma vektörü* $\mathbf{a}^t(\tau_0)$ ile $\mathbf{v}(\tau_0)$ a dik vektör olan *dikine hızlanma vektörü* $\mathbf{a}^n(\tau_0)$ in toplamı olarak tasarlanabilir.

$$\mathbf{a}^n(\tau_0) = \|\mathbf{a}^n(\tau_0)\|$$

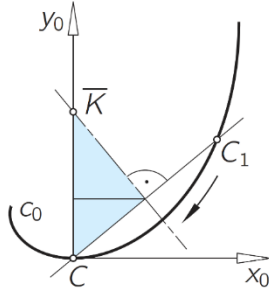
değeri doğrudan doğruya C nin eğrilik yarıçapıyla birbirine bağlıdır, çünkü;

Teorem 1. c_0 eğrisinin C noktasındaki ρ eğrilik yarıçapı $\rho = \frac{v^2}{a^n}$ dir.

Burada v yörünge hızı, a^n ise dikine hızlanmadır. Dikine hızlanma vektörünün yönü, C^* in eğrilik merkezinin, eğri teğetinin hangi tarafında bulunduğunu gösterir.

Not: Tekrar c_0 in bir cadde ile karşılaştırmasında kalalım: Hızlanma vektörü cadde boyunca seyreden arabaya gücü ile oranlı biçimde uygulansın. Grafiksel usul olarak ve hızlanma vektöründen iyi ayırt edilebilmesi için genellikle \mathbf{a} vektörünün uç noktasının yörünge üzerinde olduğu göz önünde bulundurulur. \mathbf{a}^t ve \mathbf{v} aynı ise oluşan eylemsizlik kuvveti geriye doğru baskı yapar ve teğet hızlanma vektörü seyir yönüne etki eder. Normal hızlanma arabayı viraja zorlar ve buna reaksiyon olarak biz dışarıya doğru baskı yapan merkez kaç kuvvetini hissederiz.

İspat: Σ_0 da bir koordinat sistemi C orijin olacak şekilde seçilsin, yani $x_0(\tau_0) = y_0(\tau_0) = 0$. Ayrıca x_0 - eksen c_0 eğrisine C noktasında değsin, yani $\dot{y}_0(\tau_0) = 0$ ve $\dot{x}_0(\tau_0) \neq 0$ olsun.



Şekil 4. $\bar{K} = (0, \eta)$ merkez noktası için oluşturulan dik üçgen

\bar{k} çemberini $\tau \neq \tau_0$ ve $y_0(\tau)$ olacak şekilde $C_1 = (x_0(\tau), y_0(\tau))$ noktasından geçecek ve C noktası x_0 - ekseninde olacak şekilde oluşturulur. Bu çemberin $\bar{K} = (0, \eta)$ merkez noktası için dik üçgende (Şekil 4) Öklid bağıntısından;

$$\frac{\overline{CC_1}^2}{4} = \eta \frac{y_0(\tau)}{2}$$

yani

$$\eta = \frac{x_0(\tau)^2 + y_0(\tau)^2}{2y_0(\tau)}$$

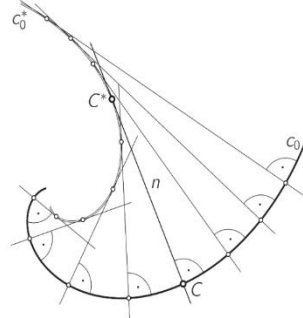
bulunur.

L' Hospital kuralının iki defa uygulanmasıyla

$$\lim_{\tau \rightarrow \tau_0} \eta = \lim_{\tau \rightarrow \tau_0} \frac{x_0 \dot{x}_0 + y_0 \dot{y}_0}{\dot{y}_0} = \lim_{\tau \rightarrow \tau_0} \frac{\dot{x}_0^2 + x_0 \ddot{x}_0 + \dot{y}_0^2 + y_0 \ddot{y}_0}{\ddot{y}_0} = \frac{\dot{x}_0(\tau_0)^2}{\ddot{y}_0(\tau_0)}$$

Ayrıca $\mathbf{v}(\tau_0) = (0, \dot{x}_0(\tau_0))$ olduğundan $v(\tau_0) = |\dot{x}_0(\tau_0)|$, $v(\tau_0)^2 = \dot{x}_0(\tau_0)^2$ ve

$\mathbf{a}^n(\tau_0) = (0, \ddot{y}_0(\tau_0))$, $a^n(\tau_0) = |\ddot{y}_0(\tau_0)|$ elde edilir. C, c_0 eğrisi boyunca hareket ederse, ait olan C^* eğrilik yarıçapı, bir c_0^* eğrisi üzerinde hareket eder. Bu eğriye c_0 eğrisinin *evolütü* denir (Şekil 5). c_0 daire yayı ya da doğru parçası ise C^* sabit kalır.



Şekil 5. c_0 eğrisinin evolütü

Teorem 2. c_0 in c_0^* evolütü eğri dikmelerin sarmal eğrisidir.

İspat: c_0 eğrisinin her C noktası için teorem 1 deki gibi bir koordinat sistemi olduğunu varsayalım.

$n_1, C_1 = (x_0(\tau), y_0(\tau))$ noktasının eğri dikmesi ve τ, τ_0 a yakınsarken, sarmal eğri ile n eğri dikmelerinin değme noktaları $S = (nn_1)$ kesişim noktalarının sınır konumudur.

n_1 artandır ve değeri $-\dot{x}_0(\tau)/\dot{y}_0(\tau)$ dir, böylece S kesişim noktasının ordinatı

$$\eta^* = y_0(\tau) + \frac{\dot{x}_0(\tau)}{\dot{y}_0(\tau)} x_0(\tau)$$

dir.

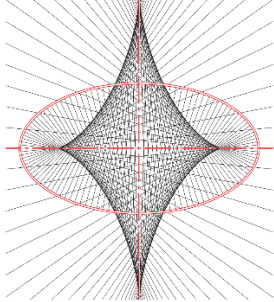
$\lim_{\tau \rightarrow \tau_0} S = C^*$ ise o zaman

$$\lim_{\tau \rightarrow \tau_0} \eta^* = \lim_{\tau \rightarrow \tau_0} \frac{x_0 \dot{x}_0 + y_0 \dot{y}_0}{\dot{y}_0} = \lim_{\tau \rightarrow \tau_0} \eta$$

olup teorem 1 deki benzer işlemlerle ispat tamamlanır.

Kinematik Yorumlar

$C \in \Sigma$ noktasından geçen $t \subset \Sigma$ doğruları daima C nin c_0 daki teğetleri olarak kalıyorken, C noktası c_0 eğrisi üzerinde sabit bir hızla hareket ediyorsa bu Σ/Σ_0 mecburi hareketine c_0 boyunca eşlik eden hareket denir. C nin t ye göre $n \subset \Sigma$ dikmelerinden oluşan n_0 sarmal yörüngesi c_0 in c_0^* evolütüdür; bu yüzden n in her sarmal noktası c_0 in C^* eğrilik merkezidir (Şekil 6).



Şekil 6. Bir elipsin eğri dikmelerinin sarmalı.

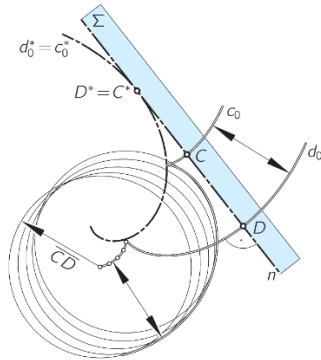
Σ/Σ_0 hareketinin her anındaki P anlık polleri C nin yörünge dikmeleri ve n nin sarmal noktalarının dikmelerinin üzerinde bulunur. Yani $P = C^*$ dır. Böylece aşağıdaki teorem elde edilir.

Teorem 3. c_0 boyunca eşlik eden Σ/Σ_0 hareketinin pol noktaları eğrilik merkezine düşerler. Yani c_0 in c_0^* evolütü Σ/Σ_0 in hareket öncesi pol eğrisidir ve $n \subset \Sigma$ dikmeleri de hareket halinin pol eğrisidir. Eğer Σ/Σ_0 in açısal hızı ω ise, o halde yörünge hızı $c_v = |\omega| \rho$ ve eğrilik $\kappa = 1/\rho = |\omega| / c_v$ dir.

c_0^* , c_0 in evolütü ise, c_0 için c_0^* in evolventidir denir. c_0 evolventleri c_0^* in bütün teğetlerini dik olarak keserler ve bunlar da teğet yığınlarının dik trajektörlerinin oluşturduğu bir eğridir.

C ve D noktalarından n üzerinde oluşabilen evolventler sırasıyla c_0 ve d_0 olsun:

c_0 ve d_0 arasındaki ortak dikmelerin aralarındaki uzunluk sabit kalır. Burada c_0 , yarıçapı \overline{CD} , merkezi d_0 üzerinde olan tüm çemberlerin sarmalıdır. Aynı durum d_0 için de geçerlidir. Bu tip sarmallara çember merkez noktasının yörünge dönüşüne göre paralel eğri denir (Şekil 7).



Şekil 7. Çember merkez noktasının yörünge dönüşüne göre paralel eğrisi

Genel olarak:

Teorem 4. c_0 , d_0 için bir paralel eğri ise, c_0 ile d_0 in dikmeleri, evolüt ve eğrilik merkezi ortaktır.

c_0^* in n dikmeleri üzerindeki yuvarlanma ile oluşan yörünge eğrisi olarak yukarıda tasarımı verilen c_0 evolventleri aynı zamanda şunu gösterir:

Teorem 5. Sürekli kıvrılan bir c_0 eğrisinin uç noktaları ve onun d_0 paralel eğrileri ortak $c_0^* = d_0^*$ evolütü üzerinde bulunurlar.

Buradan, teorem 3 e de bir ekleme yapmak gerekirse:

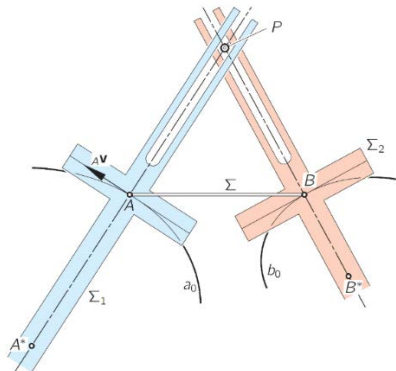
Eğer hareketli pol eğrisi bir doğru ise, bir düzlemsel mecburi hareket p_0 düzlemsel eğrisi boyunca eşlik eden hareketir.

Eğrilik İlişkisi

Her $X \in \Sigma$ noktasına karşılık, bu noktanın Σ_0 daki yörüngesinde X^* eğrilik merkezi bulunabiliyorsa, $\Sigma \rightarrow \Sigma_0$ dönüşümü elde edilir.

Eğer $A, B \in \Sigma$ noktaları, eğrilik merkezleri A^*, B^* ve yön hızıyla mevcutsa, teorem 3 sayesinde bağlantılı aktarım organı için gösterilmiş kutup değişim hızının p_v vektörü tasarımı, bazı zorunlu hareketler için geçerlidir:

P anlık polü, yörünge dikmelerinin kesişim noktasıdır. Örnek olarak, Σ_1 ve Σ_2 tarafından oluşturulan hareket ve P pol noktası Şekil 8 deki aktarım organında tasarlanmıştır. Burada Σ_1, A noktasının yörünge teğetleri ve normallerinden oluşturulan sistem ve Σ_1/Σ_0 , A nın A^* ile a_0 yörüngesi boyunca anlık pol 01 e göre oluşan eşlik eden hareketidir. Benzer şekilde Σ_1 ve Σ_2 eşlik eden hareketi B nin b_0 yörüngesi boyunca Pol $B^* = 02$ ile oluşur.



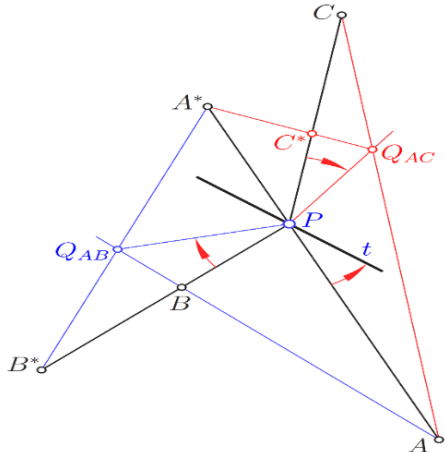
Şekil 8. Sırasıyla A^*, B^* eğrilik merkezli $A, B \in \Sigma$ noktaları ile tanımlı bir aktarım organı

Burada P sürekli Σ_1 yörünge dikmelerinin üzerinde olduğundan, p_v , Σ_1/Σ_0 da yön hızı $p_v^{f_{10}}$ den ve yörünge dikmelerinin yönündeki göreceli hız $p_v^{r_{11}}$ in toplamından elde edilir.

Teorem 6. (Bobillier teoremi) Bir hareket durumu için $A, B \in \Sigma$ noktalarındaki pol noktası P nin pol doğruları üzerindeki eğrilik merkezleri biliniyorsa, o zaman t pol teğeti için $Q_{AB} = ([AB][A^*B^*])$ olmak üzere $\angle[PA]t = -\angle[PB][PQ_{AB}]$ dir.

Örnek 1.

$A, B, C \in \Sigma$ ve bunlara ait sırasıyla A^*, B^* eğrilik merkezleri verilmiş olsun. C nin C^* eğrilik merkezini bulalım: Bobillier tasarımının iki kez ard arda kullandıktan sonra görülür ki, A, B için Q_{AB} ve A, C için Q_{AC} yardımcı noktalarının kullanımıyla açı aktarımı yapılır (Şekil 9). Hatta pol teğeti t burada gereksizdir.



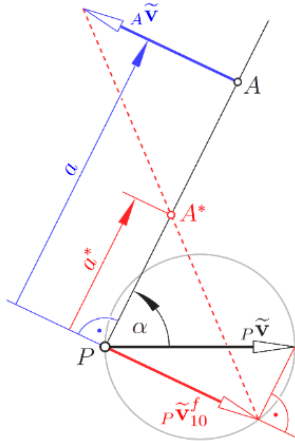
Şekil 9. Bobillier tasarımına bir örnek

Örnek 2. (Hartmann tasarımı)

$P, {}_P\tilde{\mathbf{v}}, A, {}_A\tilde{\mathbf{v}}$ verilmiş olsun. A^* in yörünge eğrilik merkezini bulalım.

${}_P\tilde{\mathbf{v}}$ den $[PA]$ pol doğrularına dik yönlendirilmiş ${}_P\tilde{\mathbf{v}}_{10}^f$ belirleyelim. ${}_P\tilde{\mathbf{v}}_{10}^f$ ve ${}_A\tilde{\mathbf{v}}$ vektörlerinin uçlarını birleştiren doğru A^* dan geçer.

Burada ${}_P\tilde{\mathbf{v}}$ nin Thales çemberi üzerindeki farklı pol doğruları için ${}_P\tilde{\mathbf{v}}_{10}^f$ vektörünün uçları *Hartmann çemberi* üzerindedirler (Şekil 10).



Şekil 10. Hartmann çemberi

Her P anlık polünden farklı $A \in \Sigma$ noktalarını A^* yörünge eğrilik merkezlerine dönüştüren ve P yi sabit bırakan $A \rightarrow A^*$ dönüşümüne *eğrilik ilişkisi* denir.

Bu teorem 6 ya göre $A \rightarrow A^*$ ve $B \rightarrow B^*$ nokta çiftleri sayesinde farklı pol doğruları üzerinde bir tek olarak belirlidir. Özellikle $A^* = P$ pol teğetini veren her A noktası için geçerlidir, çünkü burada ${}_P\tilde{\mathbf{v}}_{10}^f$ sıfır vektörüdür.

Eğrilik ilişkilerinin quadratikliği

Burada ${}_P\mathbf{v} \neq 0$ için eğrilik ilişkisini analitik olarak tasvir edebilmek için tekrar Hartmann tasarımını gözönüne alalım. x_0 eksenini ${}_P\mathbf{v}$ olarak kabul ettiğimiz Σ_0 koordinat sistemimizin orijini P olsun.

Yukarda bahsettiğimiz Σ_1/Σ_0 eşlik eden hareket boyunca $A \in \Sigma, A \neq P$ nin yörüngesi $A = (ae^{i\alpha})$ noktasını ${}_A\mathbf{v} = (ia\omega e^{i\alpha})$ hız vektörüne ve $P = (0)$ pol noktasını ${}_P\mathbf{v}_{10}^f = (-i{}_P\mathbf{v} \sin \alpha e^{i\alpha})$ vektörüne karşılık getirir. ${}_A\mathbf{v} \neq {}_P\mathbf{v}_{10}^f$ için eşlik etme hareketinin A^* pol noktası belirlidir, böylece $A^* = (a^*e^{i\alpha})$ alınabilir. Σ_1/Σ_0 in açısal hızı ω_A için;

$$\begin{aligned} {}_A\mathbf{v} &: i\omega_A(a - a^*)e^{i\alpha} = ia\omega e^{i\alpha} \\ {}_P\mathbf{v}_{10}^f &: i\omega_A(0 - a^*)e^{i\alpha} = -ia\omega \sin \alpha e^{i\alpha} \end{aligned}$$

denklemleri yazılabilir.

Birinci denklemi a^* ile ve ikinci denklemi $(a - a^*)$ ile çarpıp taraf tarafa toplarsak $(a - a^*){}_P\mathbf{v} \sin \alpha = aa^*\omega$ bulunur. $a^* \neq 0$ için $aa^*{}_P\mathbf{v}$ ile bölerek aşağıdaki teorem elde edilir:

Teorem 7. (Euler-Savary Formülü) Hareketin her pozisyonunda, $P = (0)$ pol noktası ve ${}_P\mathbf{v} \in \mathbf{R} \setminus \{0\}$, ${}_P\mathbf{v} = ({}_P\mathbf{v})$ pol değişim hızı için $a a^* \neq 0$ olmak üzere $A = (ae^{i\alpha}) \rightarrow A^* = (a^*e^{i\alpha})$ eğrilik ilişkili nokta çiftleri için aşağıdaki eşitlik geçerlidir. $\left(\frac{1}{a^*} - \frac{1}{a}\right) \sin \alpha = \omega / {}_P\mathbf{v} = k = \text{sabit}$.

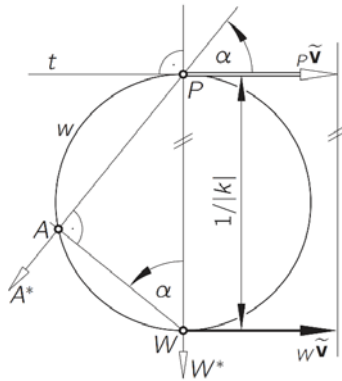
Anlık yörüngelerinin büküm noktaları üzerinde hareket eden $A \in \Sigma$ noktaları eşlik etme hareketinin ${}_A\mathbf{v} = {}_P\mathbf{v}_{10}^f$ ile gösterilen bir pol oluşturma yerleridir.

$a\omega = -{}_P\mathbf{v} \sin \alpha$ ve $1/a^* = 0$ için teorem 7 den

$$\frac{a}{\sin \alpha} = -\frac{1}{k} = \text{sabit}$$

elde edilir.

Bu durumdaki bütün A noktaları w *büküm çemberi* (Şekil 11) üzerinde bulunurlar.



Şekil 11. Büküm çemberi

Teorem 8. Σ den bir hareket durumunda belirli bir anlık P polü ve kendi yörüngesinde ilerleyen ${}_P\mathbf{v} \neq 0$ büküm noktası, P noktasında pol doğrusuna değen w büküm çemberi üzerindedir.

Bütün anlık büküm teğetleri P nin w deki tam karşı simetrisinde bulunan büküm polü W den geçer. Burada ${}_P V = {}_W V = {}_w V_{10}$ dır.

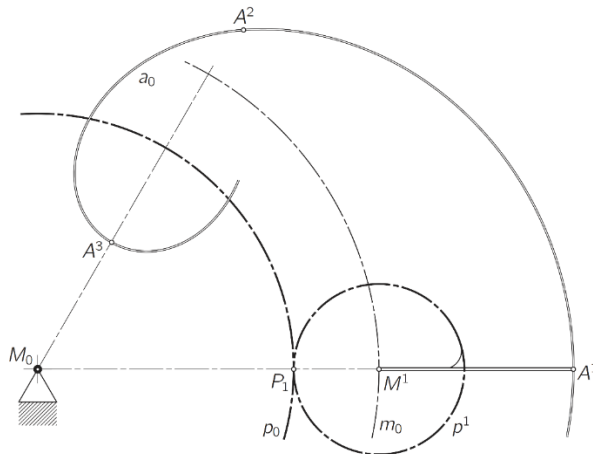
Aşağıdaki 3. örnekteki gibi, Hartmann tasarımı özellikle A , pol dikmeleri üzerinde bulunduğunda kolaydır, çünkü burada $\rho^v f_{10} = \rho^v$ dir. Eğer tekrar aynı pol ışını oluşturulacaksa, Hartmann tasarımı kesinlikle tavsiye edilmelidir. Bu tasarım aşıkârdır ve pol teğeti burada lüzumsuzdur, çünkü sadece $\rho^v f_{10}$ a gereksinim duyulur.

Örnek 3.

Σ / Σ_0 hareketi, pol eğrileri p_0 ve p çemberleri ve bir $A \in \Sigma$ noktasının yörünge üzerindeki noktaları A^1, A^2 ve A^3 olacak şekilde verilsin. A^{1*}, A^{2*} ve A^{3*} eğrilik merkezleri ve Σ^1 in w_1 büküm çemberini bulalım. Ayrıca A noktası nerede seçilmelidir ki a_0 yörüngesi üzerinde büküm noktası olsun? Hangi seçim için dip nokta vardır?

Çözüm: Gelişi güzel seçilmiş ${}_A\tilde{\mathbf{v}}^1$ ile ${}_M\tilde{\mathbf{v}}^1$ hız vektörünün hareket anındaki çember merkezi M^1 bulunabilir. Çünkü M ve P aynı açısal hızla M_0 etrafında döndüklerinden ya da $M^1 \rightarrow M_0$ anlık büküm ilişkisinin nokta çifti olduğundan ve ${}_P\tilde{\mathbf{v}}^1$ tasarlanabilir.

A^{1*} ve A^{3*} en kolay yol olarak Hartmann tasarımı yardımıyla (Şekil 12) elde edilebilirler. A^{2*} için Bobillier teoremi kullanılır.



Şekil 12. Örnek 3 için Hartmann tasarımı

Σ / Σ_0 mecburi hareketinin bir anındaki pol dikmeleri, hareket ve başlangıç pol eğrilerinin simetri eksenine ise aynı zamanda bu pol dikmeleri bu eksen üzerindeki tüm noktaların da simetri eksenidir. Böylece kendi w_0 yörüngesinin dip noktası olan W büküm polü haricindeki bütün bu noktalar yörüngelerinin tepe noktasında geçerler.

Σ de kendi yörüngesinin dip noktasında gezen bir noktanın $\omega \neq 0$ ve $p \neq 0$ için diğer bütün hareket ortamlarında varlığı gösterilebilir. Bu noktalara *Ballscher noktası* denir.

Tekrar Euler-Savary denklemine geri dönelim ve burada ortaya çıkan kutupsal koordinatları kartezyen koordinatlara dönüştürelim:

$$\begin{aligned}(x, y) &= (a \cos \alpha, a \sin \alpha) \\ (x^*, y^*) &= (a^* \cos \alpha, b^* \sin \alpha)\end{aligned}$$

olarak alalım.

Toerem 7 den,

$$(a - a^*) \sin \alpha = a a^* \text{ yani } \frac{a^*}{a} = \frac{\sin \alpha}{a k + \sin \alpha}$$

ve

$A \rightarrow A^*$ dönüşümü için eşitlikleri düzenlersek:

$$\begin{aligned}x^* &= \frac{a^*}{a} x = \frac{x \sin \alpha}{a k + \sin \alpha} \cdot \frac{a}{a} = \frac{xy}{(x^2 + y^2) k + y} \\ y^* &= \frac{a^*}{a} y = \frac{y^2}{(x^2 + y^2) k + y}\end{aligned}$$

olur ve

$$(x_0 : x_1 : x_2) = (1 : x : y) \text{ ve } (x_0^* : x_1^* : x_2^*) = (1 : x^* : y^*)$$

homojen kartezyen koordinatlar için

$$x_0^* = x_0 x_2 + k (x_1^2 + x_2^2)$$

$$x_1^* = x_1 x_2$$

$$x_2^* = x_2^2$$

karese dönüşüm denklemleri elde edilir.

Eşitliğin sağ tarafı karese fonksiyonlardan oluşur. Dönüşüm denklemlerinde ters işlemler yaparak

$$x_0 = x_0^* x_2^* - k (x_1^{*2} + x_2^{*2})$$

$$x_1 = x_1^* x_2^*$$

$$x_2 = x_2^{*2}$$

elde edilir. (bkz. Teorem 13)

A^* noktası kesin olarak belirsizdir ve A , şayet $x_0^* = x_1^* = x_2^* = 0$ yani $x_2 = x_1 = 0$ ve ayrıca $A = P$ ise, karese ilişki için bir *esas noktası*.

Teorem 9. $A \rightarrow A^*$ büküm ilişkisi, $p \neq 0$ için P pol noktası yegane esas nokta olacak şekilde, karşılıklı rasyonel karese nokta ilişkisidir.

Pol teğetinden farklı pol doğrularının üzerindeki kısıtlamalar parabolik projektifliklerdir. Her $A \in t$, $A \neq P$ için $A^* = P$ dir.

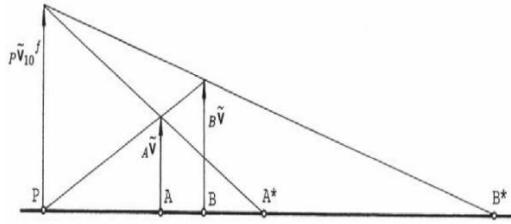
Yörünge eğrilikleri üzerine örnekler

Örnek 4.

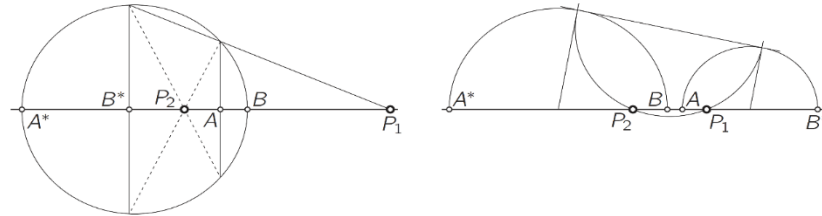
Büküm ilişkisinin iki nokta çifti $A \rightarrow A^*$, $B \rightarrow B^*$ verilmiş olsun. P pol noktasını bulalım.

Yukarıdaki şekil, P polünün hangi durumlarında Hartmann tasarımının kullanılması gerektiğini gösterir. Bu tasarım - analitik formüle edilmiş- P için karese bir denklem bulunmasını sağlar.

Projektif geometri metotlarını da kullanabiliriz. P sabit noktası $[AB]$ pol doğrusu üzerinde $A \rightarrow A^*$ ve $B \rightarrow B^*$ ile verilmiş parabolik projektifliktir (Şekil 13). Bu yukarıdaki tasarımı da doğrular; yani $p \neq 0$ un uç noktası ve dikmelerin ideal noktasını perspektif demetlerinin yardımcı merkezleri olarak görülebilir.

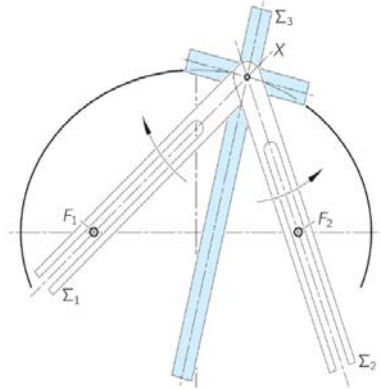


Şekil 13. P sabit noktası $[AB]$ pol doğrusu üzerinde parabolik projektiftir Steiner çemberi tasarımına uygun olarak bunun gibi iki projektiftir, yani P için iki çözüm vardır. Bu arada P aynı zamanda involüsyonlu çiftleri $A \rightarrow B^*$ ve $B \rightarrow A^*$ ile dönüşümün sabit noktasıdır. Aşağıda direkt tasarımlar görülmektedir (Şekil 14): Soldaki şekil, 1. tür c_2 - demeti için Desargues'ın involüsyon teoreminden bulunur. Sağdaki şekilde her çember yarıçapı için birbirine ortogonal iki çember dört harmonik noktada kesişirler teorisi kullanılır.



Şekil 14. a) A^*B , AB^* ı kapsar. b) A^*B ve AB^* birbirinden ayrık dururlar.

Sonuç olarak elips aracılığıyla konik kesiti k nın eğrilik merkezleri yapısına yönelik bir yöntem türetilmelidir. Aşağıdaki şekil 15 de görüldüğü gibi odak doğruları Σ_1 ve Σ_2 sistemlerini belirler. Bu sistemler konik kesit noktası X in dönüşü olarak tanımlanarak bağlanmış ve ilgili odak noktaları F_1 dolayısıyla F_2 ile hareket etmektedir. k üzerindeki X noktasının t teğeti ve n dikmesi, k boyunca Σ_0 a karşılık eşlik eden Σ_3 hareketini belirler. Böylece X^* eğrilik merkezi 03 polü ile özdeşir. ω_{13} ve ω_{23} açısal hızları, n daima odak doğrularının açıortayı olacağından, karşılıklı biçimde aynı olmak zorundadırlar.



Şekil 15. Σ_1 ve Σ_2 sistemlerini belirleyen odak doğruları

Göreceli poller 12, 13 ve 23, X ile aynıdırlar. 01 ve 02 pol noktaları Σ_1 ve Σ_2 nin ortak noktası olan X in n yörünge dikmelerinin üzerinde ve F_1 ve dolayısıyla F_2 dikmelerinin içindeki sarmal noktalar üzerinde bulunurlar. $A = 01$ noktası göreceli pol olarak Σ_3 ile aynı yön hızındadır. Yani $A_{V13} = A_{V03}$. Böylece A_{V13} , 13 polü ve ω_{13} ile belirlenmiş olur. Benzer şekilde $B = 02$ için $B_{V23} = B_{V03}$ vektörü, 23 polü ve ω_{23} aracılığıyla saptanır. Σ_0 / Σ_3 'de $A, B \in n$ noktalarının yön hızları A_{V03} ve B_{V03} den $X^* = 03$ pol noktası yapılandırılabilir ve $X^*A : X^*B = \|A_{V03}\| : \|B_{V03}\| = XA : XB$ dir.

$[AB] = [01 \ 02]$ doğrusu X^* noktası aracılığıyla içerden, X den de dışardan aynı oranda bölünebilir, buna göre:

Teorem 10. Nokta çiftleri A, B ve X, X^* elips dikmeleri üzerinde $(ABXX^*) = -1$ olacak şekilde harmonik biçimde ayrılırlar.

X e ve dolayısıyla A, B noktalarına X^* dördüncü harmonik noktasının tasarımında, t nin ve hatta n nin ana eksenleriyle kesişim noktaları T ve N in iki odak noktası ile harmonik olmalarından faydalanılabilir, yani $(F_1 F_2 T N) = -1$ dir. Bu, X den geçen iki odak doğrusu t ve n nin harmonik konumlu olmasındandır.

$[XF_1]$ doğrusu üzerinde F_1, F_2 ve T noktaları t ye paralel yansıtılarak F_1, F'_2, X noktaları bulunur. Bu noktaları $[XF_1]$ e dik olacak şekilde n dikmesi üzerine yansıtıp, A, B ve X elde edilir. Harmonikliğin projektiflikler altında değişmezliği kuralı nedeniyle N noktası bu iki yansıma sonrası X^* eğrilik merkezinden geçmelidir.

Not: Aynı tasarım yöntemi parabol ve hiperbol için de kullanılabilir.

Sarmal Yörüngelerin Eğriligi

$(c_1, c_0), \Sigma_1/\Sigma_0$ zorunlu hareketin sarmal eğri çifti ve Σ_2 , ilgili sarmal yörünge teğetleri ve dikmelerinin oluşturduğu sistem olsun. Gözlem anındaki Σ_1/Σ_0 in $P = 01$ polü ve $p_v \neq 0$ olacak şekilde, c_0 boyunca Σ_2/Σ_0 eşlik etme hareketindeki yön hızlarını inceleyelim:

c_0 in H sarmal noktasındaki C_0 eğrilik merkezi Σ_2/Σ_0 in pol noktasıdır. Burada P daima Σ_2 nin sarmal yörünge dikmelerinde bulunacağından, $p_v, \Sigma_2/\Sigma_0$ da P nin $p_v^f_{20}$ yön hızı ve sarmal yörünge dikmelerine paralel $p_v^f_{20}$ nin toplamından elde edilir. Böylece tersine $C_0 \neq P$ olmak üzere verilen $p_v^f_{20}$ ve p_v hız vektörleri için Σ_2 deki her noktanın yön hızı belirlenmiş olur.

Σ_2/Σ_1 göreceli hareketi c_1 boyunca anlık C_1 eğrilik merkezi göreceli pol 12 olacak şekilde eşlik etme hareketidir. Belirli bir C_1 noktası için C_1 in Σ_1/Σ_0 da c_{v10} yön hız vektörü Σ_2/Σ_0 da karşılıklı eşleşir; $p\tilde{v}_{10}^f$ ve $c\tilde{v}_{10}$ lerin uç noktaları da C_0 dan geçen doğru üzerindedirler. Bu işlemler, Hartmann'ın tasarımı olarak adlandırılır, böylece $C_1 \rightarrow C_0$ dönüşümü Σ_1/Σ_0 in eğrilik ilişkisindeki noktalar olarak kabul edilir. Bu durum $C_0 = P$ içinde geçerlidir, çünkü burada $p_v^f_{20} = 0$, yani sarmal yörünge dikmeleri Σ_1/Σ_0 in pol teğetleri olmalıdır.

Sonuç olarak C_1 ideal nokta ise, eğrilik ilişkisinin uygun genişlemesine göre $C_0 = C_1^*$ geçerlidir: Σ_1/Σ_0 ve Σ_2/Σ_0 aynı açısal hıza sahiptirler; bu sebepten C_0 , bir sarmal yörünge dikmeleri sonsuza yaklaşan $A \in \Sigma_1$ noktası boyunca Hartmann'a göre tasarımı yapılan A^* sınır konumudur.

Teorem 11. H sarmal noktasının (c, c_0) sarmal eğrilik çiftinin C, C_0 eğrilik merkezleri eğrilik ilişkisi olan nokta çiftleridir.

Σ/Σ_0 in her iki p, p_0 pol eğrisi için özel sarmal eğri çiftleri olarak aşağıdaki teoremi verelim.

Teorem 12. Zorunlu hareketin her anında P anlık polü için hareket ve başlangıç pol eğrilerinin K, K_0 eğrilik merkezleri eğrilik ilişkisi olan noktalardır ve P sayesinde belirlidirler.

Şayet trokoid hareketi değilse, örnek 3 de gösterilen Hartmann'ın pol dikmelerinde olduğu gibi A noktası için A^* in tasarımı, teorem 12 için de geçerlidir. Burada K yerine M ve K_0 yerine M_0 konur. Pol dikmelerinin noktalarının oluşturduğu doğrusu için K ve K_0 dan Bobillier'in tasarımının tek seferlik kullanımıyla eğrilik merkezi belirlenemez, fakat burada ilk olarak başka bir pol doğrusunda eğri ilişkisinde olan nokta çiftleri aranmalıdır. Tersine harekette pol eğrileri rollerini değiştirirler. Böylece şunu elde ederiz:

Teorem 13. A^*, A nın Σ/Σ_0 daki yörünge eğrilik merkezi ise, o zaman A da A^* in tersine hareket Σ_0/Σ daki yörünge eğrilik merkezidir.

Aşağıda doğrusal sarmal yörüngelerini tanımlayacağız:

$c \subset \Sigma$ bir doğruysa, o zaman eğrilik merkezi C bir ideal noktadır. Euler-Savary formülünden, $1/a \rightarrow 0$ sınırı aşımıyla c_0 sarmal yörüngesinin anlık C_0 eğrilik merkezinin $a^* e^{i\alpha}$ koordinatları için

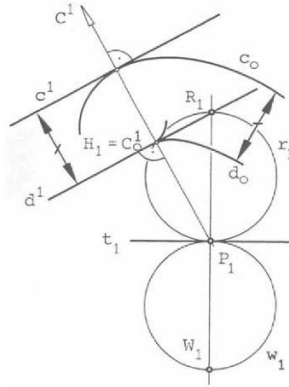
$$\frac{a^*}{\sin \alpha} = \frac{1}{k} = \text{sabit.}$$

eşitliği verilebilir.

Böylece C_0 geri dönüş çemberi r üzerinde bulunur. Dönüş çemberinin kutupsal denklemi ile karşılaştırma yapılırsa aşağıdaki sonuçlar verilebilir:

Sonuçlar

Hareketin her anında $p_v \neq 0$ olmak üzere belirli P anlık polünün eğrilik merkezi, r dönüş çemberinin doğrusal sarmal yörüngesi üzerindedir. Bu eğrilik merkezi, w büküm çemberi ve aynı zamanda t pol teğetine simetriktir. Büküm polü W_I e, t ye göre simetrik r üzerindeki R_I geri dönüş pol noktasına *geri dönüş polü* denir. $c, d \subset \Sigma$ paralel doğrularının c_0, d_0 sarmal yörüngeleri, aynı eğrilik merkezi C_0 a sahiptirler (Şekil 16). Eğer gözlemlenen anda d^I doğrusu R_I geri dönüş polüne sahipse, d^I 'in H_I sarmal noktası, sarmal yörüngesinin C^I_0 büküm ortası ile çıkarışır. d_0 ın H_I deki eğrilik yarıçapı $\rho = 0$ dır, yani bir uç ya da dayanak noktasıdır.



Şekil 16. Aynı eğrilik merkezi C_0 a sahip $c, d \subset \Sigma$ paralel doğrularının c_0, d_0 sarmal yörüngeleri

Eğer d_1 , geri dönüş polü R_1 den geçiyorsa, $d \subset \Sigma$ doğrusunun H_1 sarmal noktasında d_0 sarmal yörüngesi $\rho = 0$ eğrilik yarıçapına sahiptir. H_1 ait olduğu r_1 çemberi üzerindedir.

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ENERGY MANAGEMENT OF PHOTOVOLTAIC SYSTEM UNDER PARTIALLY SHADED CONDITIONS

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Abstract: One of the recent concerns in the photovoltaic (PV) system practice is solving the mismatching losses due to the partially shaded conditions. Mismatching problems mean that the I - V and P - V curves between the shaded and non-shaded parts of PV module are totally different. Under mismatching condition, multiple local peaks can be observed in the PV module characteristics which put difficulties for controllers to track the maximum point. To overcome such problems, current injection method is used to compensate the output current of the shaded part. This paper presents current compensation method for improving the maximum power transfer of PV system under short-term period of shading by using Electric Double Layer Capacitors (EDLC). The amount of injected current and to which part of EDLC being injected are determined by utilizing the intelligent network by means of Artificial Neural Network (ANN). The proposed method is always end up with single local maximum point and prevents to occur multiple local maximum power point (MPP) that makes the optimum point can be easily identified using conventional controller algorithm.

Keywords: ANN, current sources, EDLC, PV module, partially shaded conditions

Introduction

Building integrated PV system is recently increasing in the market share of the PV application. A small size of PV modules can be easily found on the roof of the private residences. Since the PV module is statically installed on the top of the building, then the mismatching operation is being inevitable. The potential causes of mismatching losses can be the shading of other parts of the building, dirt on the top of the surface and the unpredictable cloudy condition. In this study, the mismatching problem is focused on the partially shaded condition on PV module. Mismatching problems is defined as the different I - V and P - V characteristics output between the shade parts and the non-shaded parts of the module. Normally, all cells inside the module produce the same output current under uniform irradiance condition. However, it is not the case if some parts of module receive less intensity of sunlight. The shaded parts will produce lower level output current and power as well compared with the output of non-shaded parts. Furthermore, multiple peaks can be observed in the output terminal and the operating voltage may also be shifting to the lower region that makes some difficulty for controllers to track the optimum point.

Partially shaded condition of PV system has great implication on the controller performance. It is due to the optimum operating point of PV system under this condition may change irregularly. Until now, no single control method can be claimed to be the best to solve this kind of problem. The novel techniques to minimize the mismatching losses of partial shading still require more additional sensors, auxiliary algorithms, and power electronics units. As the output current of the shaded part is noticeably decreasing, the current injection on the shaded parts can be a promising solution. Solving the mismatching problems with current compensation method has been studied so far. Mishima and Ohnishi (2003) have proposed the electric double layer capacitors as the power compensation and system control to solve the mismatching problem under partially shaded condition. However, this method is less flexible due to the necessary an auxiliary control of relay for charging and discharging the capacitor. Mutoh and Inoue (2007) have proposed a control method to charge series-connected ultra electric double-layer capacitors (ultra-EDLCs) for maximum power point tracking (MPPT) controller. In addition, Simjee and Chou (2008) have proposed the effective charging method of supercapacitor for wireless sensor network application. All the above efforts may solve the mismatching losses problems under certain conditions, but end up in the excessive complexity of the system configuration and create difficulty in practical system use.

The current compensation method is utilized for solving the mismatching losses due to partially shaded condition using the intelligent network by means the Artificial Neural Network (ANN). The proposed ANN acts as a switch to control the current source in terms of amount of injected current and to which terminal this current being injected. The method is simpler than other methods due to there are no complicated algorithms and required power

electronic units. The necessary points in this method are only in the development of rule base for the amount and direction of current injection and the ANN training process. Another advantage of this method is always end up with single peak point that makes the conventional controller algorithms such constant voltage control, perturbation and observation, incremental conductance, and current feedback algorithms are working perfectly in identifying the optimum point (Esram, T. & Chapman, P.L., 2007, Hohm, D.P. & Ropp, M.E., 2003)

Fast moving shadows cause problems to conventional maximum power point (MPP) trackers such as Perturb and Observe (P&O), Incremental Current Conductance and Hill Climbing methods because they are mainly designed for stationary applications. Mostly their algorithms approach the zero gradient of power after taking certain step-time, but they will end up in a local maximum power point (MPP). Fast shadows cause these trackers to lose the maximum power point momentarily, and the time lost in seeking it again, because the point has moved away quickly and then moved back to the original position, equates to energy lost while the array is off power point. On the other hand, if lighting conditions do change, the tracker needs to respond within a short period of time to the change to avoid energy loss. The solving of this problem is very important for moving devices due to the unpredictable conditions such as passing under the narrow shadows of tree branches or the quick-moving shadows of passing vehicles.

In this paper, the current compensation method by means the Extra Double Layer Capacitor (EDLC) is utilized to improve the maximum power transfer of PV system under short-term period of shading. We received inspiration from Mishima and Ohnishi method for this study. The important characteristics of EDLC are high charging and discharging capabilities according to conventional batteries, but it behaves as a capacitor. If the partially shaded condition is short, the EDLC is enough to compensate the current of partially shaded PV arrays for reducing the power losses. Of course, the time period depends on the capacity of EDLC. When the EDLC is fully charged, the EDLC current becomes zero. It means that the EDLC don't absorb energy from PV when there are no shading conditions. With this method, if the EDLC is used, the I - V responses of PV array will be slow with respect to the no EDLC. Therefore, under the fast changing irradiance conditions, the conventional MPPT controller algorithms like P&O method can follow the MPP easily due the slow changing of current and voltage of PV array. Moreover, it is a simple unit due to the EDLC does not need the charger controller unit as compared with batteries. Meanwhile, ANN is utilized to operate switches that connected to the EDLC unit based on the irradiance signals condition. The method is simpler than other methods due to there are no complicated algorithms and required power electronic units. Another advantage of this method is always end up with single peak point on power-voltage curve that makes the conventional controller algorithms are working perfectly in identifying the optimum point.

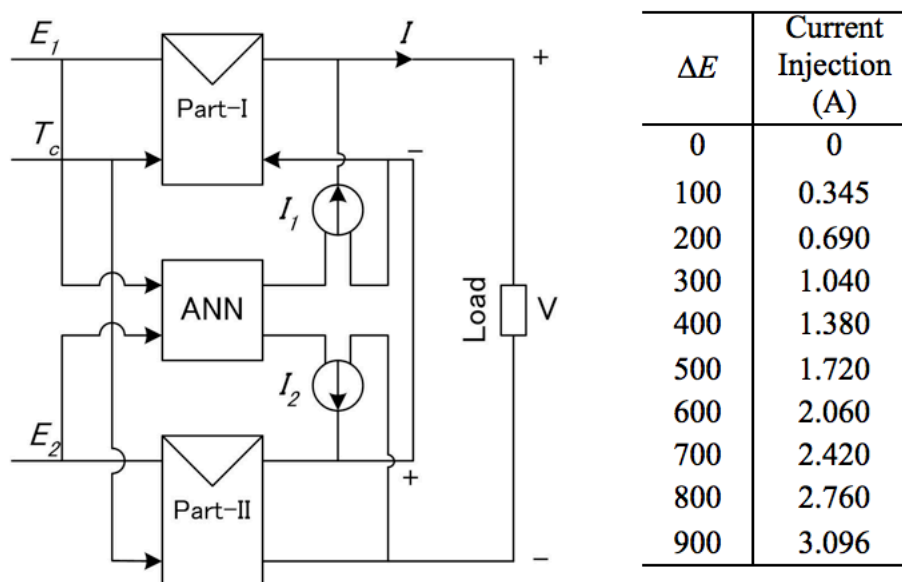


Fig 1. Configuration of proposed method and amount of current injection

Configuration of Proposed Systems

The configurations proposed method is described in Fig 1. There are two main parts in this model i.e PV module and ANN network. The PV module is divided into two series-connected parts, called Part-I and Part II based on the bypass diode connection. The irradiance, denoted with E_1 and E_2 in W/m^2 and cell temperature in degree Celsius are the input signals for both parts of PV module. The second part is the ANN block which is working as

controller for the current sources of I_1 and I_2 based on the input signals of E_1 and E_2 . The outputs of this model are indicated with current (I) and voltage (V) of the load that can be measured in the output terminal.

The type of PV module is Siemens SM55 with 36 monocrystalline Si cells in series (Karatepe, E., Boztepe M., & Colak, M., 2007). Two bypass diodes are connected for each 18 cells with non-overlapped cells configuration. Under uniform irradiance condition of 1000W/m^2 and cell temperature of 25°C , both parts produce similar I - V and P - V curves with maximum power point voltage (V_{mp}) and power (P_{mp}) are 8.798V and 27.78W , respectively (Fig. 2a). However, when Part-I of module shades with 100W/m^2 , then both curves are exactly different and two peaks occur in the output terminal (Fig. 2b). To solve this condition, current compensation method is the most logical option. Injection 3.096A in the terminal of Part-I will bring back the curves as the uniform irradiance condition (Fig. 2c). The amount of injection current is determined by the difference of short circuit current between both parts when receiving 100W/m^2 and 1000W/m^2 . In this case, the module parts with higher irradiance are selected as the target operation.

To solve the overall shading condition, a rule base for the amount of current injection and its direction are developed following the irradiance condition in both parts. The rule base of this method is expressed as follows:

$$\Delta E = E_1 - E_2 \quad (1)$$

$$\Delta E = \begin{cases} 0 & ; \text{no current injection} \\ - & ; I_1 \text{ injects current} \\ + & ; I_2 \text{ injects current} \end{cases} \quad (2)$$

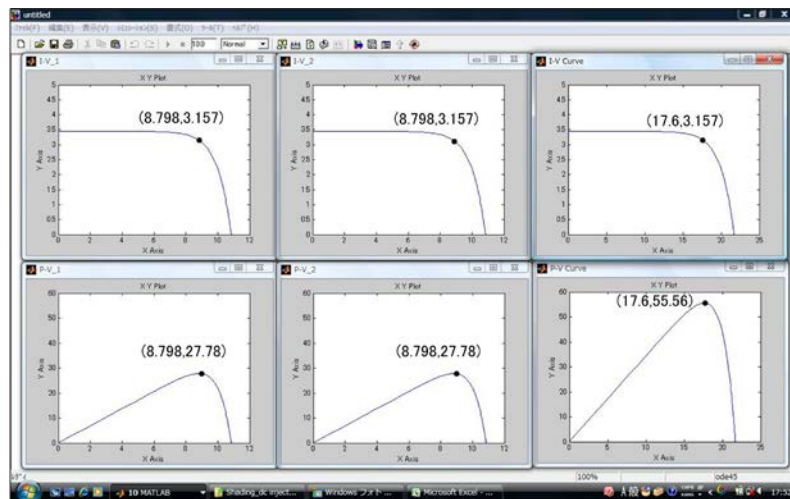
From this heuristic approach, About 100 training data set for the ANN can be generated. The ANN method is the three feed-forward neural networks with two input signals of E_1 and E_2 and two outputs I_1 and I_2 . After the training process, the number of hidden nodes is determined at 10 with minimum errors at 0.00132846 .

Table 1: Comparison between the target and the proposed method under partially shaded conditions under $T_c=25^\circ\text{C}$

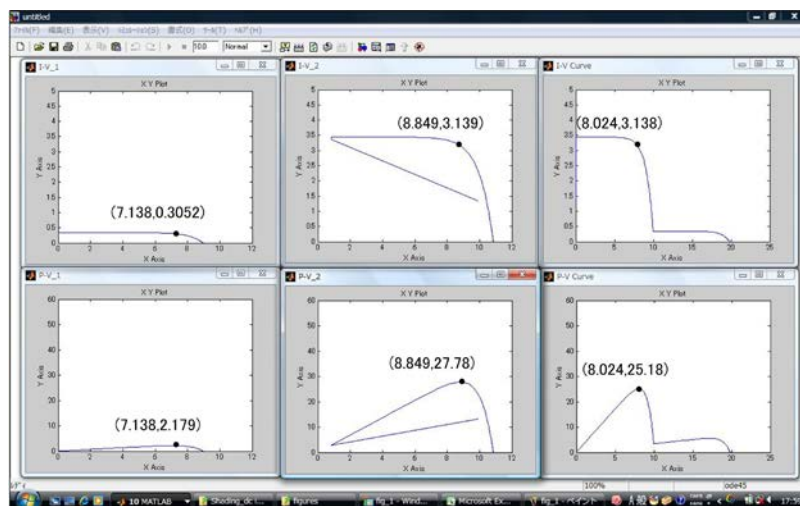
Time (h)	$E(\text{W/m}^2)$		Target		Proposed Method	
	Part-I	Part-II	$V_{mp}(\text{V})$	$P_{mp}(\text{W})$	$V_{mp}(\text{V})$	$P_{mp}(\text{W})$
10.00	150	950	17.54	52.54	17.50	52.72
10.30	225	875	17.53	48.02	17.45	48.53
11.00	315	780	17.28	42.36	17.21	42.34
11.30	230	675	17.09	36.16	17.09	36.03
12.00	350	580	16.82	30.63	16.92	31.00
12.30	650	125	16.94	34.70	17.00	34.81
1.00	775	235	17.25	42.06	17.29	42.25
1.30	820	320	17.31	44.74	17.42	44.92
2.00	940	425	17.60	51.93	17.58	52.09
2.30	999	335	17.59	55.50	17.68	55.53

The output of the proposed method can be verified by varying the irradiance in both parts of module. In Table 1, the output target means the expectation of operating point based on the maximum irradiance on the module parts under uniform condition. If shading occurs in any parts, then the ANN should decide the amount injection current and its direction. The results of proposed method are very similar to the target points in terms of V_{mp} and P_{mp} .

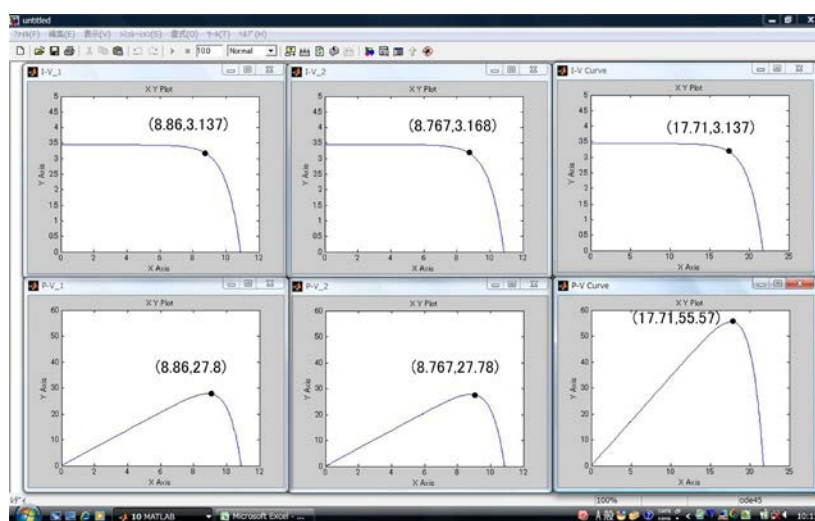
The configuration of proposed method with EDLC utilization is described as in Fig. 3. The irradiance, denoted with E_1 and E_2 in W/m^2 and constant cell temperature ($T_c=45^\circ\text{C}$) are the input signals for both parts of PV module. The ANN network controls to operate the EDLC units through the turn-on and off of the switches S1 and S2 based on the input signals of E_1 and E_2 . The proposed method is integrated by conventional perturbation and observation MPPT system. The Part-1 is arbitrarily considered as the shaded parts with determined irradiance levels. Meanwhile, the irradiance in the second part (E_2) is kept constant at 850W/m^2 .



a. Part-I b. Part-II c. Output terminal
a. Matching *I-V* and *P-V* curves under uniform irradiance condition



a. Part-I b. Part-II c. Output terminal
b. Mismatching *I-V* and *P-V* curves under partially shaded condition



a. Part-I b. Part-II c. Output terminal
c. *I-V* and *P-V* curves due to the injection current in the shaded part

Fig. 2 Comparison of *I-V* and *P-V* curves before and after injection current

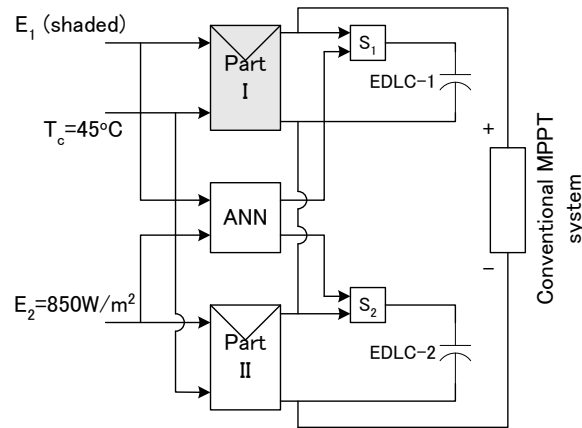


Fig 3. Configuration of proposed method with EDLC utilization

The ANN is utilized to operate the EDLCs (60F) through the switches S_1 and S_2 based on the irradiance conditions. Initially, both S_1 and S_2 are in the normally closed condition ($S_1=S_2=1$), means both the EDLCs are in charging state. Then, the switches are regulated based on the difference E_1 and E_2 as follows:

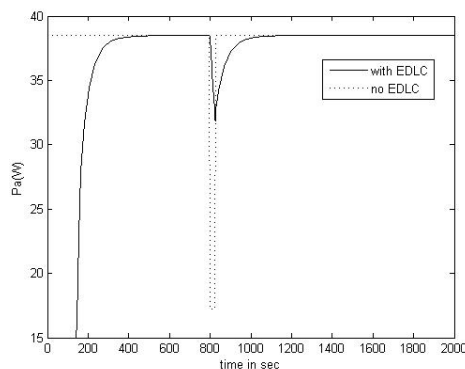
$$\Delta E = E_1 - E_2 \quad (3)$$

$$\Delta E = \begin{cases} 0 & ; S_1 = 0, S_2 = 0 \\ - & ; S_1 = 1, S_2 = 0 \\ + & ; S_1 = 0, S_2 = 1 \end{cases} \quad (4)$$

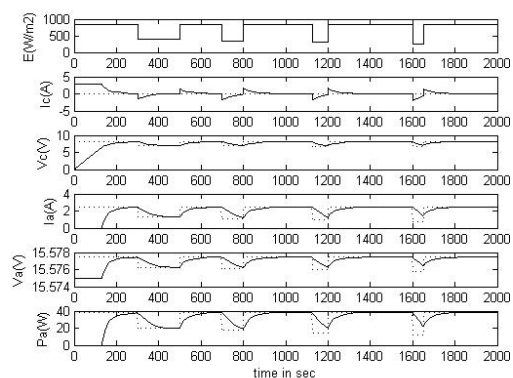
The ANN method is the three feed-forward neural networks with the number of hidden nodes is determined at 2 with minimum errors of 0.99×10^{-5} for 100 training data set. In this study, the shading is intentionally occurred in the first part of the module. The ANN will send input signal 1 to S_1 to be remained the EDLC-1 connected, while 0 to S_2 to let the EDLC-2 disconnected.

Results And Discussion

Most of the quick changes in MPP on a mobile PV array is due to the fast-moving shadows. Fast-moving irradiance condition is one of the problems that need to be solved in the non-stationary PV system applications. Under this condition, the conventional tracker starts searching the optimum point continuously which is one of the loss factors. This paper presents a novel current compensation method for improving the maximum power transfer of PV system under short-term period of shading by using Electric Double Layer Capacitors (EDLC). The Artificial Neural Network (ANN) is utilized to operate switches that connected to the EDLC unit based on the irradiance condition. This paper is directly purposed to reduce the power losses for moving objects powered by solar energy, such as solar car and solar boat systems. The proposed method can prevent to occur multiple local MPP that makes the optimum operating point can be easily identified by using a conventional controller algorithm.



a. Effect of EDLC in the short period of shading



b. Effect of EDLC on the variety period of shadings

Fig. 4. PV array outputs between using EDLC and without EDLC

The capacitor size is the important factor for this system. If the capacitor size increases, it needs to wait for more time to charge. The EDLC can provide energy according to its capacity rating. The EDLC is connected to each module parts. In this reason the number of series connected EDLC should be adapted according to optimum MPP voltage for each module type. Tap changer is a method to adjust the optimum voltage according to irradiation and temperature (Nagaoka, N., Miyamoto, A., & Ametani, H., 2004). ANN can be also used for controlling the tap changer unit in a future work.

Fig. 4 show the simulation results in different scenarios. If the period of partial shading is too long, the PV system power output with EDLC and no EDLC is the same after discharging. However, if the shading period is not too long as shown in Fig. 4a, the EDLC can reduce the power loss by compensating current of shaded module. Fig. 4b shows the results when suddenly shadow conditions occur with different time interval. The shading patterns are from 850 to 400, 350, 300, and 250W/m² during 200, 100, 75, and 50s, respectively.

Conclusion

New approach of current compensation method for solving mismatching losses due to partially shaded condition has been presented. This method is simple and able to maximize the performance of conventional controller in order to meet the optimum point. The utilization of EDLC to improve the maximum power tracking control of PV system has been presented. This method is effectively solving the mismatching losses under fast-moving shadow condition. The purpose of this study is intended to reduce the power losses for moving objects powered by solar energy, such as solar car and solar boat systems during short-term period of shading.

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Ethical Approach to a Special Way of Chemistry

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Abstract. The scientific products of synthetic chemistry present us new materials that change our physical world for the use of active. In this paper, we give some analysis of ethical matters coming from chemical synthesis by help of the researches conducted on the subject, based on concepts of accountability of human to world. We focused on the chemical arms research, ethical oppositions against educating material settings of life by chemical income, and choice of research (Schummer, 2001). It is aimed in this study to give an overview on ethical approaches about chemistry by the view of some researchers.

Keywords: ethics, synthetic chemistry, accountability, ethical matters

Introduction

Some chemist suggest that chemistry is probably the best science to study in the context of professional and scientific ethics (Schummer, 2001; Durak at all, 2015; Bunnett, 1999; Kovac, 2000; Holton, 1994). They stressed that chemistry has created the most to define itself as a living in the similar sense that medication and engineering are professions. Chemistry has a rich environment arising from the work of scientific. As a special way, chemists should be close to experiment in a laboratory or in an open area.

Gordon at all. (2001) presented a philosophy of chemistry as a profession and to explore the relationship between professionalism and ethics. They characterized as a contribution to engineering ethics and the philosophy of a profession (Schummer, 2001). According to Matthews (2003), "The Ethical Chemist" has the meaning that a collection of cases and explanations for the education of science ethics to chemistry researcher. Also, this team tried to present the parts of scientific ethics that go outside the expectations of regular ethicality and the necessities of rule. In this phrase, we can ask that what are the ethical standards of scientists? As a scientist, we know that science is not a unique and unified subject; each scientific (sub) discipline has its own history and culture.

The Accountability

The concept of accountability is given a different perspective by Schummer, (2001) that "If x is accountable for y to z , we might extricate between different kinds of accountability affording to different examples of x , y , and z . regularly x , the question or manager of accountability, is a different person of sound mind." He explained this argument as, people hold corporations, accountable for something depending on the communal construction of the corporation if all memberships share the similar accountability.

According to the transitive consequences of Schummer, (2001); x 's travels are the y for which x is held *achievement accountability*. For these activities it is essential that x can operate then that x has a free special between options and that the choice is founded on x 's favorites. In this step, accountability construct a fundamental credit of the y to an agent x . There is an alteration between past significances and coming significances, whereas future consequences are necessarily over to indeterminate forecasts of possible moments of some actions. Because of the criminal law is limited to surveying accountability, future accountability is a special arena of ethicality and the matter of ethical requests. When the possibility of well-organizing is enough condition that something can be matter to care accountability, it may be included more subject as social structures. The z in our expression ' x is accountable for y to z ' is the university to which chemist are made thankful to justify his actions related to y in a ethical environment.

A universal ethical system outlines the morals, the standards, averages, duties, and rubrics of a universal ethical discourse that somebody takes by taking accountability to people (Schummer, 2001; Kovac, 2004). Schummer stayed that the morals must be supposedly advanced done in the field of ethical model, since there is not real ethical discourse among all members of humanity. Rossi at all. (2008) formulated that there is much argument between ethical scholars about facts resultant in different universal ethical systems. They stressed there are about universal settings that every ethical system must chance to be careful a universal ethical system.

Liberty for Research

Scientists occasionally state to 'liberty of research' as a certificate to do what they want. They stayed that taking liberty of research as a 'complex' cost, researchers' castoff any claims of humanities to the switch of

their investigation. If it is correct that liberty of study is a 'complex' cost than goods of humanities, then it must have its defense on the universal ethical level. Schummer (2001) explained this situation that experts mentioning to liberty of research as a 'complex' price accept universal ethicality as acceptable morals of controlling methodical research. In this situation, it is clear to say that the topic 'liberty of research' allows short the ethical matters of the research study.

A widely known idea about the subject denoted from Schummer (2001) that "compliant liberty of research as a complex value than those of particular groups, publics, and humanities means accepting it as a charge of humanity". For the academic world, this idea has a very clear meaning that scientists believing the value as the guidelines of the research, naturally takes universal accountability to humanity for the judgement of the research. The fusion of new materials as an end cannot be checked on the base of universal ethical system without special contributions to information of universal environment (Schummer, 2001; Holdon, 1994). He argued that the research based on his model doesn't be justified by referring to liberty of research.

Result

Chemistry is a science and also, an employment. In this study, we tried to give a new perspective inspired by historical approaches that looking at chemistry as a profession, at least in the context of clarifying the ethics of science. In synthetic chemistry, all harm to nonhuman living made by ecological pollution of new materials is ethically related. Making a choice between particular ethical systems is only a modification and not a solution, since universal liberty of research is based on liberty of ethical excellent. Finally, chemists should reflect their ethical options above and beyond the common basis of universal ethicality.

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EXPERIMENTAL INVESTIGATION OF MACHINABILITY PROPERTIES OF 5035 STEEL

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Abstract: One of the main purposes in machining is to bring surface roughness to the top level. The stage where the most decisive work can be done in improving the product quality is the parameter design phase for both product and process design. In order to determine the most effective parameters and to evaluate the results more efficiently, the Taguchi experiment design technique is preferred to realize the experiments in a shorter time. This performed study was done by the aim of investigating the effect of change in terms of hardness, feed rate, and cutting tool of “Dual Phase” steel, which is a class of HSLA (High Strength Low Alloy) steels that increases usage and importance day by day, on surface quality in turning process in the pieces subjected to high forces in machine, device, car manufacturing. Experimental design In the Minitab statistical analysis program, Taguchi experiment design technique and 9 trials according to L9 orthogonal design. Experiments were performed in dry cutting conditions in CNC Turning Table that has 1.5 kW power and rotates with maximum 2000 rpm. Variance analysis and signal / noise ratio were used in the evaluation of the test results. . It was possible to achieve the intended results with only one third of the number of experiments required in full factorial design (9 experiments instead of 27). In the experiments, the cutting tool type (CBN, Ceramic and Carbide cutter), the feed rate (0,02, 0,04 and 0,06 mm/cycle) and the material hardness (Material with two different hardness values obtained by annealing at 745 and 760 degrees without heat treatment and obtained after heat treatment) were used as the independent variable (factor). The mean surface roughness value (Ra) as a dependent variable was determined from measurements taken at 6 different points in three trials. As a result, the most effective parameters on the surface quality are the feed rate, the material hardness (microstructure) and the cutting tool. The results obtained are interpreted together with the evaluations which have been entered into the literature before.

Keywords: Taguchi, Dual Phase, Surface Quality, Machinability.

Introduction

One of the main purposes in machining is to bring surface roughness to the top level. Being surface quality of material well has a positive effect on mechanical properties of material. It is required to choose cutting parameters the most suitable to get a good surface quality (Thomas and Ark., 1996).

Importance of heat treatment applied in the process of improving mechanical properties has gradually increased with growing technology. Heat treatment applied to steel plays an important role on defining machinability properties of steel (Uzkut and Ark., 2001., Çeviker, 1991., Demir and Ark., 2011). Material technology and cutting tool technology growing in recent years allows machinability of heat treated steels easily and quality (Elbestawi and Ark., 1996, Yaka and Ark., 2016). After heat treatment applied of steels, internal strains occur in material. This causes problems such as warping in workpiece, burning on surface, and micro crack. Arising these problems can be eliminated with various processes applied after heat treatment Çolak, 2006., Daghini and Nicolescu., 2007., Binali and Ark., 2018).

Dewes et al., processed AISI H13 material with 52 HRC hardness by using WC solid milling machine coated with TiCN. They observed that cutting speed increase temperature, temperature increases as directly proportional with cutting speed, and temperature in cutting area decreases with increasing tool radius. Asilturk and Akkus (2011), investigated effect of cutting speed, cutting depth, and feed rate on surface roughness in turning process of hardened AISI 4140 (51 HRC) with coated carbide. As a result of experimental studies, they showed that feed rate has the most significant effect on Ra and Rz.

Ren et al. (2014) investigated the study about optimization of cutting geometry in last milling process on Ti-5Al-5Mo-5V-1Cr-1Fe alloy with Taguchi method. They aimed at reaching combination to minimize cutting forces and surface roughness, and to optimize cutting speed by changing milling cutter geometry in the study. As a result, they found that multi performance characteristics can be improved with grey-Taguchi method. Zhao (2017), performed an experimental study to understand the effect of cutting edge radius on workpiece machining performance with regards to surface roughness and tool abrasion in AISI52100 steel. Three groups of cutter

(CBN) with 20, 30, 40 μm nominal edge radius were used in the study. Change in cutting edge radius was evaluated with an optical microscope. The effect of surface radius and tool abrasion on cutting edge radius was investigated in different machining conditions with different machining tests by designing three-leveled, two-factored experiments with Taguchi. Variations tends to lower with increasing nominal values of cutting radius, and also, it was resulted that cutting radius has an important effect on surface roughness and tool abrasion.

The situation defined above is an example of typical problem showing up machining tool that is appropriate to tolerance in engineering and research and development studies. It is required to improve surface quality which is a measurement of machinability, to make experiment to investigate effect of tool type, cutting speed and feed rate on performance, and make optimization by evaluating these experiments.

The purpose of this study is to make optimization and investigate effect of material and cutting parameters (feed rate and cutting tool type) on workpiece surface roughness that is an important machinability criterion by doing machinability experiments with turning method on steels used in machine production industry. In this study, dual-phased steel specimen obtained in three different hardness after heat treatment was performed to turning process with three different feed rate by using three different cutter type by evaluating factors affecting turning surface quality after literature review. Results obtained from Taguchi optimization were evaluated with regards to adaptation to literature.

Experimental Study

Used Material and Properties

5035 ERDEMIR quality numbered SAE 1035 Standard Tool produced as hot mill product in Ereğli Iron and Steel Factories (ERDEMİR) T.A.S and given chemical composition in Table 1 was used by preparing 12 mm diameter, and hardness measurement was performed by doing heat treatment.

Table 1: Chemical Composition of 3936 quality steel

Quality	Standard	Chemical Composition (% Weight)					
		C	Mn	P	S	Si	Al
5035	SAE 1035	0.36	0.71	0.012	0.006	0.230	0.041

It was utilized from previous studies to define relevant annealing temperatures. Temperatures values in the study performed related to mechanical properties of materials having same chemical composition (Tayanç and Toktas, 2001).

It was given water in water to turning specimen annealed 30 minutes in 745, 760, and 775 $^{\circ}\text{C}$ temperatures on the purpose of obtaining three different hardness on same material in total. During preparation of specimen, it was waited to chill oven for two different temperatures to prevent different heat treatment conditions. Specimens were subjected to cooling in water after annealing process. Temperature-time diagram (T-t) belong to aforesaid heat treatment was shown in Figure 1.

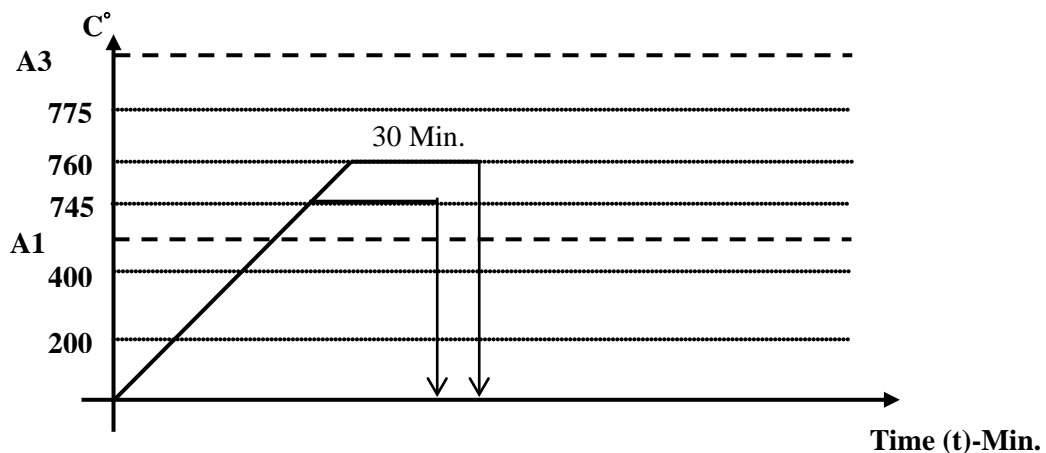


Figure 1. Temperature (T)-Time(t) diagram.

Microhardness Measurement

Hardness measurement of specimens were performed with micro Vickers method in Qness Q10 microhardness test equipment. HV 0,5 load and 10 seconds main loading values were defined as test parameters, and trace

image was taken by the help of 40X lens. Hardness measurements of materials were obtained as Vickers (HV) in Qness Q10 microhardness equipment. Results were given in Table 2.

Table 2: Micro Hardness Values

Material	Non-Processed	745°	760°
Measurement 1 (HV)	155	184	389
Measurement 2 (HV)	162	190	376
Average hardness (HV)	158,5	187	382,5

Surface Roughness Measurement

Surface roughness was measured with TIME TR200 surface roughness equipment. Three measurement trace to parallel and vertical to cutting direction were measured. The mean of three arithmetical average surface roughness measurement (Ra) in the direction and through cutting were used to show surface roughness of specimen.

Choosing Cutting Parameters and its Levels

Experimental studies within study were performed in CNC Turning Table that has 1.5 kW power and rotates with maximum 2000 rpm. Dual phase steels is a new class of high strenght-low alloy steels (HSLA). A cylindrical workpiece made from 5035 number steel having 0,36 % C ratio that is produced by ERDEMIR as special wheel steel was processed with Al₂O₃ coated Cementite Carbide, Ceramic, and CBN cutting tools by applying three different feed rate in dry cutting conditions in the study. Cutting area order is shown in Figure 2. Factors used in machining and its levels were defined with user experience and were specified in Table 3.

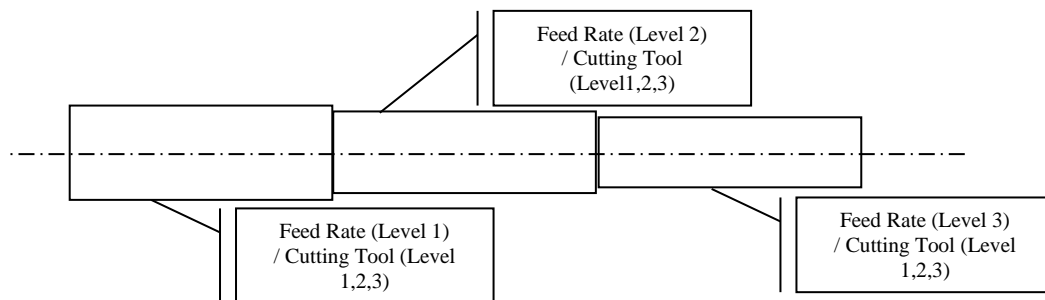


Figure 2: Cutting Area Order

Fishbone diagram is one of output in designing experiments. A fishbone diagram can be created to see relations defined factors to each other's exactly (Şirvancı, 1997). This diagram specifies all factors representing product or process quality and affecting measured values (Savaskan at al., 2004). It was decided variable and constant factors with the help of fishbone diagram. Factors affecting machinability are collected under four main categories (cutting parameters, rigidity, workpiece, cutting tool) as shown in Figure 3.

Values of variable parameters except factors that has to be constant and that cannot be controlled were taken as compatible with real working environment values as much as possible. Because cooling liquid usage will have positive effect to surface quality, experiments were planned in dry condition to keep experiment numbers in certain amount.

Table 3: Cutting Parameters

Factors	Unit	Symbol	Level 1	Level 2	Level 3
Cutting Tool	-	A	Carbide	Ceramic	CBN
Feed Rate	Mm/dev	B	0,02	0,04	0,06
Heat Treatment /Hardness	/Hv0.5	C	Non-Processed	745°C	760°C

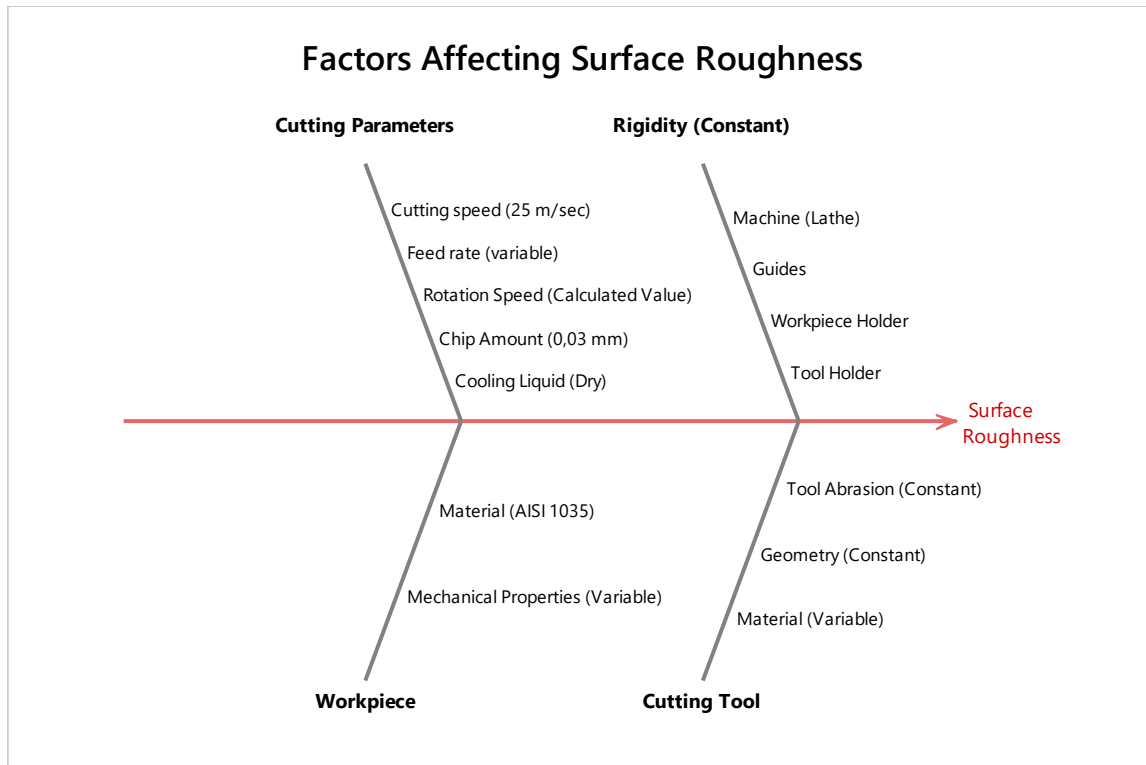


Figure 3. Evaluation of Factors Affecting Surface Roughness with Fishbone Diagram

Taguchi Experiment Design

Choosing optimum process conditions is an extremely important subject since it defines surface quality of produced pieces and dimensional sensitivity. Contact surfaces of machine elements working together are desired to finish with particular rough, especially in machine design. Sometimes, sensitive surfaces are required, and sometimes rough surfaces are suitable to work machine properly, as well. Therefore, it is important to define surface roughness in design step, and to control in production step. After, surfaces can be operated in desired roughness values (Karayel, 2009). It is needed to optimize surface quality and to define optimum cutting parameters on the purpose of machining machine pieces as suitable to environment they will work. For this purpose, feed rate, cutting tool, and material hardness was defined as parameters to use in this study. Machining experiments were performed by considering Taguchi one patterned (each factor was taken three levels) L9 orthogonal design. Experiment index was given in Table 4.

Table 4: Taguchi L9 experiment design

Experiment Nu.	Control Factors		
	Cutting Tool (A)	Feed Rate (B)	Hardness (C)
1	1	1	1
2	1	2	2
3	1	3	3
4	2	1	2
5	2	2	3
6	2	3	1
7	3	1	3
8	3	2	1
9	3	3	2

Analysis of S/N Ratios

Taguchi experiment design and analysis were performed in Minitab 16.1 package program, and basic leveled (three level) L₉ orthogonal index was used. "Smallest-the best" formula specified equation 1 was used to evaluate obtained Signal-Noise Ratios (S/N).

$$\frac{S}{N} = -10 * \log \left[\frac{\sum_{i=1}^n Y_i^2}{n} \right] \quad \text{Eq. (1)}$$

S/N ratios were calculated by using “smallest-the best” equation after obtained surface roughness ratios in machining experiments of ERDEMIR 5040 quality steel according to performed Taguchi L9 experiment design. Surface roughness values and S/N ratios obtained after machining were shown in Table 5.

Table 5: Surface roughness values and S/N ratios obtained after machining

Experiment Nu.	Control Factors			Average Surface Roughness Values (Ra) μm	S/N Ratios (dB)
	Cutting Tool	Feed Rate	Hardness		
1	1	1	1	5,255	-14,4115
2	1	2	2	2,456	-7,8046
3	1	3	3	4,890	-13,7862
4	2	1	2	0,430	7,3306
5	2	2	3	0,352	9,0691
6	2	3	1	0,632	3,9857
7	3	1	3	2,622	-8,3727
8	3	2	1	1,514	-3,6025
9	3	3	2	1,517	-3,6197

Effect of control factors on surface roughness values was analyzed by using S/N response table. S/N response table was given in Table 6 for surface roughness. This table, which is created with Taguchi method to get optimum surface roughness value, shows optimum levels besides factor effect range. S/N values of control factors for surface roughness were shown in Figure 4.

Table 6: S/N response table for surface roughness

Level	Cutting Tool	Feed Rate	Hardness
1	-12,0007	-5,1512	-4,6761
2	6,7951	-0,7793	-1,3645
3	-5,1983	-4,4734	-4,3632
Delta	18,7959	4,3718	3,3116
Effect Range	1	2	3

Optimum levels of control factors for surface roughness for A cutting tool (Ceramic-Level 2), B feed rate (0,04 mm/cyc-Level 2), C Hardness (745 C° Heat Treatment, Level 2) was specified. However, this result couldn't be measured in L9 Taguchi experiment design. These levels didn't take place in eliminated experiments because experiments number was reduced from 27 in total factorial to 9.

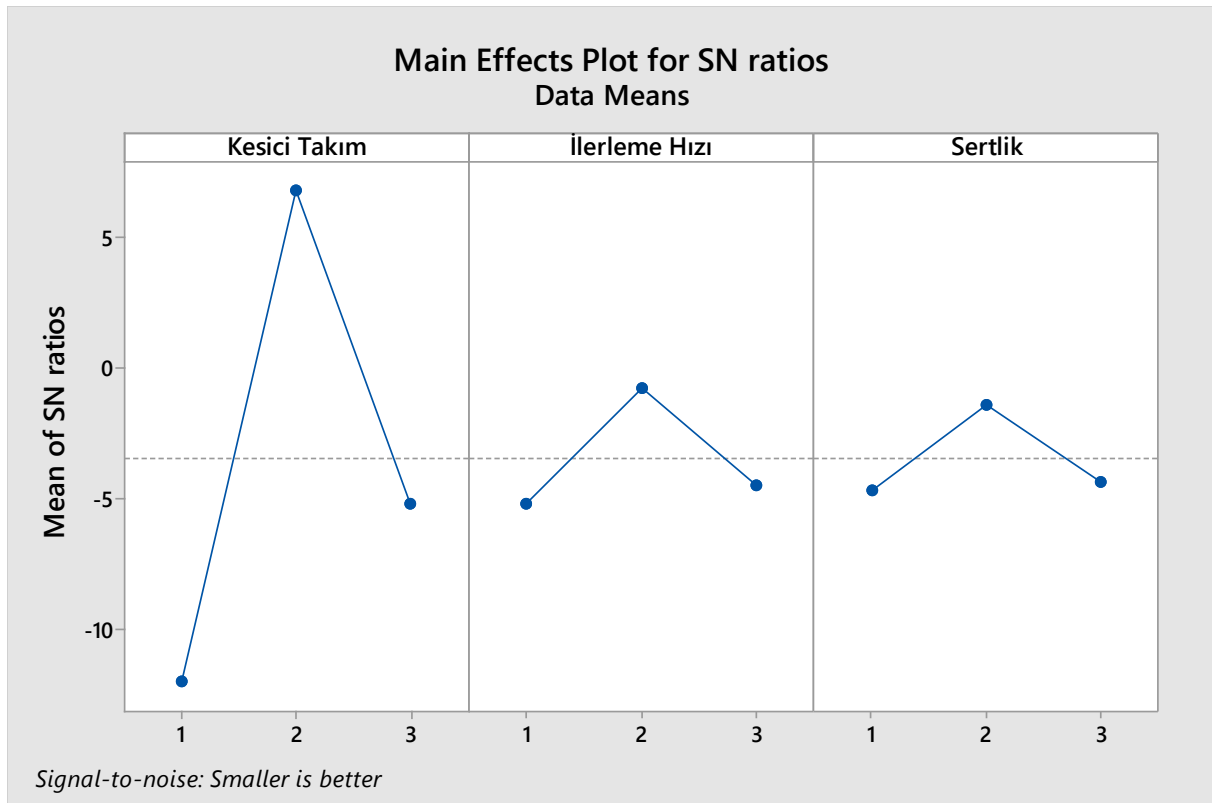


Figure 4. S/N values of control factors for surface roughness

Evaluation of Experiment Results

Change in surface roughness depending on cutting team and feed rate were explained in Figure 5 in turning ERDEMİR 5040 quality steel. When the graph is investigated, a decrease in surface roughness are seen with an increase of feed rate in CBN cutter, and the best surface roughness value was observed in 0,04 mm/cyc feed rate for every three cutter. Also, the best surface roughness value in medium steel materials was obtained from ceramic tool as seen in graph.

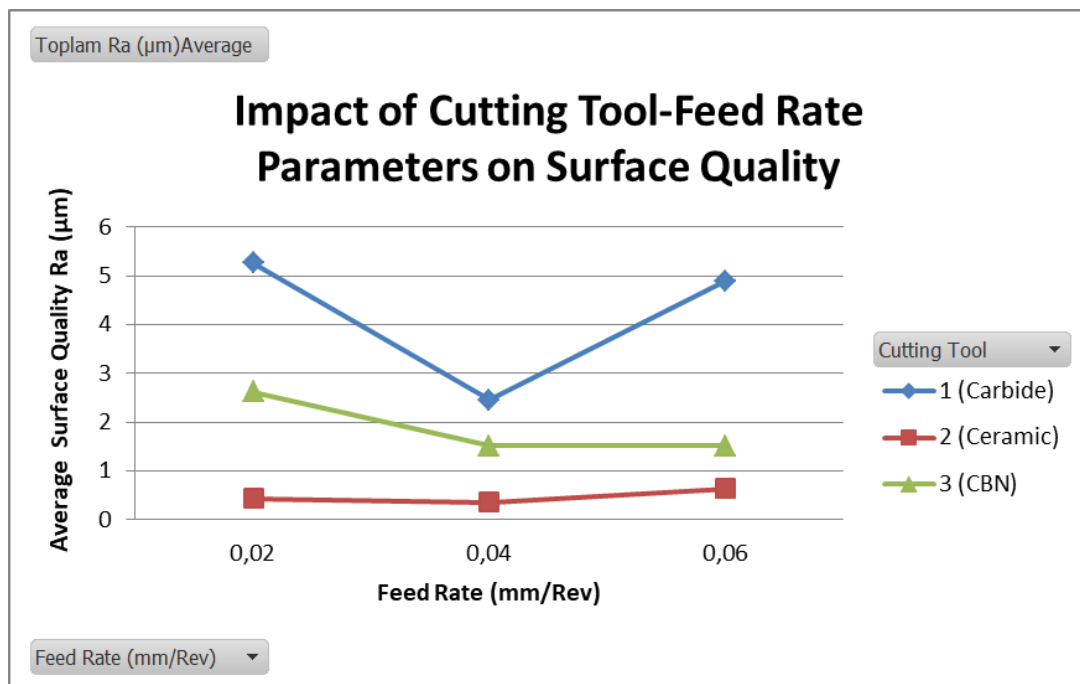


Figure 5. Change of surface roughness depending on cutting tool and feed rate in turning ERDEMİR 5035 Quality Steel

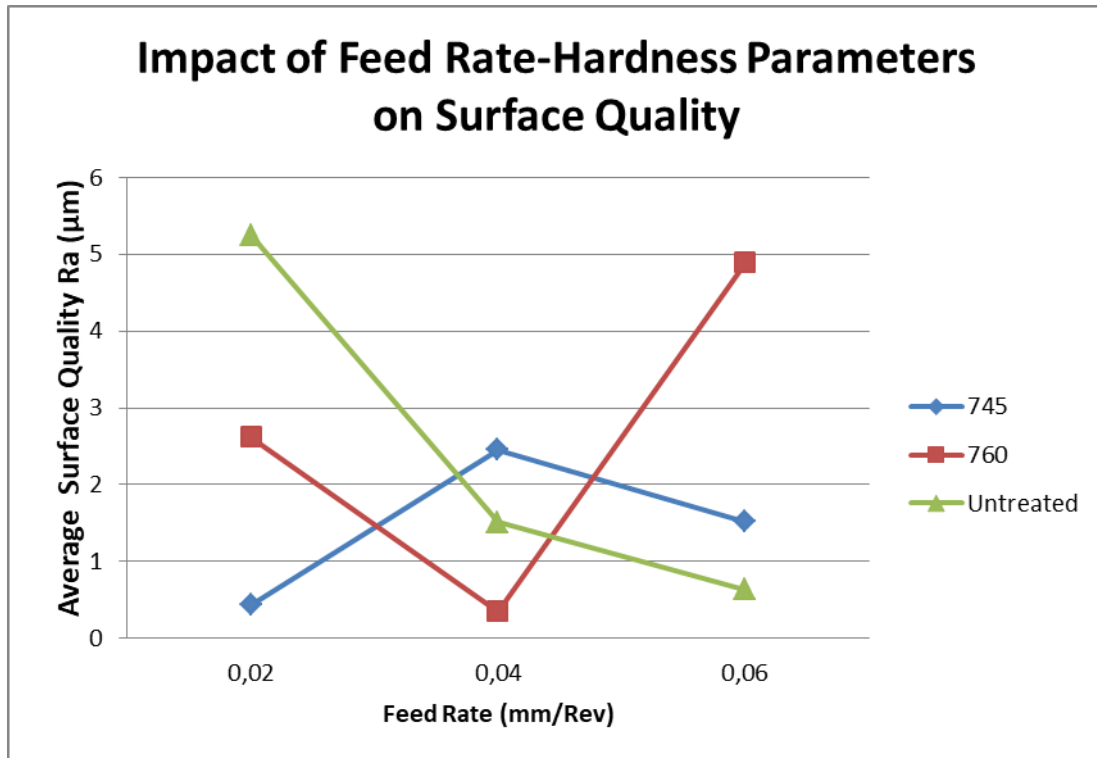


Figure 6. Change of surface roughness depending on hardness and feed rate in turning ERDEMİR 5035 Quality Steel

Change of surface roughness depending on hardness of workpiece and feed rate of cutting tool was explained in Figure 6. Lowest surface roughness in 0,04 mm/cyc feed rate was obtained from steel heat treated at 760 C°. A decrease in surface roughness with an increase feed rate was observed in non-processed specimen, and average the best surface roughness value was seen at steel heat treated at 745 C°

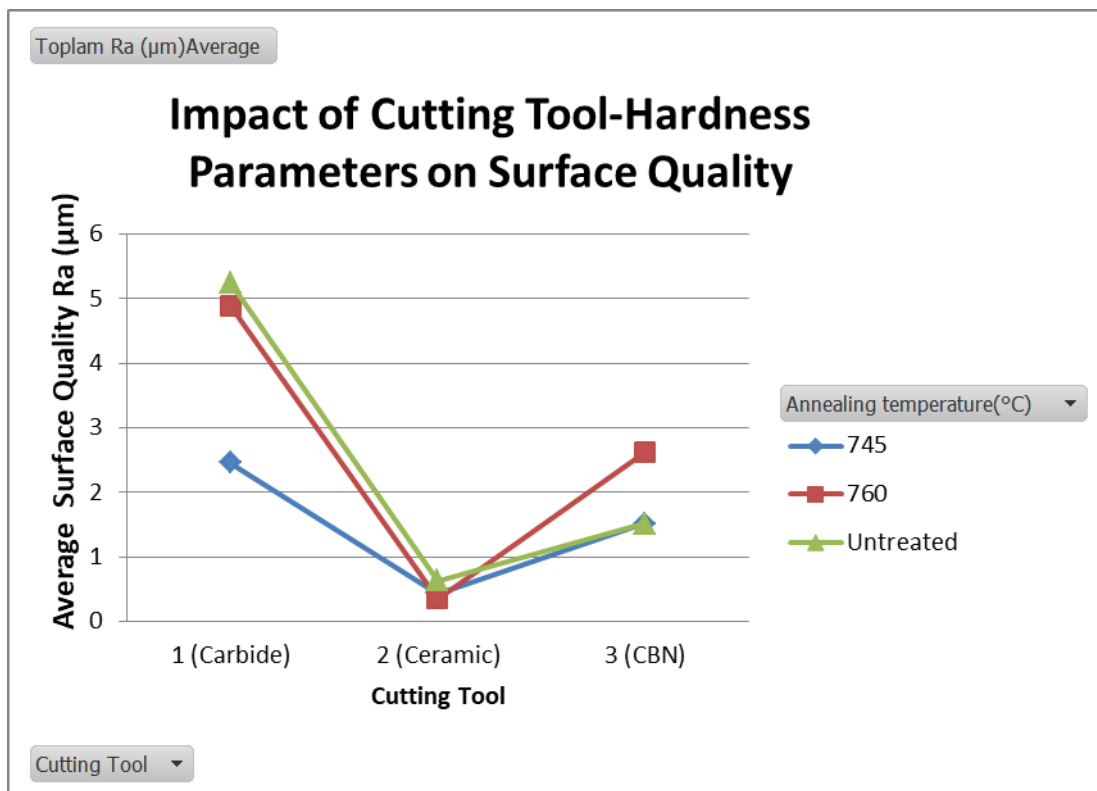


Figure 7. Change of surface roughness depending on cutting tool and heat treatment (hardness) in turning ERDEMİR 5035 Quality Steel

Change in surface roughness depending on cutting tool and hardness level is explained in Figure 7. While Ceramic cutters exhibits the best performance for every three hardness, surface roughness value in carbide cutters is higher than other ceramic and CBN cutters. Better surface quality was obtained with Ceramic cutters when medium steel is used.

Results

In this study, three different parameters were evaluated and optimized with regards to machinability because Taguchi experiment design has wide usage area, and it enables to obtain results with both less experiments and lower costs compared with traditional experiment design.

Optimisation of cutting parameters affecting surface roughness values obtained from turning of ERDEMİR 5035 Quality steel was performed in this study. A cutter tool (Ceramic-Level 2), B feed rate (0,04 mm/cyc, Level 2), C hardness (745 C° heat treated-Level 2) were specified. However, this result couldn't be measured in L9 Taguchi experiment design. These levels didn't take place in eliminated experiments because experiments number was reduced from 27 in total factorial to 9. According to analyse result, it was seen that the most efficient parameter on surface roughness was cutting tool with 70,98 % content. Micro hardness values increased with martensite increase taking place in micro structure depending on heat treatment of ERDEMİR 5035 Quality steel. This hardness increase has a positive effect to surface roughness values in turning including medium hardness, while has negative effect in high hardness.

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EXPRESSION ANALYSIS OF THE RPL9 AND LIAS GENES IN LUNG CANCER APOPTOSIS

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Abstract: Worldwide, lung cancer is a leading cause of death, is the most commonly diagnosed form of cancer, and has an increasing incidence rate in countries with a high prevalence of smoking. RPL9 and LIAS were previously found to be mutated in CHO (Chinese Hamster Ovary) cell lines that had become resistant to apoptosis. The main objective of this study was to evaluate the expression pattern of RPL9 and LIAS genes in lung cancer and to characterise their role in apoptosis. This study also aimed to determine if the expression pattern of these genes varies between the normal and diseased state. In situ hybridization indicated that RPL9 and LIAS transcription levels were higher in lung cancer relative to normal lung tissues. The mRNA levels of RPL9 is higher relative to that of LIAS as determined by the intensity of the staining. These results were confirmed by Quantitative real-time PCR. TUNEL assays showed that the highest DNA fragmentation occurred in adenocarcinoma, followed by squamous cell lung carcinoma then large cell lung carcinoma where the same localisation pattern was observed for both RPL9 and LIAS mRNA using in situ hybridization. Bio-informatic analysis revealed that RPL9 is highly conserved throughout evolution, with human RPL9 sharing 100% identity with that of chimpanzees and 98% with that of mice. Human LIAS was found to be 91% identical to rat and 90% identical to mouse. These findings coupled with the fact that mutations in RPL9 and LIAS resulted in a CHO being resistant to apoptosis, strongly suggest that RPL9 plays a role in regulating the cell cycle and apoptosis.

FARKLI ORANLARDA HİPER AKIŞKANLAŞTIRICI ve POLİPROPİLEN LİF KATKILI BETONLARIN GERİ DÖNÜŞÜMÜ

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Özet: Bu çalışmanın amacı günümüzde yaygın olarak kullanılan polipropilen lif katkılı betonlardan elde edilen agregaların yeniden beton üretiminde değerlendirilmesidir. Geri dönüşümün elde edildiği kaynak betonu polipropilen lif katkılı betondur. Kaynak betonundan elde edilen agregalar, çeneli kırıcıda kırıldıktan sonra, polipropilen lifler agregalardan ayrıştırılmadan betonda kullanılmıştır. Kaynak betonlarda sekiz çeşit polipropilen lif kullanılmıştır. Deneyler için 150 mm çapında ve 300 mm yüksekliğinde silindir numuneler kullanılmıştır. Numuneler 120 gün sonunda çeneli kırıcıda kırılmıştır. Kırma sonucunda, 4-15 mm ve 15-22.4 mm boyutlarında polipropilen lifli geri dönüşüm iri agregalar elde edilmiştir. Laboratuvar tipi çeneli kırıcıda yeterli incelikte ince agrega elde edilememiştir. Bu yüzden geri dönüşüm agregalı betonda, ince agrega olarak 0-4 mm doğal kum kullanılmıştır. Geri dönüşüm agregalı üretilen betonda, basınç, yarmada çekme, dört nokta eğilme, aşınma ve su emme deneyleri yapılmıştır. Polipropilen lif katkısı kaynak betonun basınç basınç dayanımını düşürmüştür, yarmada çekme ve eğilme dayanımını arttırmıştır. Geri dönüşüm agregalı betonun kaynak beton değerlerine yaklaşabilmesi için, ince agrega olarak doğal kum kullanılması sonucuna varılmıştır. Elde edilen geri dönüşüm agregalı betonun 28 günlük basınç 32.2 ile 43.6 MPa arasındadır. Geri dönüşüm agregalı betonun dört nokta eğilme, yarmada çekme dayanımları düşmüştür. Aşınmaya karşı direnci zayıflamıştır. Su emme değerleri artmıştır.

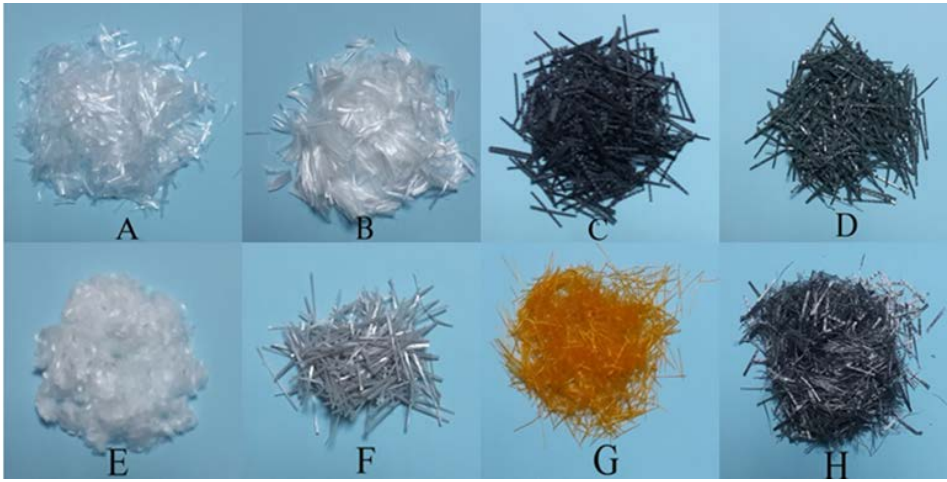
Keywords: Lif, Geri Dönüşüm, Eğilme, Yarmada-çekme, Basınç dayanımı.

Giriş

Agreganın sürekli doğadan alınması ekeolojik dengesizliğe neden olmaktadır (Khoshkenari, Shafigh, Moghimi ve Mahmud, 2014, Naik, 2008, Mehta ve Monteiro 2006, Kunieda ve Nakamura, 2014). İnşaat sektörü, kaynak tüketicisi ve atık üreticisidir (Cachim, 2009, Jianzhuang, Wengui, Yuhui ve Xiao, 2012). İnşaat atıkları daha çok dolgu malzemesi olarak kullanılmaktadır (Topçu ve Günçan, 1995, Tam Vivian ve Tam, 2009). İnşaat atıklarının yarısını beton atıklar oluşturmaktadır (Tam Vivian, Gao, Tam ve Ng, 2009, Tabsh ve Abdelfatah, 2009). Beton atıklarının yapısal betonlarda kullanımı, çevre açısından önemlidir (Jiménez, Ayuso, Galvín, López ve Agrela, 2012). Türkiye de 1999 yılındaki deprem sonrasında, sadece Adapazarı ilinde yaklaşık 2 milyon ton atık beton çıkmıştır. Atık betonun değerinin 5,5 milyon dolar olduğu belirtilmiştir (Gümrükçüoğlu, İleri, Sümer ve Seyfettinoğlu, 2000). Beton atıklarının taze betonda agrega olarak kullanılması yönündeki çalışmaları arttırmıştır (Kou ve Poon, 2012, Medina, Zhu, Howind, Rojas ve Frías, 2014). Yapısal betonda kullanımının üzerindeki en olumsuz etkisi, agrega üzerindeki yapışık harçtır (Kwan, Ramli, Kam ve Sulieman, 2012). Geri dönüşüm agregasının beton içindeki tane boyutu dağılımı önemli bir etkidir (Xiao, Li, Shen ve Poon, 2015). Geri dönüşüm agregalarının su emme değeri yüksektir (Khoshkenari, Shafigh, Moghimi ve Mahmud, 2014, Jianzhuang, Wengui, Yuhui ve Xiao, 2012, Xiao, Li, Shen ve Poon, 2015, Kibert, 1993, Barra ve Vazquez, 1999, Padmini, Ramamurthy ve Mathews, 2009). Yeşil beton üretiminde geri dönüştürülmüş agrega ve kauçuk parçaları da kullanılmıştır (Jian-He, Yong-Chang, Li-Sha ve Zhi-Hong, 2015). Geri dönüştürülmüş agrega kullanarak üretilen betonun performansını iyileştirmek amacıyla çimentonun belli oranında mineral katkı ilaveleri yapılmıştır (Dilbaş, Şimşek ve Çakır, 2014, Kou, Poon ve Agrela, 2011). İnşaat ve yıkım atıklarının çevreye zarar vermeden yeniden kullanmanın yolu bu atıkları agregaya dönüştürmektir. Geri dönüştürülmüş agregalar daha çok yapı temelleri, kaplamalar ve zemin stabilizasyonunda değerlendirilmektedir (Oikonomou, 2005). Prekast beton atıklarından elde edilen geri dönüştürülmüş kaba agrega ile üretilen betonda süperplastikleştirici kullanımının önemine değinmişlerdir (Soares, De Brito, Ferreira ve Pacheco, 2014). Betonun zayıf yönlerini geliştirmek amacıyla betonda lif katkılarının kullanımı her geçen gün artmaktadır. Liflerin beton üzerindeki etkileri, lifin tipine, cinsine, şekline, boyutlarına ve betonu oluşturan diğer malzemelerin özelliklerine göre değişmektedir (Topçu ve Canbaz, 2006). Polipropilen lif katkılı betonlardan elde edilen geri dönüşüm agregalarının, su emme değerlerinde artış görülmüştür. Ayrıca darbe dayanımı ve donma çözülme sonrası ağırlık kayıpları da artmıştır (Topçu ve Baylavlı, 2016). Lif katkılı betonların da geri dönüşümü çevre kirliliği açısından büyük önem taşımaktadır. Bu çalışma, farklı tip ve özellikteki polipropilen lif katkılı kaynak betonlarından elde edilen geri dönüşüm agregaların yeniden betonda kullanılmasını amaçlamaktadır.

Malzemeler ve Yöntem

Deneyisel çalışmada öncelikle lif katkılı ve lif katkısız kaynak betonlar üretilmiştir. Lif katkılı beton karışımlarında sekiz çeşit polipropilen lif kullanılmıştır (Şekil 1). Polipropilen liflerin teknik özellikleri Tablo 1’de verilmiştir. Kaynak beton karışımına her lif çeşidinden üç farklı oranda katılmıştır. Lif oranları 600-1200 ve 1800 g/m³’tür. S: Polipropilen lif katkısız kaynak betonları, A,B,C,D,E,F,G,H ise polipropilen lifleri ifade etmektedir. Örneğin A6; A lifinden 600 g/m³ katkılı, B12; B lifinden 1200 g/m³ katkılı, C18; C lifinden 1800 g/m³ katkılı olduğunu göstermektedir. Kaynak beton üretiminde, 0-4mm, 4-15mm ve 15-22,4mm boyutlarında kırmataş agregası kullanılmıştır. Tüm karışımlardaki çimento tipi CEM I 42.5 R’dir. Kaynak beton karışımındaki su-çimento oranı sabit tutulmuştur. Taze betonun akışkanlığını korumak için hiperakışkanlaştırıcı katkı kullanılmıştır. Karışımlardaki lif oranı arttıkça akışkanlaştırıcı katkı oranı da artırılmıştır. Akışkanlaştırıcı katkı oranı, taze betonun çökmesinin belli bir değerin altına inmemesi ve segregasyon yapmaması için deneme karışımları ile belirlenmiştir. Lif katkılı ve katkısız olmak üzere 25 seri kaynak beton üretilmiştir. Kaynak beton numune boyutları 150 mm çapında ve 300 mm yüksekliğindedir. Kaynak beton karışım oranları Tablo 2’de verilmiştir. Kaynak betonlar 120 gün sonunda çeneli kırıcıda kırılmıştır (Şekil 2). Kaynak beton üretiminde kullanılan agregası boyutlarına göre kırım yapılmıştır. Kırım sonunda 0-4mm, 4-15mm ve 15-22,4mm boyutlarında geri dönüşüm agregaları elde edilmiştir. Kırma işlemi sırasında bazı liflerin koptuğu bazı liflerin ise harçtan kolayca sıyrıldığı görülmüştür. Özellikle kancalı ve nervürlü liflerin agregalar ve harç arasında köprü görevi yaparak kırma sırasındaki dağılmayı azaltmıştır (Şekil 3).



Şekil 1. Polipropilen Lifler

Tablo 1. Polipropilen Liflerin Teknik Özellikleri

Lif	Çekme Dayanımı (MPa)	Birim Ağırlık (g/cm ³)	Ergime Noktası (°C)	Elastisite Modülü (MPa)	Su Emme (%)
A	450-600	0.91	160-590	3500	0.01/0.02
B	400-500	0.91	160-590	3500	0.01/0.02
C	400-800	1.36	253	11300	0.04
D	400-800	1.36	253	11300	0.04
E	600-700	0.91	150-160	3500	0.01/0.02
F	620	0.90	160-590	9500	-
G	400-800	1.36	250	11237	0.4
H	600	0.90	230	3800	0.01/0.02
Fiber	Uzunluk (mm)	Genişlik (mm)	Kalınlık (mm)	Narinlik	Şekli
A	12	0.48	0.30	25	Dairesel
B	19	0.48	0.30	37.5	Dairesel
C	30	1.20	0.30	100	Yivli
D	30	1.20	0.45	25	Kancalı
E	30	0.48	0.30	62.5	Dairesel
F	40	0.433	0.433	0.92	Düz
G	18	0.3	0.50	36	Dairesel
H	20	0.6/1.3	0.18/0.22	33/46	Düz



Şekil 2. Çeneli Kırıcı

Tablo 2. Kaynak Beton Karışım Oranları

Karışıma Giren Malzemeler		CNL	Karışımlar ve Lifler, g/m ³		
			600	1200	1800
Kum (0-4 mm)	(kg/m ³)	1127	1127	1127	1127
Kırma Taş (7-15 mm)	(kg/m ³)	451	451	451	451
Kırma Taş (16-22,4 mm)	(kg/m ³)	301	301	301	301
Su	(kg/m ³)	156	156	156	156
Çimento	(kg/m ³)	300	300	300	300
Polipropilen Lif	g/m ³	-	600	1200	1800
Katkı	%	0,6	0,8	0,9	1,1
Su-çimento ratio	W/C	0.52	0,52	0,52	0,52
Birim Ağırlık	(kg/m ³)	2335	2335	2335	2335



Şekil 3. Polipropilen Lifli Geri Dönüşüm Agregaları

Geri Dönüşüm Agregalarının Yeniden Beton Karışımında Kullanımı

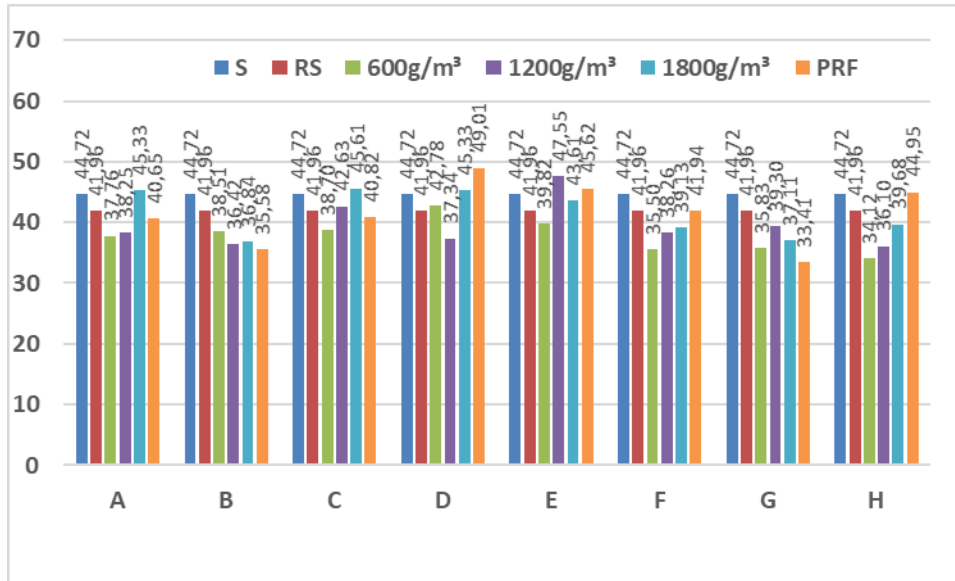
Kaynak betondan elde edilen geri dönüşüm agregalarının yeniden betonda kullanılması için öncelikle deneme karışımları yapılmıştır. Laboratuvar tipi çeneli kırıcıda yeterli incelikte ince agregaya elde edilememiştir. Yapılan deneme karışımlarında, geri dönüşümden elde edilen ince agreganın (0-4mm) tamamının ince agregaya olarak betonda kullanımının, taze beton özelliklerini olumsuz etkilediği görülmüştür. İnce malzeme oranı az olduğundan üretilen betonda segregasyonun çok fazla olduğu gözlenmiştir. Bu yüzden ince agreganın miktarının yarısı kadar doğal kırma taş kum kullanılmıştır. Geri dönüşüm agregalı betona iri agregaya olarak, 4-15 mm ve 15-22.4 mm boyutlarında geri dönüşüm agregaları ilave edilmiştir. Kaynak beton karışımlarında her lif çeşidinden üç farklı oranda (600-1200 ve 1800 g/m³) kullanıldığından, her lif çeşidinden üç farklı geri dönüşüm agregası elde edilmiştir. Yeni karışımlarda her lif çeşidinden elde edilen agregalar kendi içinde karıştırılarak kullanılmıştır. Örneğin, A lifli karışımdan elde edilen 600-1200 ve 1800 g/m³ lif katkılı geri dönüşüm agregaları kendi içinde eşit ağırlıklarda karıştırılmıştır. RS: Polipropilen lif katkısız kaynak beton geri dönüşüm agregalı betonu göstermektedir. PRF: Polipropilen lif katkılı kaynak beton geri dönüşüm agregalı betonu göstermektedir. Geri dönüşüm agregalı betonun karışım oranları Tablo 3'te verilmiştir.

Tablo 3. Geri Dönüşüm Betonlu Karışım Oranları

Bileşenler		RS	PRF, g/m ³
Kırmaş Kum (0-4 mm)	(kg/m ³)	564	564
Geri Dönüşüm Kum (0-4 mm)	(kg/m ³)	563	563
Geri Dönüşüm Agregası (4-15 mm)	(kg/m ³)	410	410
Geri Dönüşüm Agregası (15-22,4 mm)	(kg/m ³)	251	251
Su	(kg/m ³)	196	196
Çimento	(kg/m ³)	350	350
Polipropilen Lif	g/m ³	-	600+1200+1800
Katkı	%	0,5	0,5
Su-Çimento Oranı	W/C	0.56	0,56
Birim Ağırlık	(kg/m ³)	2340	2340

Basınç Dayanımı

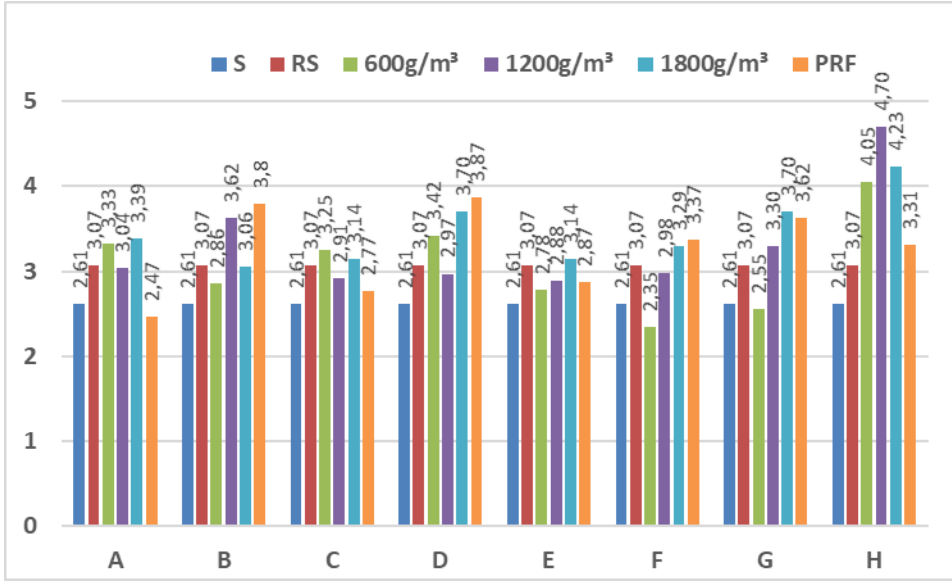
Lif katkılı ve lif katkısız betonlardan elde edilen geri dönüşüm agregalarının yeniden betonda kullanılması ile yapılan betonun 28 günlük basınç dayanımları incelenmiştir. Kaynak betonların basınç dayanımları ile lif katkılı ve lif katkısız geri dönüşüm agregalı betonların basınç dayanımları karşılaştırılmıştır. Basınç dayanımları için 15x30cm'lik silindir numuneler kullanılmıştır. Lif katkısız kaynak betonun (S) basınç dayanımı 44,72 MPa'dır. RS betonunun, kaynak betonun basınç dayanımını sağlaması için deneme çalışmaları yapılmıştır. Yapılan çalışmalarda çimento miktarı 50 kg artırıldığında kaynak beton basınç dayanımına yaklaştığı sonucuna varılmıştır. RS betonunun basınç dayanımı 41,696 MPa'dır. Kaynak betondaki çimento miktarı 300 kg/m³ iken, geri dönüşüm betonlarındaki çimento miktarı 350 kg/m³'tür. Lif katkılı betonlardan elde edilen geri dönüşüm agregalı betonların (PRF) basınç dayanımları yaklaşık 33 MPa ile 49 MPa arasında değişmektedir. İnce agrega olarak doğal kum kullanılması ve çimento miktarının 50 kg artırılması ile kaynak beton basınç değerlerine yakın değerler elde edilebildiği sonucuna varılmıştır (Şekil 4).



Şekil 4. Silindir Basınç Dayanım Sonuçları

Yarmada-Çekme Dayanımı

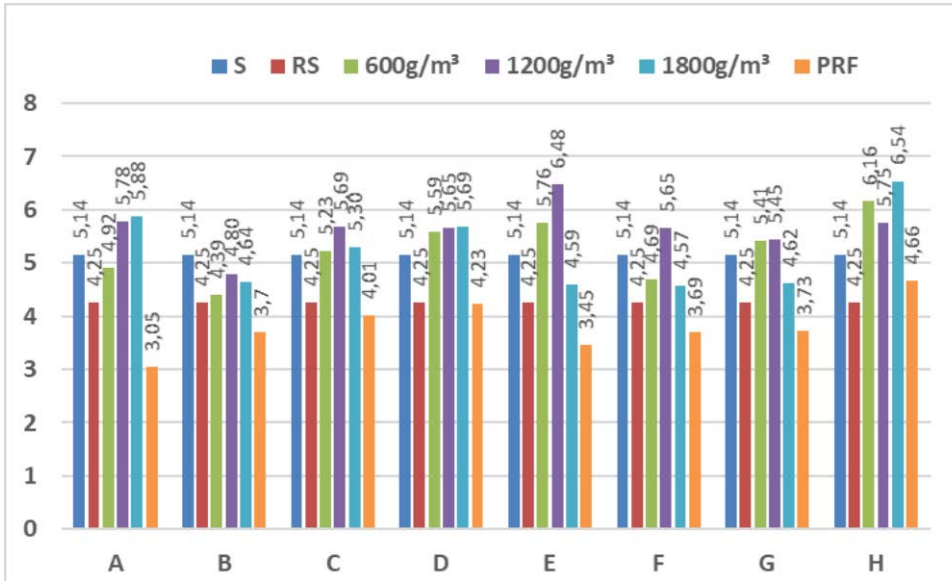
Polipropilen lif katkısız kaynak betonun yarmada çekme dayanımı 2.61 MPa'dır. Polipropilen lif katkılı kaynak betonların yarmada çekme dayanımları 2.35 MPa ile 4.70 MPa arasında değişmektedir. Polipropilen lif katkısı betonun yarmada çekme dayanımını arttırmıştır. Polipropilen lif katkılı betonlardan elde edilen geri dönüşüm agregalı betonların yarmada çekme dayanımları 2.47 MPa ile 3.87 Mpa arasında değişmektedir. A, C, E ve H lifli karışımlarda kaynak betona göre yarmada çekme dayanımları düşerken diğer karışımlarda artmıştır (Şekil 5).



Şekil 5. Yarmada-Çekme Dayanım Sonuçları

Eğilme Dayanımı

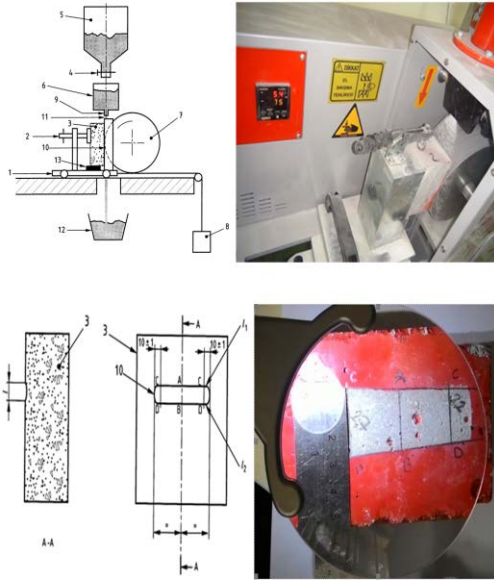
Polipropilen lif katkısız kaynak betonun eğilme dayanımı 5.14 MPa'dır. Polipropilen lif katkılı kaynak betonların eğilme dayanımları 4.25 MPa ile 6.54 MPa arasında değişmektedir. Polipropilen lif katkısı betonun eğilme dayanımını arttırmıştır. Polipropilen lif katkılı betonlardan elde edilen geri dönüşüm agregalı betonların eğilme dayanımları 3.05 MPa ile 4.66 MPa arasında değişmektedir. Geri dönüşüm agregalı betonların eğilme dayanımları kaynak betonlara göre düşmüştür (Şekil 6).



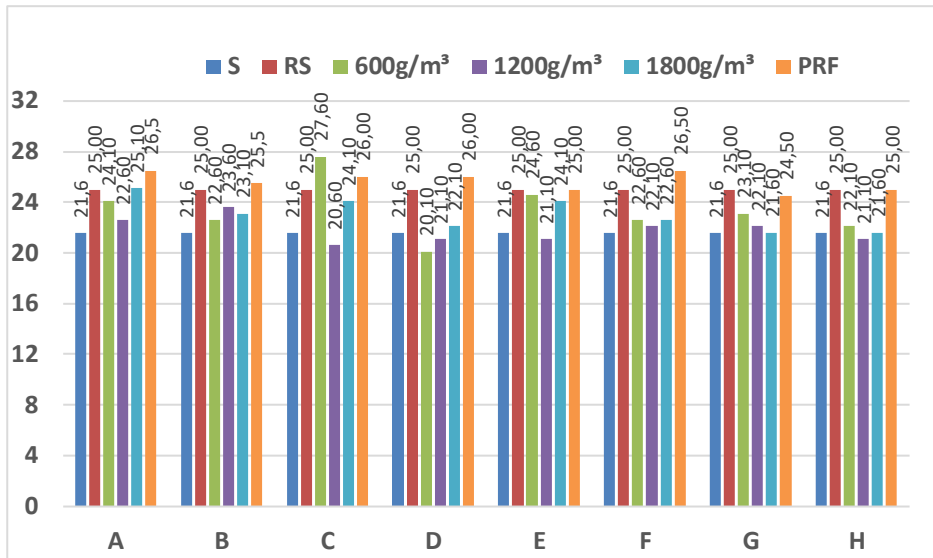
Şekil 6. Eğilme Dayanım Sonuçları

Aşınma Dayanımı

Dikey aşınma deneyi için 70x70x115mm boyutlarında numuneler hazırlanmıştır. Aşınma cihazında numuneler, 75/dakika devir ve F80 alüminyum oksit zımpara tozu ile debisi dakikada 2,5 litre olacak şekilde aşındırılmıştır (Şekil 5). Aşındırılan yüzey üzerinde iki noktadan aşınma mesafeleri ölçülmüş ve ortalama aşınma boyutları kalibrasyon düzeltilmesi ile hesaplanmıştır (Şekil 7). Numunelerin aşınma deneyi 28 gün sonunda yapılmıştır. Polipropilen lif katkısının betonun aşınmaya karşı direncini zayıflattığı sonucuna varılmıştır. Geri dönüşüm agregalı betonda aşınma değerleri de kaynak betona göre daha da artış göstermiştir (Şekil 8).



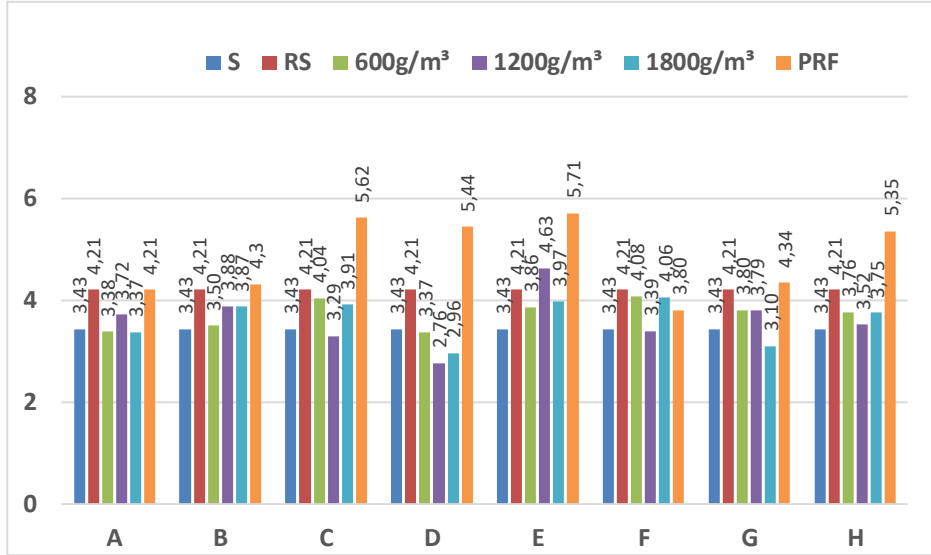
Şekil 7. Aşınma Dayanımı Deney Cihazı ve Ölçümler



Şekil 8. Aşınma Dayanım Deney Sonuçları

Su Emme

Polipropilen lif katkısız kaynak betonun su emme %3.43'dür. Polipropilen lif katkılı kaynak betonların eğilme dayanımları %2.764 ile %4.63 arasında değişmektedir. Polipropilen lif katkısı betonun su emme değerini artırmıştır. Geri dönüşüm agregalı betonun su emme değeri ise %4.21 ile %5.71 arasında değişmektedir. Betonda polipropilen lifli geri dönüşüm agregası kullanılması su emme değeri oldukça artırmıştır (Şekil 9).



Şekil 9. Su Emme Deneyi Sonuçları

Sonuçlar

Polipropilen liflerin agregalar ve harç arasında köprü görevi yaparak kırma sırasındaki dağılmayı azalttığı görülmüştür. Yapılan çalışmalarda çimento miktarı 50 kg arttırıldığında kaynak beton basınç dayanımına yaklaştığı sonucuna varılmıştır. İnce agregalar olarak doğal kum kullanılması ve çimento miktarının 50 kg arttırılması ile kaynak beton basınç değerlerine yakın değerler elde edilebildiği sonucuna varılmıştır.

Polipropilen lif katkısı betonun yarmada çekme dayanımını arttırmıştır. Polipropilen lif katkılı betonlardan elde edilen geri dönüşüm agregalı betonların yarmada çekme dayanımları 2.47 MPa ile 3.87 Mpa arasında değişmektedir. A, C, E ve H lifli karışımlarda kaynak betona göre yarmada çekme dayanımları düşerken diğer karışımlarda artmıştır. Polipropilen lif katkısı betonun eğilme dayanımını arttırmıştır. Geri dönüşüm agregalı betonların eğilme dayanımları kaynak betonlara göre düşmüştür.

Polipropilen lif katkısının betonun aşınmaya karşı direncini zayıflatmış sonucuna varılmıştır. Geri dönüşüm agregalı betonda aşınma değerleri de kaynak betona göre daha da artış göstermiştir. Betonda polipropilen lifli geri dönüşüm agregası kullanılması su emme değeri oldukça arttırmıştır.

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FATTY ACID COMPOSITIONS OF TOTAL LIPID, PHOSPHOLIPID AND TRIACYLGLYCEROL FRACTIONS OF MATURE BREAST MILK IN TURKEY

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Abstract: In this study, compositions of fatty acids, including mature milk samples, of a mother who just gave birth from 35 mothers were analysed. Total milk lipids extracts were transmethylated and analyzed by using an improved gas-chromatographic method. There were 20 fatty acids measured in the milk samples. The major components were palmitic acid (C16:0), stearic acid (C18:0), myristic acid (C14:0), oleic acid (C18:1 ω -9), linoleic acid (LA, C18:2 ω -6), in total lipid, PL and TAG fractions. In comparison with PL fractions, total lipid and TAG fractions were characterized by a lower percentage of saturated fatty acids (SFA), a higher percentage of monosaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). There was no statistical differences in total lipid and triacylglycerol fractions (TAG) in mature milk samples.

FORM AND FUNCTION OF DENOMINAL VERB CONSTRUCTIONS IN KARTVELIAN LANGUAGES

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Abstract: In the linguistic literature the verbal forms derived from nouns are known as *verbe denominationale* (DNV). In general, comparatively fewer scientific works have been created on such verbal structure and function. In Georgian and other Kartvelian languages mainly nouns and adjectives are verbalized. Verbalization of nominals is possible via the affixation. The word-formation is based on Common Kartvelian principle and mold. Basing on the empirical material, the paper analyzes DNVs form and function in Georgian, Megrelian and Laz.

Keywords: DNV, denominationale verb, Georgian, Mingrelian, Laz, morphology

1. Introduction

In the Kartvelian languages two kinds of voices are distinguished. They are conditionally called **active** and **passive** voice due to the frequent semantic and formal non-coincidence (*Jorbenadze 1995*). The voice forms include the primary (*verbe primaire*) and relatively late formed denominal (*verbe denominationale*), i.e. secondary (*secondaire*) verbs. Since they do not have their own specific word-formative molds, they use formative models of active and passive voices, which lead to their research with respect to voice.

Georgian DNVs have been thoroughly studied and analyzed by A. Shanidze in the work "Denominal verbs in Georgian". According to the author, majority of pure verbs form passive voice via **i-** and **e-**, **d-** is a derivative suffix of denominal verbs that is derived from **-n** formant as a result of phonetic processes (*Shanidze 1981, 39*). Old Georgian theological and secular literature is distinguished by the frequent derivation of verbal forms from the nominals (*Melikishvili 1975, 132-140*).

In Georgian the formation models of the denominal verbs, correlation between their forms and content were dedicated to many valuable scientific works, which focus on the issue of semantic differentiations of the denominal verbs (*Kiknadze 1946, Chikadze 1973, Jorbenadze 1975, 1995, Gogolashvili 1977, Muzashvili 1984, 1993, Zhgenti 1987, Shengelia 1990, Kobiashvili 1998, Loladze 1998, Peikrishvili 2009, Tuskia 2014...*). In Svan, the DNVs have been researched in terms of formation by Z. Chumburidze.

In studying the voice category in Megrelian and Laz, the issue of function and formation of denominal verbs should be separated because:

- 1) they reflect different from the primary verbs structural and semantic picture
- 2) they have never been the subject of special research in Megrelian-Laz.

In terms of derivation and semantics, we studied and analyzed more than 4497 DNVs in Kartvelian languages. Statistical data outlined and demonstrated the key issues, novelties and trends that were related to the present research.

2. Materials And Metods

The main research sources are the following empirical materials: a) dictionaries, b) digital sources and c) empirical material obtained in Samegrelo and Lazeti expeditions:

A) Dictionaries:

1. The Explanatory dictionary of the Georgian language, Tb. 1986
2. I. Asatiani, Laz Dictionary, Tb., 2012
3. A. Tandilava, Laz Dictionary, Tb., 2013
4. I. Bujaklishi, H. Uzunhasanoglu, I. Aleksiva, Great Nenapuna, Istanbul., 2007
5. A. Kobalia, Megrelian Dictionary, Tb., 2010

B) Digital sources:

1. ARMAZI <http://armazi.uni-frankfurt.de/frame.htm>
2. GDC - Georgian Dialectic Corp. www.corpora.co

C) empirical material obtained in Samegrelo and Lazeti expeditions (2012- 2013)

In order to obtain Laz and Megrelian empirical material **fieldwork linguistic method** was utilized. In order to get the necessary samples, we often used the **eliciting method** of preliminary prepared questionnaires, grammatical models, analogies, nominal stems. Via this method we checked and verified the forms we were interested in. The answer to preliminary prepared question was relevant to our research. Expedition records show free style narratives from informants of different age groups and social classes.

Observation on live speech - **observation method** allowed us to record the research material. Via the **descriptive** and **comparative** methods the Georgian and Megrelian-Laz data were compared with each other that revealed common and distinctive features.

3. Structure Of Dnvs

In Megrelian verbalizing elements of a nominal are represented by: **-d** suffix (In Laz a **-d** suffix is actually lost. It is preserved only in some verbs), theme markers: **-an/-am/-ap/, -un/-up/-um, -en/-em/-eb/-ep** and vowel-prefixes: **o-, a-, i-, u-**. The mentioned verbalizing elements create three structural models:

a) R - d- THM

In analyzing more than 1200 passive voice verbal stems with 147 forms with **-d** were distinguished in Megrelian. Of them, the formant **-d** is confirmed at 139 nominal stems and 8 at verbal ones. In Megrelian **-d** fails to derive verbal forms of newly established words, and, unlike Georgian, it failed to double up a form-derivative function. It remained in Megrelian indigenous vocabulary as a verbalizing element. After forming a voice category, like in Georgian, such forms were likely evaluated as passives.

Georgian:

(3.a1) *çiteli : çitl-d-eb-a*
Red.ADJ : red-DNV/PASS-THM-S3.SG.DNV
„red : he is blushing“

(3.a2) *saxl-i : saxl-d-eb-a*
house.N : house-DNV/PASS-THM-S3.SG.DNV
„house : he is settling in the village“

Actually, so called primary masdars (MSD1) that are derived from adjectives with **-in** element are verbalized via **-d** where the derivative **i-** vowel is substituted by **-o** one (3.a4)

Megrelian:

(3.a3) *monča* → *monč-in-i* : *monč-in-d-u*
ripe.ADJ → *ripe.MSD1* : *ripe-MSD1-DNV/PASS-S3.SG.DNV*
 „ripe : it ripens“

(3.a4) *bitka* → *bitk-in-i* : *bitk-on-d-u*
bitka.ADJ → *huge.MSD1* : *hug-MSD1-DNV/PASS-S3.SG.DNV*
 „to become huge : he becomes huge“

b) R - THM

Georgian:

(3.b1) *Mcqemsī* : *mččems-av-s*
Shepher.N : *shepher-THM-S3.SG.DNV*
 "Shepher : he/she is Shepherds"

Megrelian:

(3.b2) *čqeši* : *čqeš-un-s*
Shepher.N : *shepher-THM-S3.SG.DNV*
 "Shepher : he/she is Shepherds"

Laz:

(3.b3) *čqeši* : *čqeš-um/up-s*
Shepher.N : *shepher-THM-S3.SG.DNV*
 "Shepher : he/she is Shepherd"

c) CV - R – THM

Georgian:

(3.c1) *šavi* : *a-šav-eb-s*
black.ADJ : *ACT-black-THM-S3.SG.DNV*
 "black : he/she makes blacks"

Megrelian:

(3.c2) *uča* → *uč-ar-i* : *a-učar-en-s*
black.ADJ → *black-COMP-NOM* : *ACT-black-THM-S3.SG.DNV*
 "black : he/she makes blacks"

Laz:

(3.c3) *uča* → *uč-on-i* : *a-učan-en/ep-s*
black.ADJ → *black-COMP-NOM* : *ACT-black-THM-S3.SG.DNV*
"black : he/she makes blacks"

Unlike Georgian in Megrelian-Laz the number of verbalization via a personal marker (*čiri* “distemper/plague” > *sčirs* “suffers from sth/is affected”) is scarce. Verbalization function of a preverb is minor, as well.

4. Nominal Stem Of Dnvs

In Megrelian-Laz, mostly cardinal nouns and adjectives derive verbal forms. Numeral, pronoun, adverb, and participle rarely occur as a stem of a secondary verb. A nominal stem of a denominal verb can be:

a) root, simple

(4.a1) **Georgian:** *parcxi* : *parcx-av-s*
Megrelian: *bucxi* : *bucx-un-s*
Laz: *bucxi* : *bucx-up/um-s*
harrow.N : *harrow-THM-S3.SG.DNV*
"harrow : he harrows"

b) derived, having new lexical meaning

(4.b1) **Georgian:** *txeli* : *a-txel-eb-s*
Megrelian: *titxari* : *a-titxar-en-s*
Laz: *titxoni* : *o-titxan-ep/em-s*
thin.ADJ : *ACT-thin-THM-S3.SG.DNV*
"thin : he makes sth thin"

c) compound (composite)

(4.c1) **Georgian:** *tvalquri* : *tvalqur-ob-s*
Megrelian: *to[li]qūži* : *to[li]qūž-en-s*
Laz: *to[li]qūži* : *to[li]qūž-ap/am-s*
eye and ear.N : *eye and ear-THM-S3.SG.DNV*
"eye and ear : keeps an eye and ear on sth/pays attention"

d) masdar

(4.d1) **Megrelian:** *biqvin* : *o-biqvin-an-s*
stupid.MSD1 : *ACT-stupid-THM-S3.SG.DNV*
"stupid : looks like a stupid"

e) borrowing

Russian > *мандраж* "fair"

(4.e1) **Georgian:** *a-mandraž-eb-s*
Megrelian: *a-mandraž-en-s*
ACT- fair-THM-S3.SG.DNV

Laz: *mandraž-oba ikips*
fair- MSD mace.AUX.DNV

"frightens sb/sth"

Greek > *dulia* „work"

(4.e2) **Laz:** *dulia mechaps*
job.N give.AUX.DNV
"employs sb"

Turkish > *paxali* "expensive/sth"

(4.e3) **Laz:** *o-paxal-eb-s*
ACT-expensive-THM-S3.SG.DNV
"becomes expensive"

Arabic > *iemini* "oath/vow"

(4.e4) *ieminoba ikips*
oath.MSD mace.AUX=DNV
"swears/vows"

Persian > *nazli* "coquettish"

(4.e5) **Georgian:** *i- naz-eb-a*
Megrelian: *i-naz-eb-u*
Laz: *i-nazl-ep-s*
PASS-coquettish-THM-S3.SG.DNV
"being coquettish"

5. Function Of Dnvs

In Kartvelian languages the semantics of the denominal verbal stem is mostly determined by the semantics of nominal represented in its stem. However, the samples are confirmed when a verbalizing form has no semantic link with a nominal form and is semantically changed (*xuji* "shoulder" : *exujebu* "will like").

A. Shanidze connects the process of changing of a nominal into a verb with **transformation**, even if a verb is transitive or intransitive (Shanidze 1981, 39). B. Jorbenadze links the semantics of **transformation** with the vowel-prefix active (*a-lamaz-eb-s* “makes sb/sth beautiful”) and **d-** formant passive voice (*lamaz-d-eb-a* “becomes more beautiful”) verbs, and **instrumentative** – with active voice verbs with thematic marker (*xerx-av-s* “saws sth”) and prefixal passive voice verbs (*i-xerx-eb-a* “is sawed”) (Jorbenadze 1975, 109-111, 138-140). In the author’s opinion, if there is a active and state verbs, then an active verbal form usually acquires the meaning of **causality**, and the state verb expresses the **active** process: *a-balax-eb-s* “feeds on grass”: *balax-ob-s* “grazes” (Jorbenadze 1995, 197). The author also connects semantics of inchoative with the starting process of action: *aabolebs* “will make sth smoke” - *aboldeba* “sth will begin to emit smoke”... (Jorbenadze 1989, 172-187).

G. Gogolashvili's view is noteworthy, as well. The scholar discusses the issue of correlation of form and content in single-personal denominal verbs. In his opinion, denominal formal groups of single-personal verbs are distinguished by the correlation between the meaning of that nominal from which a verbal stem was formed. The author discusses the contradictory of content and notes that such opposition is characteristic only of denominal verbs. The primary verbs with similar formation do not reveal such contextual confrontation (Gogolashvili 1980, 50-55).

Observation of empirical material in Megrelian and Laz demonstrates that the core function of the denominal verbs is also a **transformation**, which is historically expressed via **-d**. Today, in Megrelian the derivation via **-d** in the newly-established words are limited so the transformation is also showed by passives of prefixal formation. **Instrumentative** is expressed by a small group of verbs. Differentiation of the prefixal forms expressing transformation and instrumentative is possible by the semantics.

Like in Georgian, the Megrelian-Laz DNVs demonstrate contextually opposed forms even in one structural model, i.e. one structure combines different semantic groups. Eight groups are detached in semantic classification of the DNVs

a) **Marking object in a nominal stem is subject:**

(5. a1) **Georgian:** *mçqems-av-s*
Megrelian: *çqeš-un-s*
Laz: *çqeš-um/up-s*
 „shepherds (shepherd)“

b) **Subject acts via a nominal presented in a stem:**

(5. b1) **Georgian:** *çeb-av-s*
Megrelian: *çab-un-s*
Laz: *çab-um/up-s*
 „glues (with glue)“

c) **Subject acts on the nominal represented in a stem:**

(5. c1) **Georgian:** *bundg-av-s*¹
Megrelian: *bundgon-un-s*

¹west georgian dialect

Laz: *bundgon-um/up-s*
„removes feather“

d) Subject acts on an object to obtain result similar to a nominal marked in a stem:

(5. d1) **Georgian:** *a-txel-eb-s*
Megrelian: *a-titxar-en-s*
Laz: *titxan-up/um-s,*
„thins sth“

e) Subject resembles, wants to resemble an object represented in a stem and behaves like this object:

(5. e1) **Georgian:** *gogo-ob-s*
Megrelian: *cir-en-s*
"behaves like a young girl"

f) Subject acts like a nominal represented in a stem:

(5. f1) **Georgian:** *sulelivit dadis*
Megrelian: *o-čvag-an-s*
„walks like a fool“

g) Subject speaks like a nominal represented in a stem:

(5. g1) **Georgian:** *susun-eb-s*
Megrelian: *svasal-an-s*
"speaks coquettishly"

h) Subject looks like a nominal represented in a stem:

(5. h1) **Georgian:** *qelss irerebs*
Megrelian: *o-riyin-an-s*
„looks with a neck craned“

Each group consists of the units of different structures, but one and the same content.

Conclusion

The analysis of research material in Kartvelian languages showed that the verbalization of nominals is possible via the affixation. These affixes are: theme markers and vowel-prefixes. A suffix **-d** has the word-derivative function in Megrelian; In Georgian after the formation of voice category, on the new development stage it acquired the function of word-formation (resp. derivative of passive voice), in Laz it is lost.

Generally, the word-formation is based on Common Kartvelian principle and mold. Derivation of verbal stems from nominal ones is more fully and diverse in Georgian and Megrelian than in Laz.

In terms of function there are represented eight groups. Though it should be emphasized that the core function of denominal verbs is transformation.

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Abbreviations

ABS - Abstract

ACT - Active Voice

ADJ - Adjective

AUX - Auxilliary verb

CV - Character Vauel

COMP - Comparative

DNV - Denominale Verb

MSD - Masdar

MSD1 - primary Masdar

N - Noun

NOM - Nominative Case

PASS - Passive Voice

R - Radix

S - singular

S3 - Subject third person

THM - Thematic marker

Group Explorer in Abstract Algebra

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Abstract. Group Explorer can be used to make easy teaching and learning of the abstract algebra. In the paper, we used a famous group A_4 to check whether it is an abelian group or not, but some of the more difficult concepts can be illustrated to make lecture presentation more colorful. Then, we explore the student's idea to understand to positive effect of the application.

The essence of Group Explorer in representing notions in group algebra is a good helper to practice the program in the lectures. Twenty-two participants in an undergraduate course taking Abstract algebra lecture were charted concerning the practices by means of Group Explorer. For the effect of the application, all participants believed that the A_4 group explorer with visualization was useful to the teaching and defined the habits concerning the programme by means of technological materials.

Keywords: abstract algebra, group theory, group algebra, technology

Introduction

Students' difficulty in weak points of the abstract way of the course and its concepts is very important structures in the teaching and learning of algebraic lectures in universities. Many researchers have determined the ways to teach the notions (Edwards & Brenton, 1999; Hazzan, 1999; Dubinsky, Dautermann, Leron & Zazkis, 1994) by the essential attention with how learners concretely to recognize the notions, for example, group concept, quotient groups and subgroups (Schubert, Gfeller and Donohue, 2002).

We remember that normal subgroups and quotient groups have near relation. Using the relation, we describe a visualization by the active structure of *Group studies* which could help the student's concrete understanding of what a quotient group is. It is manipulated a Cayley diagram of the group A_4 into a more suitable diagram for imagining the quotient of A_4 by a subgroup isomorphic to $Z_2 \times Z_2$ (Carter and Emmons, 2005).

Before the course, our students learned some basic concepts as normal subgroups, we are illustrating the concepts, to presents students efficient representing perceptions to related with the notion. We shortly remember that, normal subgroups have a special visual way that permit learners to procedure a quotient group; in other words, "H is a normal subgroup of G, at the time we will give a quotient group G/H (Carter and Emmons, 2005).

The lecture Details

In the lecture, we are using a nice visualization of A_4 fashioned by Carter and Emmons (2005). They presented their visualization step by step as below;

1. Let's begin by introducing of the rectangular Cayley diagram for A_4 : your diagram should look like figure1. It is aimed *Group Explorer* to arrange the lines in a rectangle.

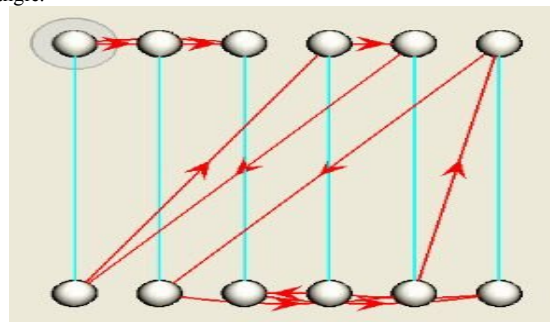


Figure 1: rectangular Cayley diagram for A_4

2. It is confirmed the diagram to establish the figure round the group H isomorphic to V_4 . The share of the Cayley Diagram figure which matches to the construction of H as figure 2. And, it is shifted to the figure, than teacher would make of the H subgroup (figure 3) (Carter and Emmons, 2005).

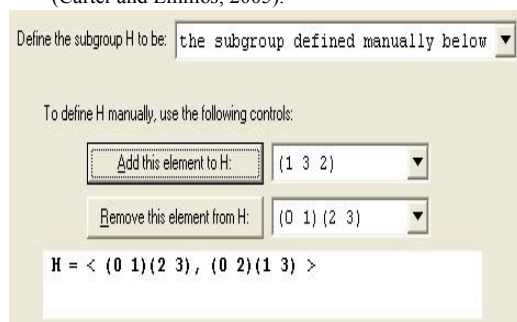


Figure 2. Actions to display an order-4 subgroup

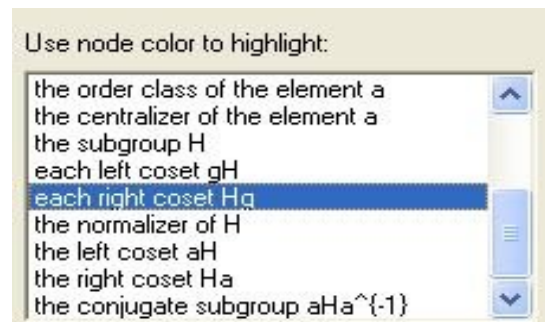


Figure 3. Finding of the right cosets of H

3. Finding cosets of Subgroup. three distinct classes (Carter and Emmos, 2005). 3 different sets by color, every color has the meaning as a right coset Hg of the subgroup H in A_4 (figure 4).

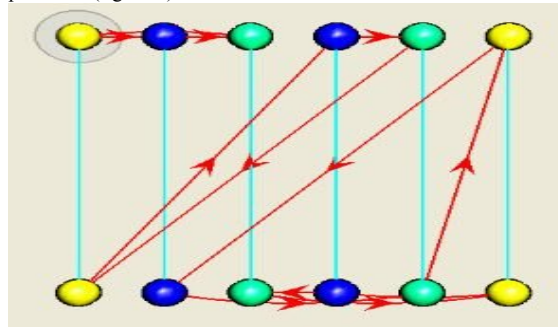


Figure 4. Cosets of A_4

Our Student's Views

At the end of the 3-hours lectures, the students were surveyed for the practices with the program and software, and students' learning of applying the modern equipment to response explicit requests of students for some notions revealed before this step. Students' images of "enjoys and hates" about some group examples applied the lectures. The groups of answers that developed in analysing that students enjoyed about the applications were software program and education style (Schubert, Gfeller and Donohue, 2002). participants answers could be categorized as below;

- benefiting from the technology (software),
- Simple application of algebric concepts,

"I tested simple using of group concepts and exploring was to understand and to practice. I can say that this situation was beneficial that everything to recognize in the lecture. I didn't have my book to find the everything what I look for. Everything I want to find was on Group explorer" (Student 3).

"It is very nice to see by software presenting that I was focusing to control in lesson. These applications turned some situations easier to perceive that some directions are learning and when some notions mention to special difficulties or examples" (Students 7).

"I enjoyed manipulating cosets of group A_4 Generating moreover highlighting cosets was also very entertaining and helpful". (Participant 12).

Conclusion

The outcomes of the work show that students' ability was an important issue in shaping notion learning at the abstract algebra lectures. Our lectures' method and effects to the students suggest that they were highly willing to follow the course and using Group Explorer. Almost all the students in our work group recognized the visual lectures as a constructive part of the group concept studies (Schubert, Gfeller and Donohue, 2002).

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Horizontal Building Construction I

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Abstract. The possible way of aiding the horizontal building at the sector of construction are developing step by step. In this study we pointed out the study of construction to encounter the modern developments. We are focusing on the construction explanation for a special environmental situation when incorporating some project restrictions, producing minimum disruption, by helping of new structure production systems and administration to restrict the constructional problems or faults.

Keywords: horizontal building construction, construction project, construction robotics

Introduction

In the chiefly communal horizontal building production, the characteristic inspiration of the persons is to have a member of the communal reserves (Lupa, 2015). He also noted that communal reserves are getting to be consumed, the fundamental permitted context needs the disintegration of the plan transfer procedure into three stages; design, bid, build. Moreover, risk level is classically escaped by both holders and workers, and it has a nonappearance of observable prizes (Lupa, 2015; Fu, X at all. 2012). In this study, we are analysing three design parameters (Arshad, 2014); farming resource utilization, rapid construction and *on site-off site* logistics

Of course, it is denoted hard to entirely incorporate the parameters in a unique horizontal structure building. So, to show details of the parameters, we selected different construction models. The first phase of the study, we focus on design standards to encounter the contemporary requirements of structure building. That situation contains the work of three project factors. Then, we analyse the difficulties opposed to incorporate the factors in construction structure. Later, a modern method is given for horizontal structure constructing. (Arshad, 2014).

Farming resource utilization

This construction design inspires to create accessible incomes and gathering in a special department at local position. Vertical agricultural work is a perfect solution of farming to apply in metropolis (Arshad, 2011). According to him, main determined selections for the farming; procedure of growing vegetable in air without soil, rising boards to the wall with necessary amount of water and developing flowers by means of mineral resolution as presented below (figure 3).



Figure 3. Vertical hydroponic design system to grow strawberries in Zimbabwe
(<https://zimbabwebookproject.weebly.com/hydroponics-etc.html>)

Rapid construction

Some researchers noted that fast building is a design notion to improve proficiency of building procedure current by period restriction to ensure the achievements of plan transfer in a limited period of agreement and encounters customer pleasures (Arshad, 2014 & Yahya and Mohamad, 2011). The four pylons of spectacular mega bridge in Bangkok, Industrial Ring Road, rise 173 m into the sky. For the realization, the ACS climbing system ensured rapid construction system. The PERI formwork solution with the ACS self-climbing system permitted effective building through different connections (www.peri.co.th/projects/civil-engineering/mega-bridge-industrial-ring-road.html). The pylons were divided into 3 sections with convoluted alteration zones. The ACS V climbing system ensured horizontally-located stands at all times for safe and ergonomic working operations (figure 5).



Figure 5. Mega bridge, industrial ring road in Bangkok ensured rapid construction system (www.peri.co.th/projects/civil-engineering/mega-bridge-industrial-ring-road.html)

Result

The idea of a modern building robot is demonstrated that completes horizontally. We can say that it is not far to obtain the load of building components from an appropriate preliminary level. Also, it would transfer horizontally to spread at necessary position for location. We believe that this would get a special standard of horizontal constructional designs in next years.

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Horizontal Building Construction II

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Abstract. The possible of advancing the horizontal building sector in the ranges of building-ready project materials and all-embracing protection rules are developing step by step. In this stud we pointed out the study for a building plan to encounter the new contests. We are focusing on the building explanation for an atmosphere that mixing convinced plan constraints, generating minimum trouble, doing contemporary construction engineering methods and administration to border the construction production.

Keywords: horizontal building, building project, building robotics

Introduction

It has been many discussions among the vertical construction works and the horizontal construction works showed that there is a major distinction that is to an excessive amount connected to the communal area and private area (Domich, 2005). The main points which act the capability of the vertical building sector and the horizontal construction sector to present modernization are the inspirations and the procedures that manage the sectos, and that are basically dissimilar in point of project, project and construction (Domich, 2005).

In this study, we are noting three project parameters;

- decentralized energy generation
- life-work integration

Of course, it is not easy to completely mix these parameters in a unique horizontal construction building. So, to show details of the parameters, we selected different construction models (Arshad, 2014).

The first phase of the study, we focus on project standards to encounter the contemporary requirements of construction building in a study part. Then, we present the difficulties challenged to mix the parameters in construction building (Arshad, 2014; Domich, 2005).

Energy group in a center point

Many experienced energy funds were considered connected to some concrete reasons, machineries, disadvantages and the effectiveness in order to offer a regionalized energy group. Different types of energy funds are in use all over the world such ass wind, waste, sunlight, heat, kinetics and water (Arshad, 2014; Hasegawa, 2010; Malakahmed at all. 2011). A lots of nations in the world as Germany, Turkey and China and others are using wind power for power generation (Arshad, 2014; Kocaman, 2016; Fu, X at all. 2012).

We note that kinetics is alternative energy source used many different areas. For example, human movement could be applied to yield energy by piezoelectric action (figure 1).



Figure 1. UK-based Pavegen company makes electricity-generating flooring
(www.futureentech.com/2016/05/pavegens-power-generating-floor)

Water sources could be practiced for energy production by using water excreciating, turbines and some technological equipment. From top to bottom construction could yield power from rainfall, for example, it falls from almost two hundred meters to a fifty flat construction (Arshad, 2014) (figure 2).



Figure 2. Water pumped Hydro Hawaii's Energy Storage
(www.google.com.tr/search?q=water+pumped+hydro+storage+technologies&rlz)

Life-Work integration

In modern and economic life, there is a propensity of a selection of staffs for many. Arshad (2014) give a similarity that “this is something like juggling the five balls at once; work, family, friends, health, spirit”. According to this story, if you drop one of glass balls, it will be damaged and will never be the same as it was before. Arshad stayed that this parameter can be integrated in organizations to provide the facilities for the workers with infrastructure (Arshad, 2014).

Some employers present elastic working times; “Beddington Zero Energy Development” is a useful staying presentation in Hackbridge, London, projected by the architect Bill Dunstern (Arshad, 2014; Wikipedia, Beddington Zero Energy Development) (figure 4).



Figure 4. BedZED organisation with a building of life-work integration
(www.greenroofs.com/projects/pview.php?id=547)

Result

The idea of a new building robot is demonstrated that accomplishes horizontally. We can say that it is not far to have the mass of construction fundamentals in an appropriate initial level. Also, it would transfer horizontally to spread at essential position for settlement (Arshad, 2014). We agree with that it would get a new model of horizontal construction building in next generation applications. Finally, at this level, its model could be advanced to do it a portion of a robotics building structure.

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HYBRID CONTROL OF RECTIFIER/REGULATOR FOR WPT 4 LEVEL WIRELESS CHARGING SYSTEM OF ELECTRIC VEHICLE

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Abstract: In this paper, hybrid control of rectifier/regulator of wireless power transfer system for electric vehicle has been studied. Hybrid control comprises integral cycle control and PWM control. It has good control capability in itself not causing severe switching loss. A prototype of 22 kW is made and tested, and its proposal is verified

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

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, f_i 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 f_i feature (Loscalzo et al., 2009).

$$C_j + 1 = \frac{\sum_{i=1}^p f_i K \left(\frac{C_j - f_i}{h} \right)}{\sum_{i=1}^p K \left(\frac{C_j - f_i}{h} \right)}, \quad j = 1, 2, \dots \quad (1)$$

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 $merit_S$, the mean attribute-class correlation is presented by rcf for $(f \in S)$, and the correlation between the mean attributes is presented by rff parameters.

$$merit_S = \frac{k * rcf}{\sqrt{k * (k-1) * rff}} \quad (2)$$

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_i attribute with M data can be found by equation 3.

$$E = - \sum_{i=1}^M (f_t(i) \log(f_t(i))) \quad (3)$$

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 M_{cmatch} cell is cloned and mutated. The number of clones is calculated by equation (9),

$$affinity \ threshold = \sum_{i=1}^n \sum_{j=j+1}^n \left(\frac{affinity(agi, agj)}{n(n+1)/2} \right) \quad (4)$$

$$affinity(agi, agj) = 1 - \text{Euclidean distance}(agi, agj) \quad (5)$$

$$stimulation = 1 - affinity \quad (6)$$

$$stimulation(mc, ag) = \begin{cases} affinity(mc, ag) & \text{if } mc.class = ag.class \\ 1 - affinity & \text{otherwise} \end{cases} \quad (7)$$

$$Mcmatch = \text{argmax}(stimulation(mc, ag)) \quad (8)$$

$$numClones = stimulation * clonalRate \quad (9)$$

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

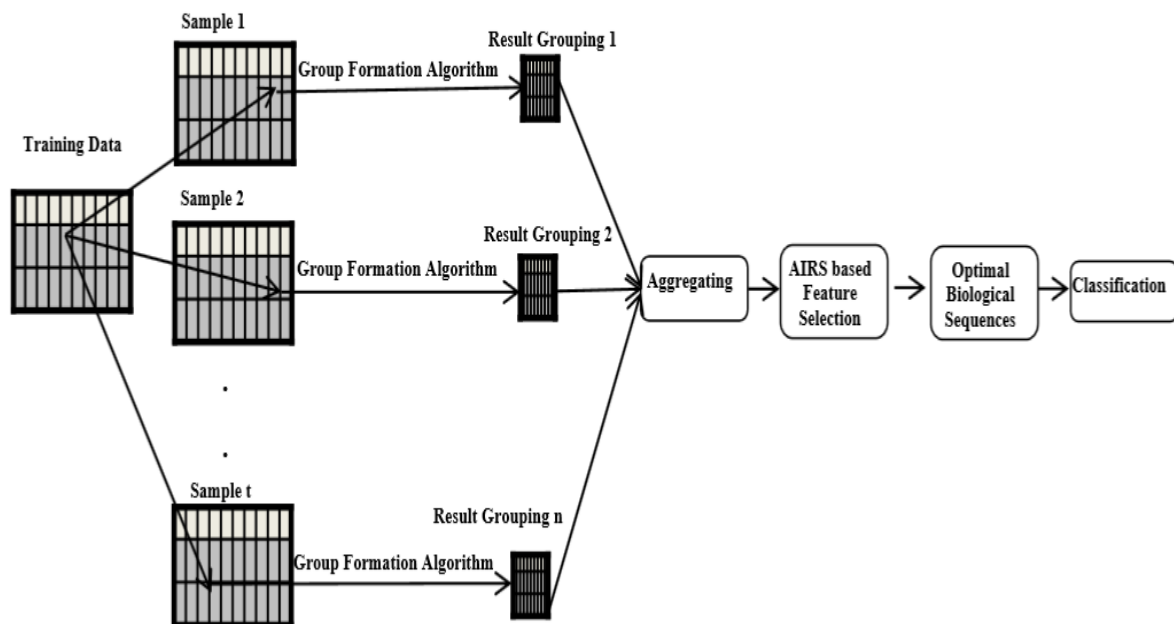


Figure 1.Proposed ensemble gene selection framework

B. Standard Artificial Immune Recognition Systems:


```

Input: InputPatterns, clone rate, mutationrate, stimthresh, resourcecmax, affinitythresh
Output: cell memor  $\leftarrow$  eInitializeMemoryPool(InputPatterns)
  For (InputPatterni  $\in$  InputPatterns)
    Stimulate (cellsmemory, InputPatterns)
  cellbest esGetMostStimulatedby1NN (InputPatterni, cellsmemory)
  If cellclass,best  $\neq$  eInputPatternclass,i
    Then cellmemory moCreateNewMemoryCell (InputPatterni )
  Else clonenum  $\leftarrow$  cellsstim, best x clonerate x mutationrate
    cellscloves  $\leftarrow$  lcellsbest
    For (i to clonenum )
      cellscloves  $\leftarrow$  lCloneAndMutate (cellsbest)
    End
    While (AverageStimulation (cellscloves )  $\leq$ , stimthresh
      For (celli  $\in$  cellscloves)
        cellscloves loCloneAndMutate (cellsi)
      End
      Stimulate (cellscloves, InputPatterns)
      ReducePoolToMaximumResources (cellscloves, resourcecmax)
    End
    cellsc elGetMostStimulated (InputPatterni, cellscloves)
    If (cellsstim , c > cellsstim , best)
      Then
        cellsmemory  $\leftarrow$  ecellsc
        If (Affinity(cellsc , cell best)  $\leq$  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 1 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

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 Artificial 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.

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		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	{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

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 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.

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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IMPROVEMENT OF SELF-LOOSENING PREVENTION EFFECTS OF THREADED FASTENERS THROUGH FINITE ELEMENT ANALYSIS

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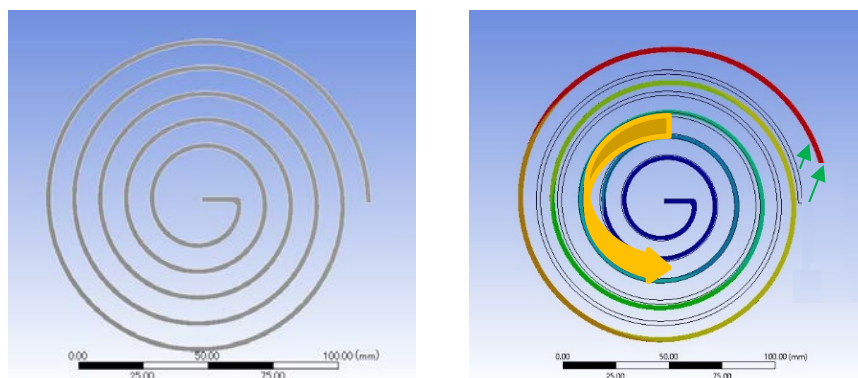
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Abstract: Threaded fasteners using screws/bolts are used not only in industrial field but also in various fields such as precision instruments and medical field. Many accidents caused by the loosening of the screw/bolt threaded fasteners are actually reported. As one countermeasure, nut with spring washer is used, but there remains the problem that effective loosening prevention effects cannot be obtained in the case of increasing in the parts number or no-using of such nuts etc. Then further improvement on loosening prevention effects of screw/bolt threaded fasteners are desired. In this research, new screw/bolt structures having self-loosening prevention effects are designed by applying the spring characteristic swelling effects in loosening direction of springs. 3D CAD modeling and finite element analyses are carried out to evaluate the spring characteristic effects and self-loosening prevention effects of new designed screw/bolt structures. Analytical results indicated that self-loosening prevention effects can be affected by the shape/size design variables of applied helical cuttings introduced for new screw/bolt structures.

Keywords: Threaded fasteners, Screws/Bolts, Spring characteristic effect, Self-loosening prevention effects, 3D CAD modeling, Finite elements analysis

Introduction

There are various kinds of fastening methods using screws/bolts for threaded fasteners, such as using bolts and nuts together or tapping screws. Designers can select different products or fastening methods assuming to different environments. Many of analytical and experimental investigations on self-loosening bolt fasteners problems ^{[1]-[3]}, however, loosening problems of threaded fasteners are still unavoidable through the screws/bolts tightening methods under cyclic vibrations or external compact loadings. In our previous research ^[4], spring characteristic effects as shown in Figure 1 are interested as applied to new designed screw/bolt structures, which can result to self-loosening preventive effects on threaded fasteners. The spring characteristic effect means that spring structure as shown in Figure 1(a) has the swelling effect under rotating counterclockwise (loosening direction) as shown in Figure 1(b).



(a) Spring structure (b) Swelling effect in loosening direction
Figure 1. Conceptual diagram of spring characteristic effect

Concept structural designs on conventional M6 hexagon bolt for obtaining self-loosening preventable threaded fastener purposes were carried out by using 3D CAD software SolidWorks ^[4]. Helical cutting with cross-sectional shape and cross thread turning in reverse direction to thread rotation direction were introduced to general hexagon bolts as shown in Figure 2(a) and (b). As the result, new bolt structures provided by plurality of springs cross each other are designed with spring characteristic effects supposed to be imparted as shown in Figure 2(c). Spring characteristic effects of the helical-cutting applied bolts were firstly confirmed by analytical approaches under counterclockwise rotating loading.

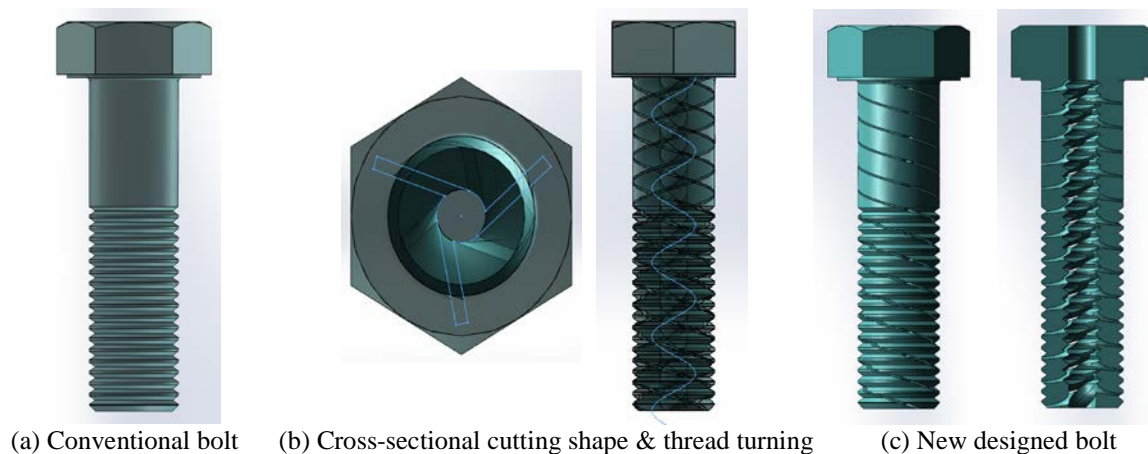


Figure 2. Helical-cutting applied bolt for self-loosening preventable threaded fasteners

In this research, parametrical studies are executed to evaluate the affections of different design variables, such as line width of cross-sectional cutting shape and helical pitch applied to screw structures, on the self-loosening preventive effects of threaded fasteners.

Parametrical investigation of helical cutting process on self-loosening prevention effects

Self-loosening preventable effects of threaded fasteners using the helical-cutting applied bolts can be confirmed through finite element analysis modeling on Junker vibration test, which is based on ISO 16130 standard including new designed bolt, nut, fixed plate and vibration plate as shown in Figure 3. The friction generated on the contact surfaces between the stationary plate and the diaphragm and nut are considered not negligible and the friction coefficient are set to 0.17 obtained from experimental result [1]. The contacts between each surfaces are modeled as contact elements based on the penalty method. Table 1 shows the constraint conditions used for analytical modeling of Junker vibration test. C45 and X12Cr13 materials are applied for designed bolts, nuts, and testing fixtures of Junker vibration test. Detail material properties are as shown in Table 2 for self-loosening prevention effect evaluations.

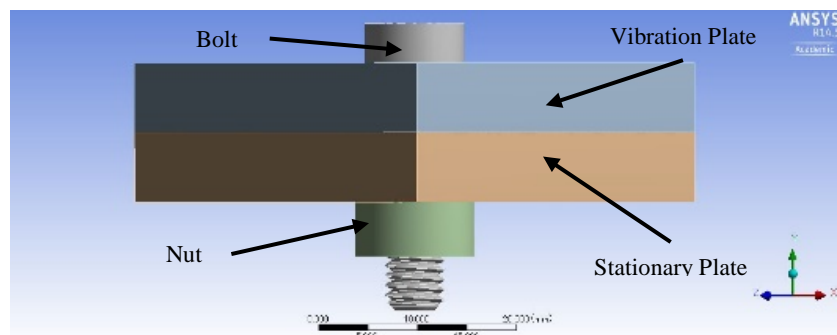


Figure 3. Analytical model of Junker vibration test

Table 1. Restraint conditions for analytical modeling of Junker vibration test

Test Type	ISO 16130 Junker Vibration Test
Number of Vibrations	1000
Direction of Vibrations	x Direction : $\pm 0.3\text{mm}$
Fixed	Side of Fixed Plate
	Bolt End : x and z Directions
Fastening Axial Force	4330N

Table 2. Material properties used for analytical modeling of Junker vibration test

Material	C45	X12Cr13
Young's Modulus	205GPa	200GPa
Poisson's Ratio	0.3	0.3
Density	7800 kg/m ³	7800 kg/m ³
Applied Parts	Bolt, Nut	Vibration Plate, Stationary Plate

Three dimensional modeling on Junker vibration test of threaded fasteners are executed using new designed M6 screw/bolt structures with different design variables based on the analytical method mentioned above. The design variable of line width of cross-sectional cutting shape as shown in Figure4 are changed from 0.5 mm to 0.9 mm with every 0.1 mm based on conventional M6 bolt. Design variable of helical cutting pitch as shown in Figure5 are changed from 11.0 mm to 19.0 mm with every 2.0 mm for numerical studied. 25 cases combined between line width of cross-sectional cutting shape and helical cutting pitch are considered in the analytical evaluations as shown in Table3.

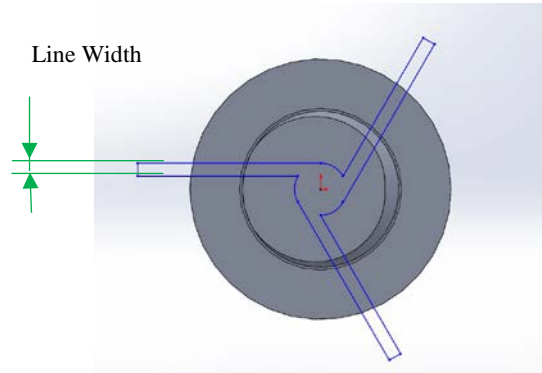


Figure4.Design variable of line width of cross-sectional shape for helical cutting process on M6 bolt

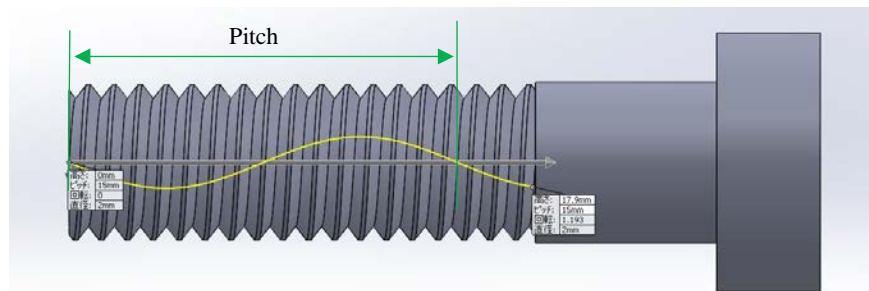


Figure5.Design variable of helical pitch for helical cutting process on M6 bolt

Table3.Design variables for analytical evaluation of Junker vibration test

Helical cutting pitch, mm	Line width of cross-sectional cutting shape, mm				
11	0.5	0.6	0.7	0.8	0.9
13					
15					
17					
19					

Analytical results on self-loosening prevention effect evaluation of threaded fasteners using new designed bolts with helical cutting

Analytical results of the self-loosening prevention effects using the designed new bolt structures with different design variables are shown in Figure6 to Figure15 based on the analysis method above mentioned. Horizontal axis shows the iteration number of vibrations and vertical axis shows the axial forces of threaded fasteners representing the loosening conditions.

Figure6 to Figure10 show the analytical results for each helical cutting pitch with different line widths. From these results, it can be seen firstly that for small helical cutting pitch like 11.0 mm and 13.0 mm, self-loosening preventive functions are observed for most cases of different cross-sectional cutting line width. Secondly, the falling of axial forces due to the iterated vibrations becomes gentle with thicker line width of cross-sectional cutting shape in the cases of helical cutting pitch large than 15.0 mm. These results conclude that utilization of new designed screw/bolt structures with small helical cutting pitch are available to obtain self-loosening preventive threaded fasteners.

Figure11 to Figure15 show the analytical results for each line widths with different helical cutting pitch. From these results, it can be seen that for thicker line width more than 0.7 mm, self-loosening preventive functions can be obtained for more cases of different helical cutting pitch. Secondly, combination between helical cutting pitch

and line width of cross-sectional cutting shape are very important for the self-loosening preventive effect of threaded fasteners.

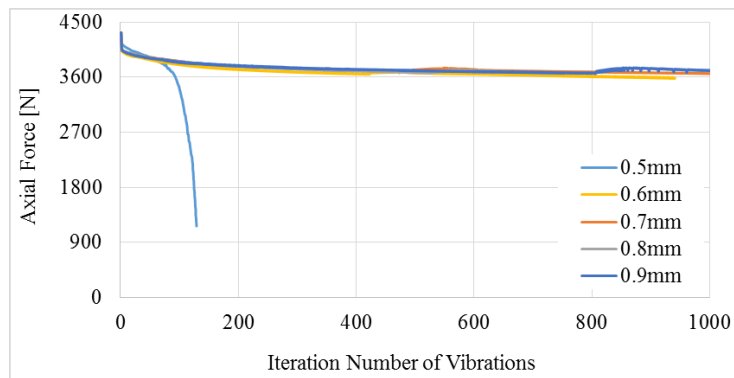


Figure6.Changes on axial forces for pitch of introduced helical cutting process: 11mm

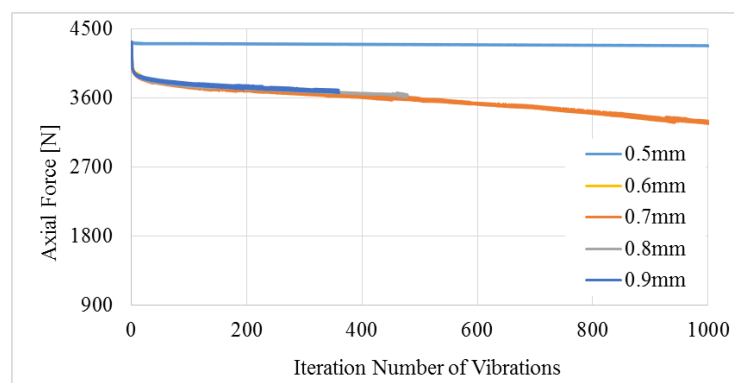


Figure7.Changes on axial forces for pitch of introduced helical cutting process: 13mm

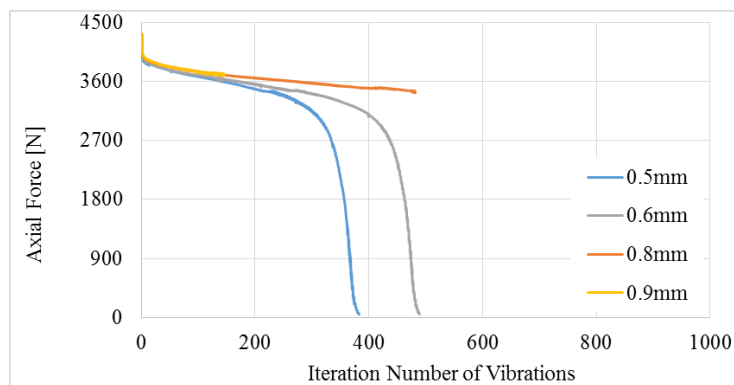


Figure8.Changes on axial forces for pitch of introduced helical cutting process: 15mm

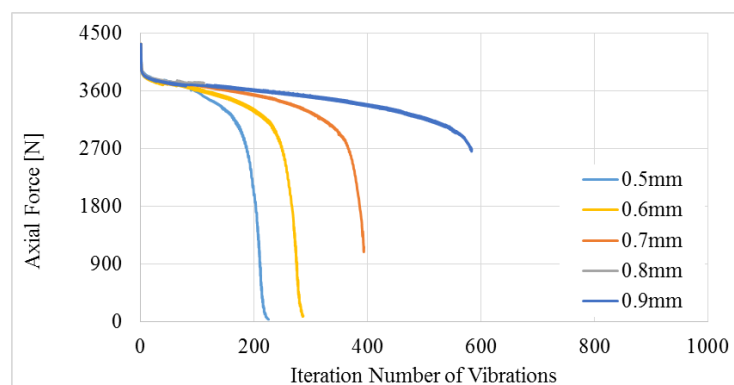


Figure9.Changes on axial forces for pitch of introduced helical cutting process: 17mm

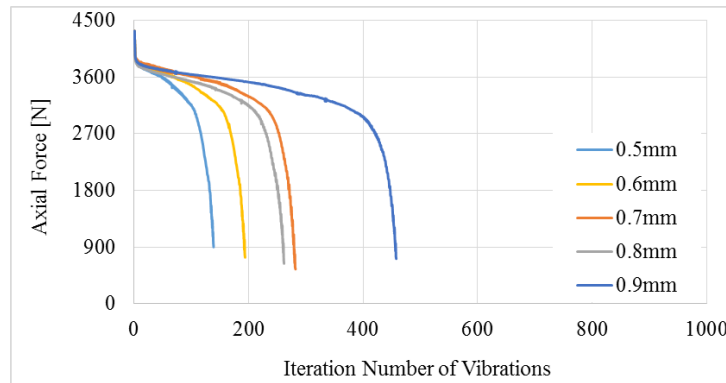


Figure10.Changes on axial forces for pitch of introduced helical cutting process: 19mm

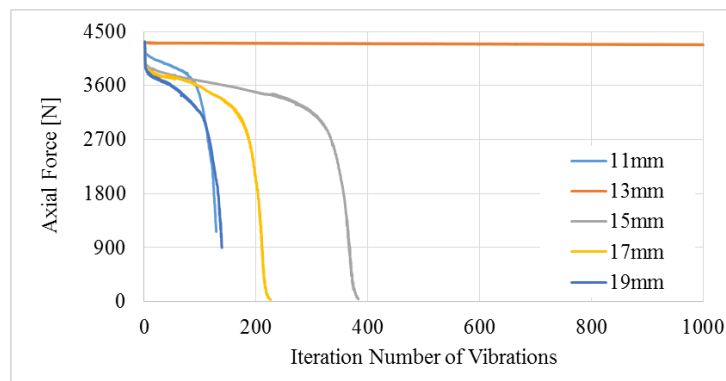


Figure11.Changes on axial forces for line width of cross-sectional cutting shape: 0.5mm

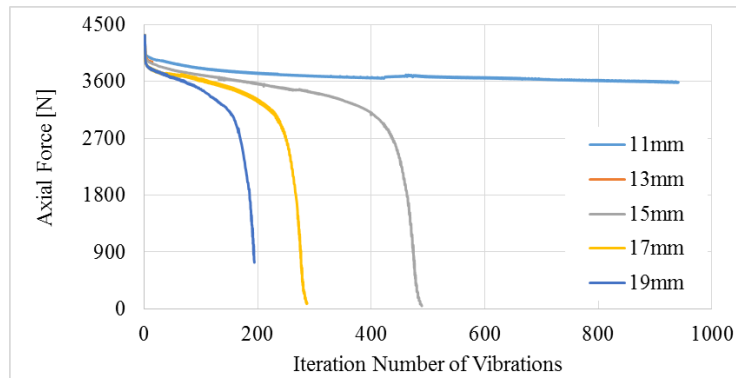


Figure12.Changes on axial forces for line width of cross-sectional cutting shape: 0.6mm

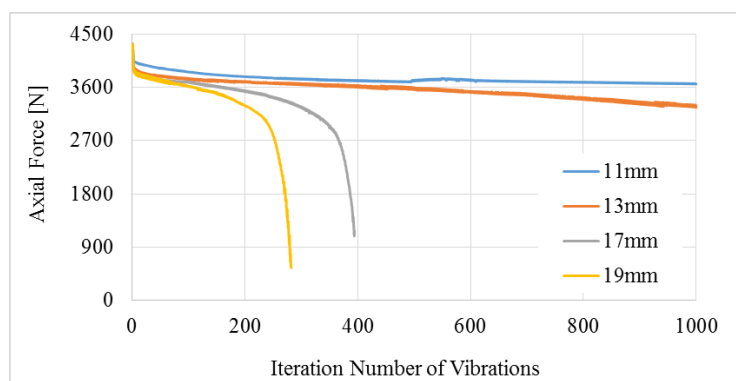


Figure13.Changes on axial forces for line width of cross-sectional cutting shape: 0.7mm

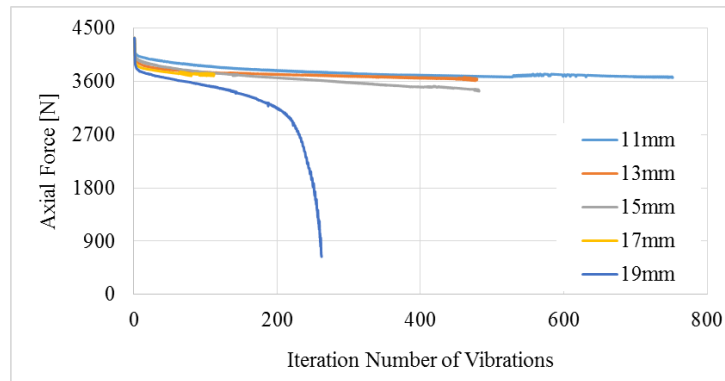


Figure14.Changes on axial forces for line width of cross-sectional cutting shape: 0.8mm

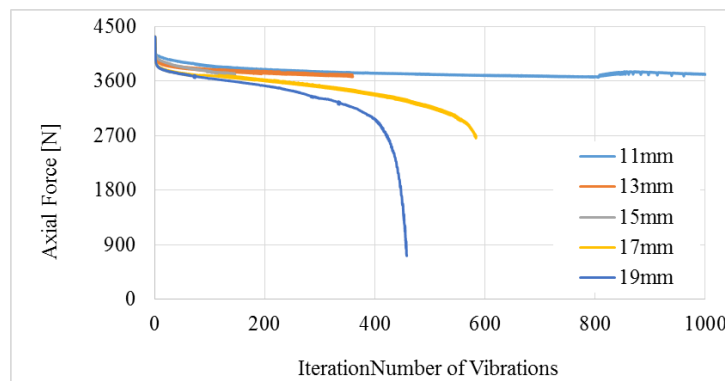


Figure15.Changes on axial forces for line width of cross-sectional cutting shape: 0.9mm

Conclusion

In this study, parametrical studies are executed to evaluate the affections of different design variables, such as line width of cross-sectional cutting shape and helical pitch applied to screw structures, on the self-loosening preventive effects of threaded fasteners. From analytical results, the following conclusions are obtained.

1. Utilization of new designed screw/bolt structures with small helical cutting pitch are very effective to obtain self-loosening preventive threaded fasteners.
2. For cross-sectional cutting shape with thicker line width, self-loosening preventive functions can be obtained for more cases of different helical cutting pitch.
3. Combination between helical cutting pitch and line width are very important for the self-loosening preventive effect of threaded fasteners using different screw/bolt structures.

Because the deterioration on strengths of bolts caused by the helical cutting processing on screw structures, strength evaluation should be carried out for threaded fasteners using the new designed screw/bolt structures in the future study.

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IMPROVEMENT ON TENSILE STRENGTH AND FATIGUE PERFORMANCES OF MESHED GUM METAL PLATES FOR BONE GRAFT APPLICATIONS

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Abstract: Degenerative intervertebral discs have a sign of epidemic as one of diseases caused by aging and lifestyle habits. Currently practiced treatments called spinal fusion surgery using pure titanium or titanium alloy implant products have the problems like overloading on healthy nature bones caused by the extra stiffness and heavy weight of such metal implants. Therefore, creation of implant products that meets mechanism like density, elasticity/rigidity of nature bones are required to reduce the burden on patient's health bones. Meshed titanium plates for bone graft applications have improved with excellent three-dimensional (3D) flexibility, lower elastic modulus and higher strength in previous studies. In this study, mesh structures as applied on Gum Metal plates with high biocompatibility are interested and their tensile strength/fatigue performance are investigated through analytical and experimental approaches for implant application on intervertebral disc defections. Based on different basic mesh shapes designed in this study, sample meshed Gum Metal plates were fabricated by laser cutting process and tensile fatigue experiments were executed. It concluded that high strength and fatigue performance of meshed Gum Metal plates can be obtained by using with some kind of designed basic mesh shapes.

Keywords: Tensile Strength, Fatigue Performance, Mesh Structure, Gum Metal Plates, Analytical and Experimental Approaches

Introduction

Recently in Japan, degenerative intervertebral discs have a sign of epidemic as one of diseases caused by aging and lifestyle habits. Degenerative intervertebral discs include lumber disc herniation, intervertebral disc herniation and cervical disc herniation. Table 1 shows the comparison of annual case numbers of these patients with/without surgeries having been increased year by year.

Table 1 Comparison of annual case number of surgeries for hernia of intervertebral discs

Individual surgeries	Total case number		Average days in hospital	
	2014.4~2015.3	2016.4~2017.3	2014.4~2015.3	2016.4~2017.3
Accumulation period	2014.4~2015.3	2016.4~2017.3	2014.4~2015.3	2016.4~2017.3
Surgical removal	7,152	8,216	11.5	10.6
Other surgeries	17,187	17,156	18.0	17.3
No surgeries	16,590	17,246	9.8	9.9
Total throughout the year	40,929	42,618	13.5	13.0

In this study, disc herniation as one type of disc defects is interested. Disc herniation means that the intervertebral disc protrudes beyond the normal intervertebral space to compress the nerve and cause pain as shown in Fig.1. The treatment for disc herniation varies depending on different conditions. One of the currently practiced treatments is called spinal fusion surgery using metallic implants as also shown in Fig. 1. In this treatment, the upper and lower spinal cords of the defective disc are fixed using pure titanium or titanium alloy implant products. However, there is a problem that the loads caused by the titanium metal implants on the nature bones of the human body are large and will cause overloading on healthy nature bones^[1]. Therefore, in order to reduce the loads on patient's health bones, creation of flexible implant products matching the mechanism such as the elasticity and rigidity of natural bones are desired as much as possible.

Mesh structure^[2] applications are then considered for Gum Metal plates as applied on spine for hernia of intervertebral discs. Basic mesh shapes are designed and applied for Gum Metal plates and mechanical performances such as bending stiffness, tensile strength and fatigue performances of such meshed Gum Metal

plates are experimentally and analytically evaluated^{[3]~[6]}. The purpose of this study is to improve the tensile strength and fatigue performances of meshed Gum Metal plates as applied for hernia of intervertebral discs.

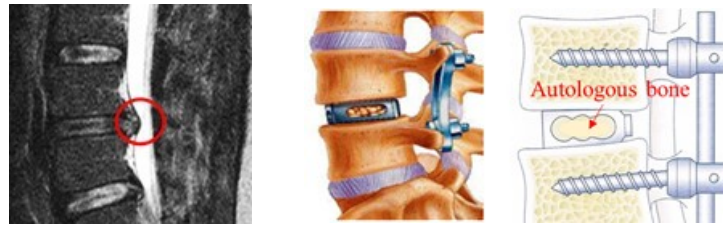


Fig. 1 MRI image of disc herniation (left) and metallic implant installation examples (right)

Design of Basic Mesh Shapes for Meshed Gum Metal Plates

Mechanical characteristics of Gum Metal plates

As shown in Fig. 2^[7], Gum Metal material shows characteristics like relatively low elasticity rigidity, high strength, large elastic deformability and high biocompatibility compared with other metals and metal alloys.

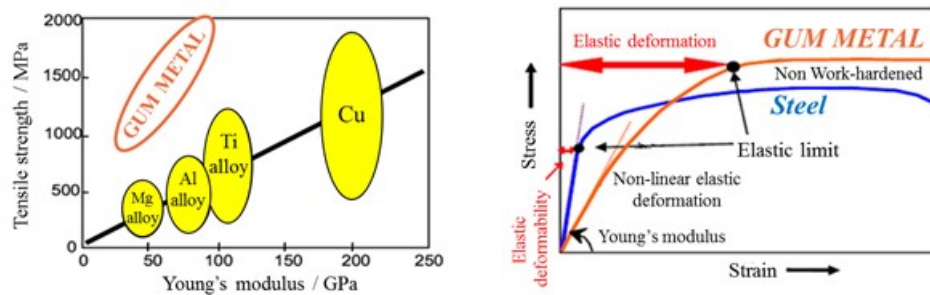


Fig. 2 Comparison of mechanical properties between GUM METAL and other metals

Designed basic mesh shapes and model of meshed Gum Metal plates

Basic mesh shapes are designed under the following design conceptions.

- (1) Single fundamental mesh shape construction for simplification of manufacturing processing and cost-down purpose
- (2) Higher three-dimensional flexibilities including expansion/contraction, bending and torsion for possibility of handily shape changes during surgery
- (3) Easy-controllable mechanical properties like elastic modulus, bending stiffness etc. for approachability to natural-bone's mechanical properties

Fig. 3 shows an example of the meshed structure with S curves obtained by patterning the basic mesh shape following the above design concepts.

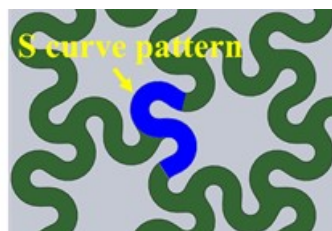


Fig. 3 Example of meshed structure with S curves from basic mesh shape pattern

Two types of basic mesh shapes are designed based from regular tetragon and regular hexagon, 90° and 60° axisymmetric mesh shapes, following the above mentioned design concepts using 3D CAD software SolidWorks as shown in Fig. 4. The radius R and diameter D of the circles shown in Fig. 4 are taken as design variables of basic mesh shapes for parametric studies. For each types, basic mesh shapes are introduced for analytical and experimental approaches having different design variables and including the improved mesh designs of 90° axisymmetric 90°-④ and 90°-⑤ as shown in Fig. 5. Using these basic mesh shapes, prototype meshed plate models of meshed plates are then created and also shown in Fig. 5. Meshed Gum Metal plate specimens are then manufactured by laser-cutting processing as shown in Fig. 6. These meshed plate specimens are subjected to tensile

fatigue experiments to evaluate their tensile fatigue characteristics and shape models are used for stress analysis. The influence on the stress concentration of the meshed plate specimens by different design parameters are evaluated by finite element analysis through ANSYS Workbench.

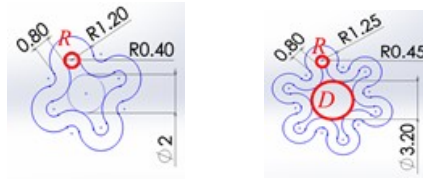


Fig. 4 Design variables of basic mesh shapes (left: 90° axisymmetric type, right: 60° axisymmetric type)

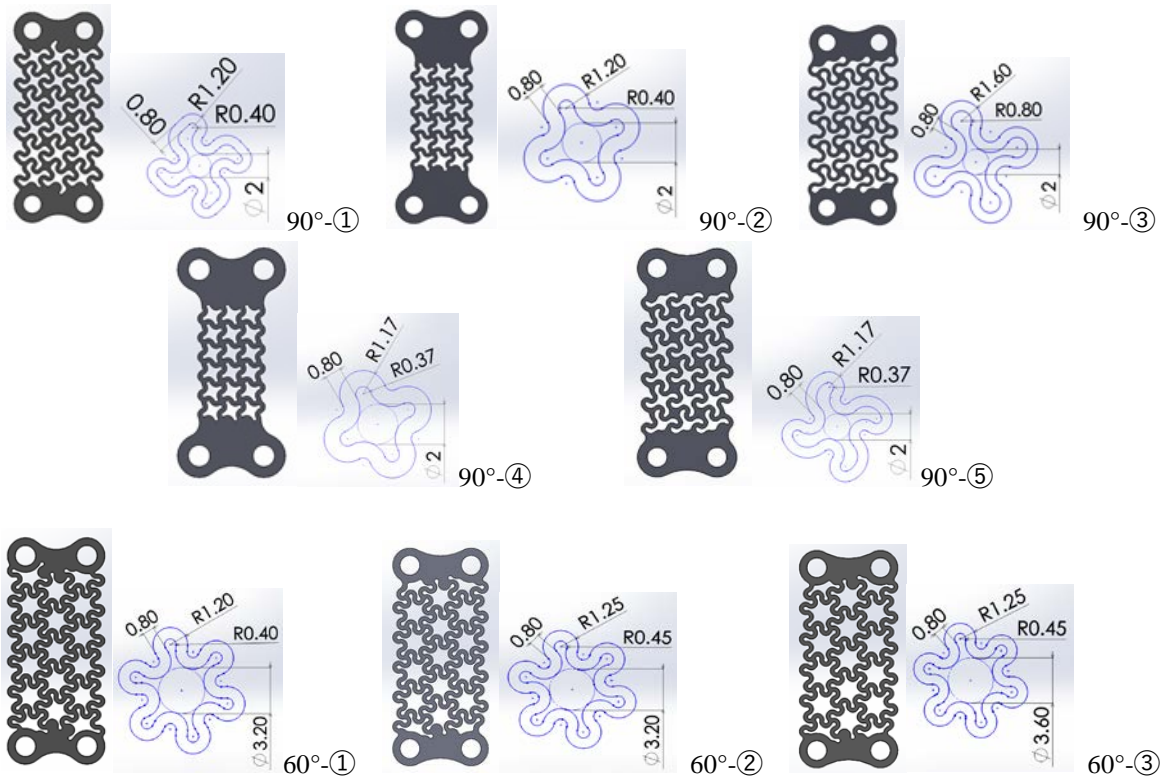


Fig. 5 Basic mesh shapes and meshed plate models for meshed Gum Metal plate specimens
(90° axisymmetric shapes: ①-⑤, 60° axisymmetric shapes: ①-③)

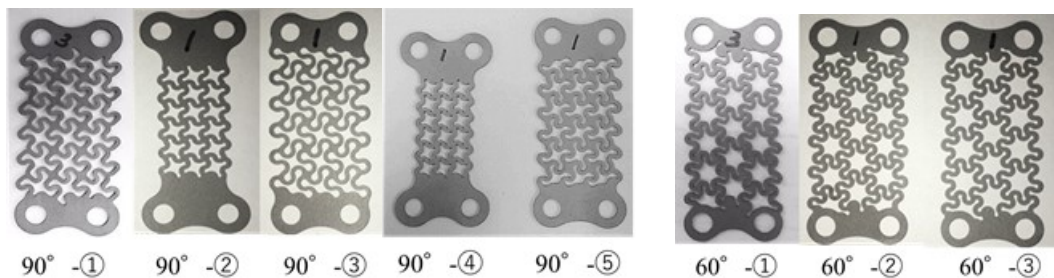


Fig. 6 Sample meshed Gum Metal plate specimens for tensile fatigue tests
(left: 90° axisymmetric shapes ①-⑤, right: 60° axisymmetric shapes ①-③)

Tensile Fatigue Characteristics of Meshed Gum Metal Plates

Tensile fatigue experiment on meshed Gum Metal plates

Tensile fatigue tests of meshed Gum Metal plate specimens were conducted based on JIS standard Z 2273 using special fixtures necessary for thin plates. Total 36 specimens of 6 types of meshed plates were tested with testing machine (Asahi Seisakusho FRS-20) and specimen installation as shown in Fig. 7. The amplitude of iterated tensile

loads were ranged from 20N to 90N with 10N amplify and 5N minimum tensile loading as shown in Table 1. The frequency of tensile load iteration was set at 10Hz.

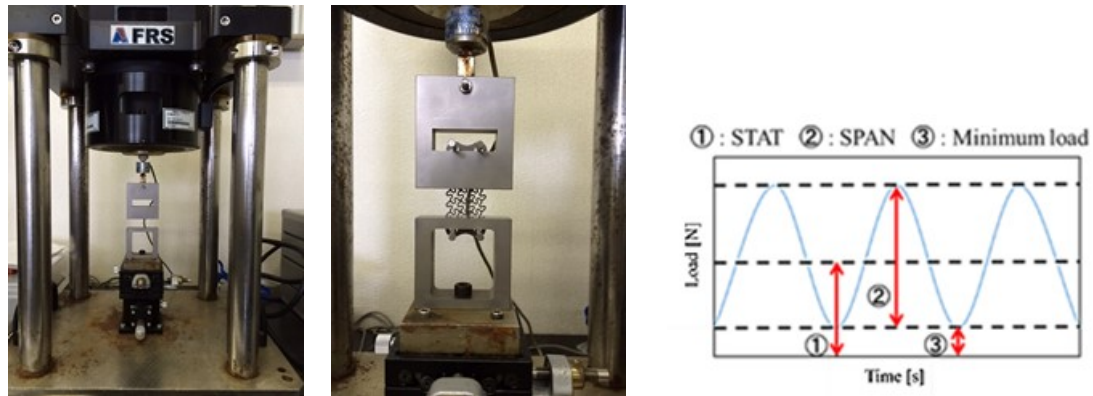


Fig. 7 Tensile fatigue experiment and meshed Gum Metal plate specimens with machine, fixtures and settings

Table 1 Tensile fatigue test tensile loads (90° and 60° axisymmetric specimens)

No. of specimen	No.1~No.6
SPAN [Np-p]	20N~90N
STAT [N]	25N~95N
FREQ [Hz]	10.0

Stress analysis for meshed Gum Metal plates under fatigue tensile loading

It is difficult to use the effective cross-sectional area of the meshed plate specimens for stress calculations because of the complex meshed shapes. Then stress analyses using finite element analysis software ANSYS Workbench were carried out in order to grasp the maximum Von Mises stresses under iterated tensile loading of the tensile fatigue tests. Fig. 8 shows the image of finite element mesh for sample meshed plate specimen models and Table 2 shows the finite element mesh information for all types of meshed plate specimen models. Material properties of Gum Metal shown in Fig. 2 are used for analytical approach.

From the obtained stress contour plots of sample 90° and 60° axisymmetric specimens also shown in Fig. 8, it can be confirmed that the stress concentrations occurred at the same locations and didn't change so much for different specimen types under different tensile loading. Maximum Von Mises stresses with respect to tensile loads obtained from these analytical results are shown in Fig. 9 of sample meshed plate specimen models with different design variables.

Table 2 Analytical conditions for each meshed GUM METAL plates (90° and 60° axisymmetric models)

Analytical conditions	90°-①	60°-①	90°-②	60°-②	90°-③	60°-③	90°-④	90°-⑤
Element size [mm]	0.124	0.125	0.122	0.125	0.128	0.122	0.129	0.129
Number of elements	179,235	187,380	202,740	187,380	188,995	194,304	163,476	201,246
Number of nodes	232,962	240,695	249,774	240,695	245,046	247,303	201,306	252,679

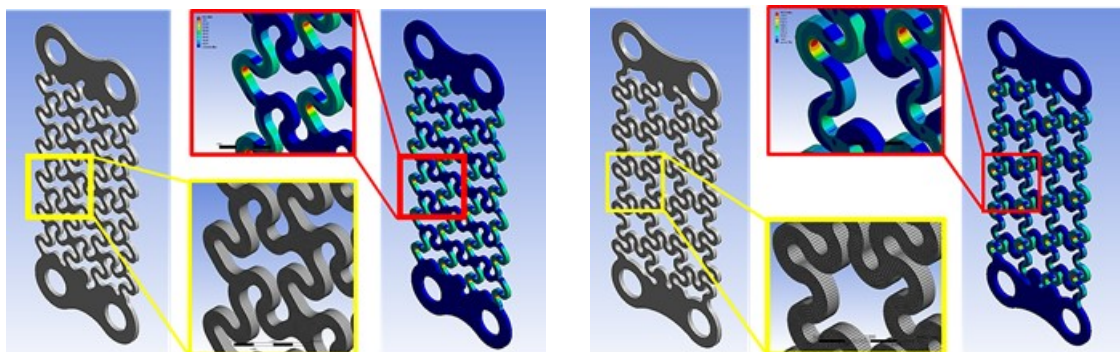


Fig. 8 Finite element mesh and tensile stress results of sample meshed plate models (left: 90°-①, right: 60°-③)

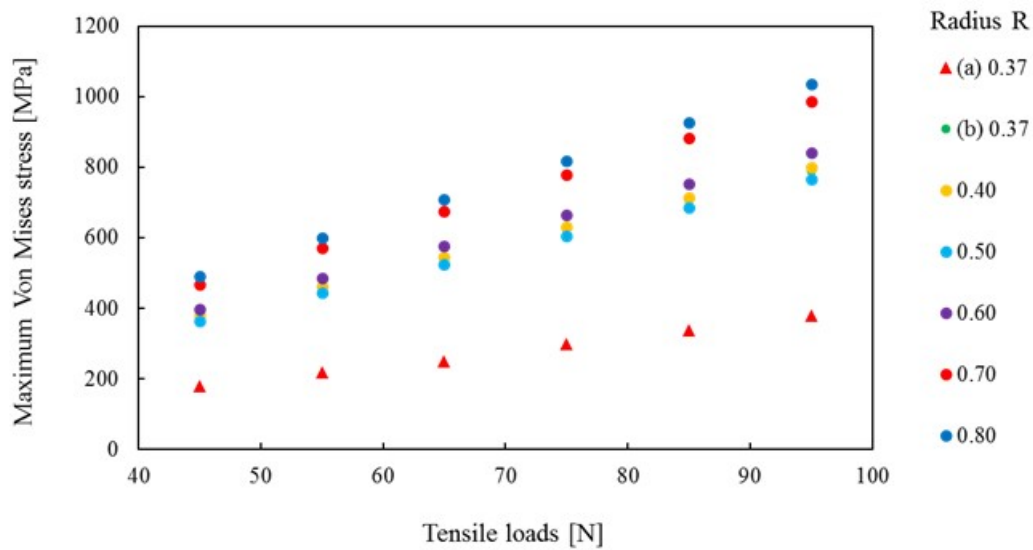


Fig. 9 Maximum Von Mises stress results with respect to tensile loading (90°: circle, 60°: triangle)

Results And Discussion

Tenise fatigue characteristics of sample meshed Gum Metal plate specimens

Firstly, Fig. 10 and Fig. 11 show the fractured photographs of sample 90° and 60° axisymmetric meshed Gum Metal plate specimens after tensile fatigue tests. Compared with the stress contour diagram of the tensile stress analysis results as shown in Fig. 8, it can be seen that meshed plate specimens fractured at the same location with the stress concentration occurred.

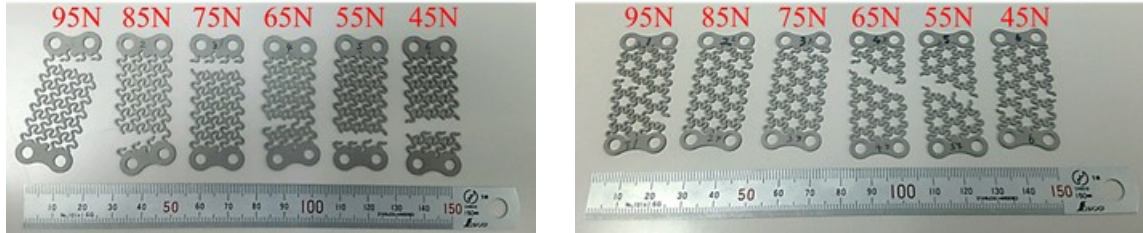


Fig. 10 Meshed Gum Metal plate specimens after tensile fatigue tests
(left: 90° axisymmetric specimen ①, right: 60° axisymmetric specimen ③)

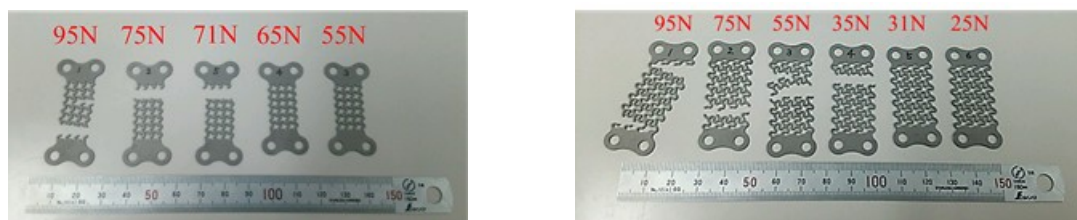


Fig. 11 Improved meshed Gum Metal plate specimens after tensile fatigue tests (left: 90°-④, right: 90°-⑤)

Secondly, the maximum Von Mises stress results are shown in Fig. 12 with respect to maximum iteration number of tensile loading until specimen fractured, combined with experimental and analytical results on the tensile fatigue tests of sample meshed Gum Metal plate specimens. Vertical axis represents the maximum Von Mises stresses under different tensile loads from finite element analysis, and horizontal axis represents the maximum iteration number of tensile loads obtained from the tensile fatigue experiments.

From these results shown in Fig. 12, durability of meshed Gum Metal plate specimens changed little with 60° axisymmetric type specimens under different design variables, which was different with the type of 90° axisymmetric specimens.

On the other hand, the maximum Von Mises stress results of improved meshed Gum Metal plate specimen 90°-④ and 90°-⑤ are also plotted on Fig.12 with respect to maximum iteration number of tensile loading until specimen fractured. From these results shown in Fig. 11 and 12, it can be seen that the improved 90° axisymmetric specimen ④ and ⑤ have both reached the fatigue limit at 10^7 iteration number with lower maximum Von Mises stress value and without specimen fractured. Both improved meshed Gum Metal plate specimens 90°-④ and 90°-⑤ show the same maximum Von Mises stress value approximately 200MPa as the tensile fatigue limit of meshed Gum Metal plates, although under different amplitude of tensile loads.

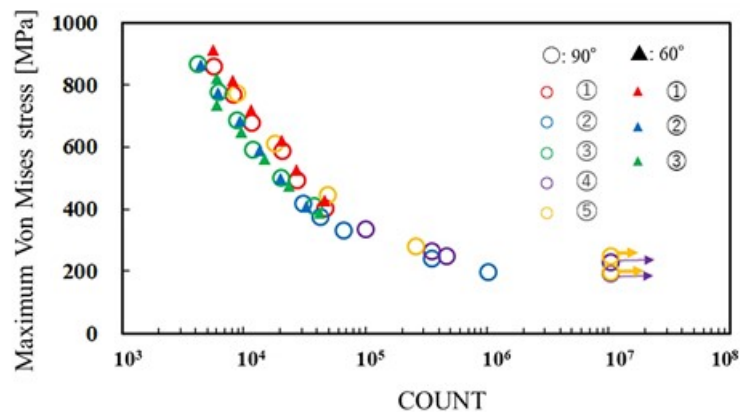


Fig. 12 Combined results of tensile fatigue tests for all sample meshed Gum Metal plate specimens (90°: circle, 60°: triangle)

Improved basic mesh shapes for 90° axisymmetric meshed plate specimens ④ and ⑤ have the following characteristics compared with original 90° and 60° axisymmetric specimens.

- (1) Gentle curvatures of S curves caused by the basic mesh shapes
- (2) Small S curves with minimum value of radius R of basic mesh shapes
- (3) Smaller projected area per basic mesh shape with enough strength to withstand fatigue tensile loads

As the curvature degree of S curve decreases in the improved basic mesh shapes ④ and ⑤, the tensile loads are dispersed and caused lower maximum Von Mises stresses on meshed plate models. It was found that maximum Von Mises stress of the obtained meshed plate specimens can be suppressed and then it's effective to increase the iteration number of fatigue tensile test. It can be concluded that changing the S curves caused by design parameters like radius R in basic mesh shapes will affect the stress concentration, and as the results, greatly affect the tensile fatigue characteristics of meshed plate models.

Totally, from the experimental and analytical results obtained in this study, tensile fatigue characteristics of meshed Gum Metal plates are influenced by the stress concentrations mainly caused by S curves of basic mesh shapes. It is considered that for each type of meshed plate specimens, different tensile loads should be determined from finite element analysis to obtain lower than 200MPa maximum Von Mises stresses for meshed Gum Metal plates to reach the tensile fatigue limit at 10^7 iterations.

Conclusion

Experimental and analytical evaluation on tensile fatigue characteristics of meshed Gum Metal plates were executed. From the experimental and analytical results,

- (1) Fractures were occurred at the inflectional locations with large curvatures for both type of the specimens, and coincident with the stress concentration locations obtained from analytical results.
- (2) The change in curvatures of basic mesh shapes was found to greatly affect maximum tensile stress results. It was also found to effect on experimental results of sample meshed plate specimens, such as the number of cycles at final fractures under different tensile fatigue loads. On the other hand, it was found that changing

the central circle diameter D of basic mesh shape would hardly affect the tensile fatigue characteristics of sample meshed plate specimens.

- (3) By broadening the tensile load ranges of tensile fatigue tests for different sample specimens, it was confirmed that maximum Von Mises stresses from the sample meshed plate models with different basic mesh shapes can be grasped analytically and then to reach the tensile fatigue limits of meshed plate specimens.

Therefore, design change on meshed structures such as adjustment of the curvature of S curves caused by the pattern of basic mesh shape are effective for improving the fatigue resistance characteristics of meshed plates under tensile loading.

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İMZA TANIMA İLE ÖĞRENCİ DEVAM SİSTEMİ TASARIMI

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Özet: Yükseköğretim kurumlarında öğrencilerin derslere katılması başarıyı etkileyen en önemli faktörlerin başında gelmektedir. Buna çözüm olarak belirli oranda devam etmeyen öğrencilerin devamsızlıktan kalması bazı üniversitelerin yönetmeliklerinde yer almaktadır. Bu kapsamda ek donanım gerektiren manyetik veya biyometrik okumaya dayalı birçok yoklama sistemi geliştirilmiştir. Bu sistemlerde donanım maliyetlerinin yüksek olması, manyetik kartların başka öğrenciler tarafından okutulması başlıca problemler arasında gelmektedir. Bu çalışmada ek donanıma gerek duyulmayan, imza tanıma ve karşılaştırmasına dayalı bir yoklama sistemi tasarlanmıştır

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Özet

Bu çalışma İnandık (Çankırı) Köyü'nde son birkaç yıl içinde meydana gelen yer çökmeleriyle bağlantılı olarak oluşan dolinlerle ilgilidir. Buradaki dolinlerin oluşumunu ve yakın çevresine etkilerini açıklayabilmek için sahanın jeoloji raporları incelenmiş ve jips karstı literatürü taranmıştır. Çökme olaylarının yaşandığı köyde arazi gözlemleri yapılarak litoloji ve topografya ile ilgili bilgiler toplanmıştır. Çalışmanın bulgularına göre bir tanesi hafriyatla doldurulmuş olmak üzere 3 çökme dolini tespit edilmiştir. Söz konusu dolinlerin 2 tanesi örtü kayası çökme dolini ve bir tanesi de alüvyal örtü çökme dolini olarak sınıflandırılmıştır. İnandık Köyü'nün 1,5 – 2 km kuzeybatısında KB-GD uzanışlı bir hat boyunca görülen bu dolinler, jips karstıyla bağlantılı yeraltı boşluklarının tavan kısımlarının çökmesi sonucu oluşmuştur. Yeraltı boşluklarından kaynaklanan çökme olaylarının neden olduğu yerel sarsıntılar, 2015 yılının başından itibaren İnandık Köyü'nde konutların hasar görmesine neden olmuştur. Süregelen bu tehlikeli duruma önlem olarak 2017 yılının Kasım ayında Afet ve Acil Durum Yönetimi (AFAD) Başkanlığı köyün yerinin değiştirilmesine karar vermiştir.

Anahtar Kelimeler: Çökme dolini, jips karstı, yeraltı boşlukları, İnandık

Giriş

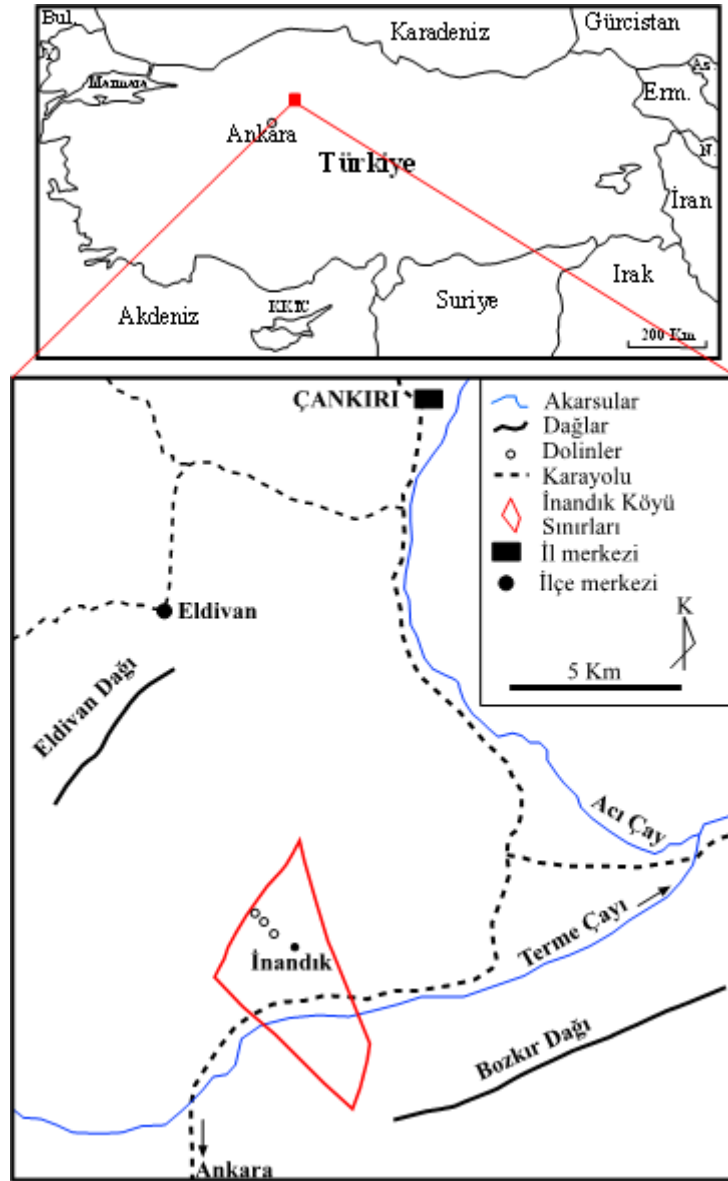
Kalker, jips veya kayatuzu katmanlarından oluşan yeraltı litolojisine sahip bölgelerde gelişen yeraltı boşluklarıyla bağlantılı çökmeler, oldukça derin olabilen genellikle dairesel bir şekle sahip çukurların (çökme dolinlerinin) oluşmasına neden olur. Meteorik suların etkisiyle jips ve kayatuzunda başlayan karstik prosesler, diğer koşullar aynı kabul edildiğinde, kalkerdekine göre daha hızlı gerçekleşir (Cooper and Gutiérrez, 2013; Doğan, 2002). Jips içeren formasyonların farklı seviyelerinde, jipsin erimesi sonucunda oluşan boşlukların boyutları ve jips tabakalarını örten katmanların litolojik özellikleri sığ veya derin dolinlerin oluşmasına neden olabilir. Ayrıca çökme sürecinin ani veya kademeli gerçekleşmesi de yine yeraltı boşluklarının boyutuna ve boşluk tavanının litolojik özelliklerine bağlıdır. Çökme sürecinde yeraltı su seviyesinin hareketi de önemli rol oynamaktadır.

Türkiye'de Çankırı ve Sivas çevresinde yaygın olan jips karstını jeolojik, jeomorfolojik ve hidrojeolojik açıdan inceleyen birçok çalışma bulunmaktadır (örn. Alagöz, 1967; Doğan, 2002; Değirmenci vd., 1995). Bu çalışmalarda jips karstının özellikleri, kimyasal süreçler ve neticede oluşan karstik yerçekilleri ele alınmıştır. Son yıllarda, oluşum sıklığı ve sayısı Konya Ovası'ndaki kadar olmasa da, Çankırı ve Sivas çevresinde yer çökmesine bağlı oluşan dolinlerin sayısı artmıştır. Bir yandan su kaynaklarının tüketimindeki artış diğer yandan iklim değişikliğine atfedilen kuraklık olayları, yeraltı suyu seviyesinin düşmesiyle sonuçlanmaktadır. Bu durum uygun litolojik ortam özellikleriyle birleşince yer çökmeleri kaçınılmaz olmaktadır. Bu çökme olayları tarım arazilerini, ulaşım altyapısını, sulama kanallarını, su rezervuarlarını ve kırsal/kentsel yerleşim alanlarını tehdit etmektedir. Bu çalışmayla dikkat çekilmek istenen tehlike, İnandık Köyü için öngörülmüş ve yerleşmenin taşınması kararı alınmıştır. Bu çalışmada, İnandık Köyü'nde gerçekleşmiş çökme olaylarının mekanizmasının açıklanması, benzer litolojik ve hidroklimatolojik özelliklere sahip alanlarda yer çökmelerinin sıklığının artma olasılığına dikkat çekilmesi amaçlanmıştır. Arazi kullanımı ve planlamasında jips karstıyla bağlantılı risklere dikkat çekilmesi bu çalışmanın diğer amaçlarındandır.

İklim değişikliğiyle bağlantılı su kaynaklarının azaldığı ve yeraltı suyunun kontrolsüz kullanıldığı bölgelerde çökme dolinlerinin gelişmesine uygun jeolojik koşullar da varsa, çökme olaylarından tarım arazileri, yerleşim alanları ve mühendislik yapıları büyük zararlar görebilir. Nitekim İnandık Köyü'nde çökme olayları gerçekleştiğinde konutlarda yıkım olmamakla birlikte hasar gerçekleşmiştir. Bir sonraki çökme olayının köy yerleşim alanında gerçekleşme olasılığına karşı yerleşim alanının terk edilmesi kararlaştırılmış ve yeni yerleşim alanı belirlenmiştir.

Bu çalışmaya konu olan dolinler, Çankırı il merkezinin güneybatısında jips katmanlarını içeren Bozkır formasyonunun bulunduğu İnandık Köyü yerleşim alanının iki kilometreden yakın çevresinde oluşmuştur (Şekil 1). İlki (derinliği 12-13 m, çapı 15 m) 2015 yılında olmak üzere günümüze kadar üç çökme dolininin oluştuğu arazi çalışmamızda belirlenmiştir. Dolinler İnandık Köyü'nün kuzeybatısında, KB-GD yönündeki dar bir kuşak boyunca oluşmuştur. Bu kuşak, uzanış yönü değiştirilmeden güneydoğuya doğru uzatıldığında İnandık Köyü

yerleşim alanından geçmektedir (Şekil 1). İlk çökme dolini oluştuktan sonra AFAD ve Çankırı Valiliği'ne bağlı birimlerce köy yerleşim alanında yer radarı (GPR) kullanılarak jeofizik testleri yaptırılmıştır. Yapılan testler sonucunda köy yerleşim alanının zemininde, yüzeyden üç metre aşağıda başlayan boşlukların çökme riski oluşturacak düzeyde olduğu değerlendirilmiştir. Bu çalışmalar sonucunda İnandık Köyü'nün bulunduğu yerden taşınması kararlaştırılmıştır.



Şekil 1. İnandık Köyü'nün konumu.

Materyaller Ve Yöntem

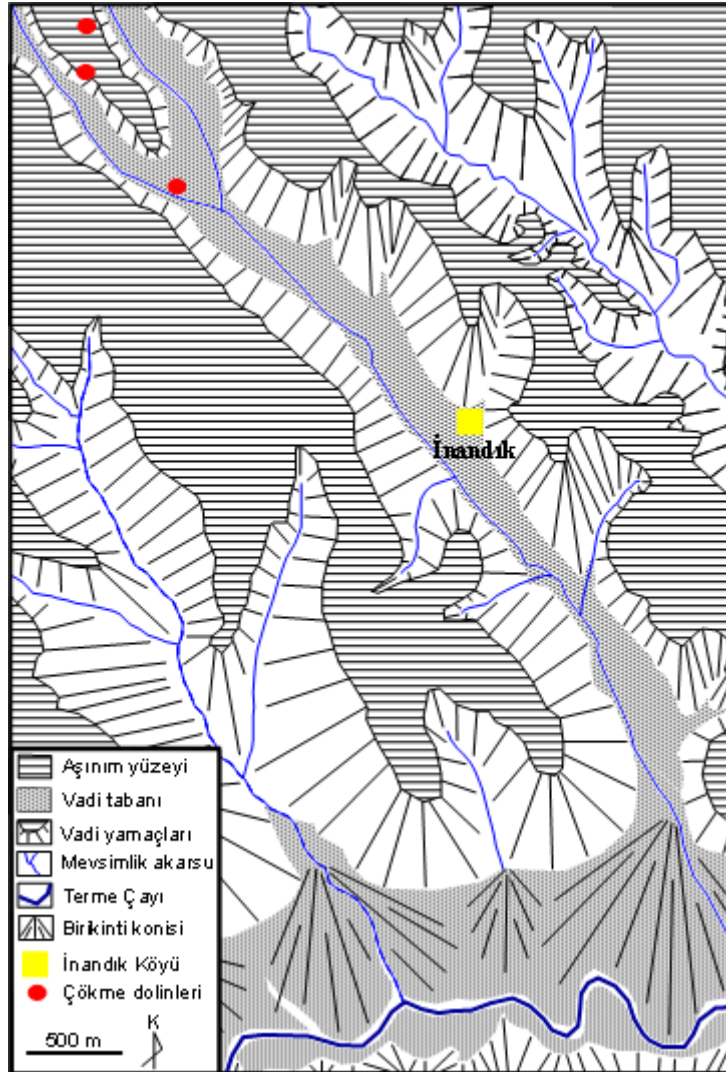
Öncelikle Karst jeomorfolojisi ve çökme dolinleriyle ilgili ulusal ve uluslararası literatür taranıp, çalışma sahasıyla ilgili yayınlar incelenmiştir. Araştırma sahasındaki çökme dolinlerinin/yer çökmelerinin oluşumunu açıklamak için arazinin stragrafik, litolojik ve tektonik özelliklerinin incelenmesi gerekir. Bu amaçla MTA Genel Müdürlüğü'nden, ilgili sahayı kapsayan 1/100000 ölçekli Çankırı-H31 Paftası ve jeoloji raporu temin edilmiştir. Arazinin topografik özelliklerinin değerlendirilmesi ve jeomorfoloji haritasının üretilmesi için Harita Genel Müdürlüğü'nün bastığı 1/25000 ölçekli H31a1 paftasından CBS yazılımları kullanılarak sayısal yükseklik modeli oluşturulmuştur. İnandık Köyü arazisinin yapısal ve jeomorfolojik özelliklerinin gözlemlenmesi ile çökme dolinlerinin arazideki konumlarının tespit edilmesi ve boyutlarının ölçülmesi amacıyla arazi çalışması yapılmıştır.

Arazi bulguları, jeolojik rapor içeriği ve jeomorfolojik özellikler birlikte değerlendirilerek Waltham ve Fookes (2005)'un önerdiği sisteme göre dolinler sınıflandırılmıştır. Çökmenin gerçekleştiği jeolojik formasyondaki karstlaşma sürecinin dolin oluşumunu nasıl kontrol ettiğini aşamalarıyla birlikte ortaya koyan bir model yaklaşımla çökme mekanizması açıklanmıştır.

Bulgular

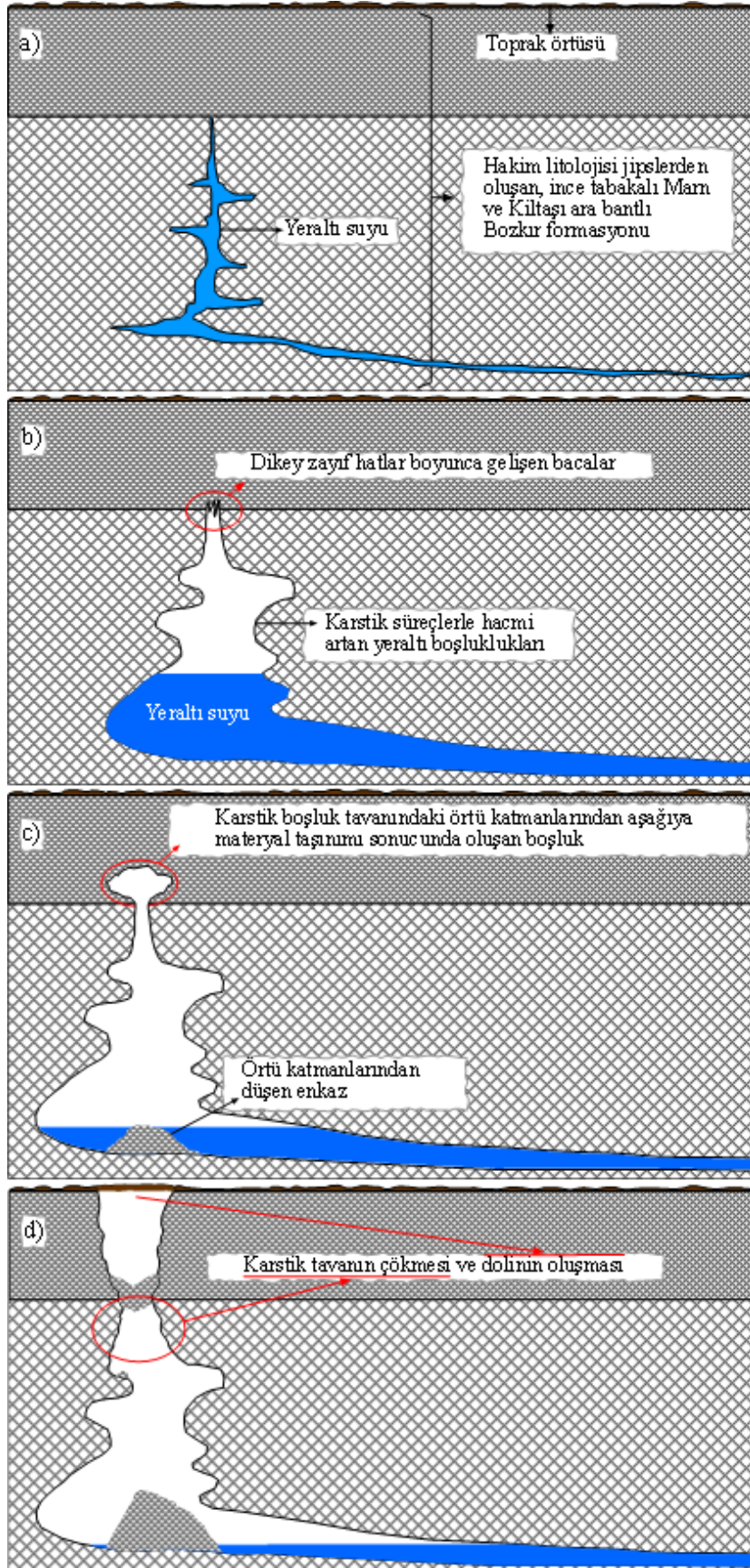
İnandık Köyü'nde oluşan çökme dolinleri çamurtaşı, kumtaşı, jips ve tuf ardalanmalı alt pliyosen yaşı 500-600 metre kalınlığındaki (Sevin vd., 2016) Bozkır formasyonunda gelişmiştir. Birimde egemen kaya türü olan jipslerin oluşturduğu katmanlardaki karstlaşma, yeraltı boşluklarının oluşmasına neden olarak çökme olaylarına zemin hazırlamıştır.

İnandık Köyü'nün bulunduğu vadi tabanı ortalama 200 m genişliğinde ve yaklaşık 5 km uzunluğa sahiptir. Vadi tabanı, güney kısımlarda 700 m, kuzey kısımlarda 850 m yüksekliktedir. Köyün çevresinde bulunan Pliyosen aşınım yüzeyleri ortalama 830-900 metre aralığında ve kuzeye doğru yükseklikleri artmaktadır. Aşınım yüzeyleri ve vadi tabanı arasında yükselti farkı güneyde 130 m, kuzeyde 50 m'dir. Aşınım yüzeylerini parçalayan mevsimlik akarsular Terme Çayı'na ulaştıkları kısımlarda birikinti konileri oluşturmuştur (Şekil 2).



Şekil 2. İnandık Köyü çevresinin jeomorfoloji haritası.

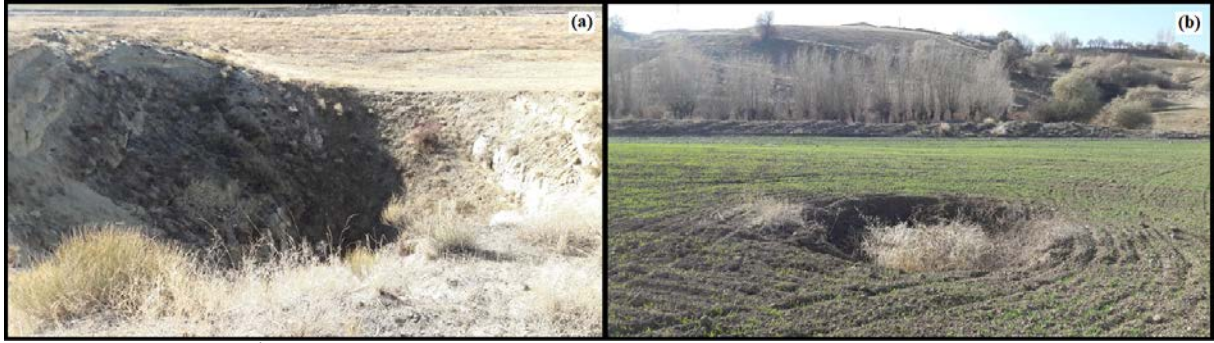
Yapısal özellikleriyle birlikte litolojik birimlerin karstlaşmaya uygun olduğu bölgelerde yeraltı sularının düşey ve yatay hareketleri zamanla karstik boşlukların oluşmasına neden olur (Şekil 3a). Bu boşlukların hacmi büyüdüğünde boşluk tavanında dikey zayıf hatlar boyunca bacalar şeklinde, üst kısımlardaki katmanlarla bağlantılı oluklar gelişir (Şekil 3b). Yer yüzeyinden yer altına sızmaya başlayan meteorik suların hareketiyle aynı yönde, karstik boşlukların tavanındaki bacalardan aşağı taşınmaya başlayan gevşek materyaller karstik boşluk tavanının hemen üstünde yeni boşlukların oluşmasına neden olur (Şekil 3c). Materyal taşınmasıyla yeni oluşan boşluğun hacmi büyüdükçe dayanağını kaybeden yer yüzeyine yakın katmanlar çökmeye başlar (Şekil 3d). Bu süreçler çalışırken yeraltı su tablasının konumu da şüphesiz önemlidir. Çünkü yeraltı suyuyla doymun olan bir ortamda materyal taşınımı gerçekleşmeyecektir. Bu nedenle su tablasının karstik boşluklardan daha aşağıdaki seviyelere, en azından karstik boşlukların alt seviyelerine kadar çekilmiş olması gerekir (Şekil 3).



Şekil 3. İnandık Köyü'ndeki örtü kayası çökme dolinlerinin oluşum aşamaları.

Waltham ve Fookes (2005)'ın önerdiği dolin sınıflama sistemine göre, İnandık Köyü'nün kuzeyinde, aşınım yüzeyinde bulunan 2 dolin (Şekil 2'de birbirine yakın olanlar) örtü kayası çökme dolinidir (Şekil 4a). Bunlar

yukarıda oluşum mekanizması açıklanan ve blok diyagram serisi ile çökme aşamaları gösterilen özelliklere sahip dolinlerdir. Daha güneyde, akarsu vadi tabanındaki tarım arazisinde bulunan dolin ise örtü çökme dolinidir. Burada alüvyal örtü içinde çökme meydana gelmiş, örtü kayası çökme dolini kadar derin olmayan 6 m çapında ve 1 m derinliğinde bir çöküntü oluşmuştur (Şekil 4b).



Şekil 4. İnadık Köyü'ndeki örtü kayası çökme dolini (a) ve örtü çökme dolini (b).

Sonuç Ve Öneriler

İklim değişikliğiyle bağlantılı su kaynaklarının azaldığı ve yeraltı suyunun kontrolsüz kullanıldığı bölgelerde çökme dolinlerinin gelişmesine uygun jeolojik koşullar da varsa, çökme olaylarından tarım arazileri, yerleşim alanları ve mühendislik yapıları büyük zararlar görebilir. Nitekim İnadık Köyü'nde çökme olayları gerçekleştiğinde konutlarda yıkım olmamakla birlikte hasar gerçekleşmiştir. Bir sonraki çökme olayının köy yerleşim alanında gerçekleşme olasılığına karşı yerleşim alanının terk edilmesi kararlaştırılmış ve yeni yerleşim alanı belirlenmiştir. Afet yönetim ilkelerine göre, çökme probleminin yaşanabileceği potansiyel bölgelerin detaylı olarak belirlenmesi ve haritalanması, yapı/yerleşmelerin planlama aşamasında mutlaka yer yapısının jeodezik yöntemlerle test edilmesi koşulu yasal zorunluluk olmalı, gerekiyorsa belirlenen yeraltı boşluklarına uygun inşaat teknikleriyle dolgu yapılmalıdır.

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INVESTIGATION INTO CARRIER BASED PWM METHODS FOR MATRIX CONVERTERS

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Abstract: In this study, the carrier based pulse width modulation for matrix converters is studied. A number of significant changes have been applied to the carrier signal to improve the output current's total harmonic distortion. Also third harmonics are injected to the voltage references for a better voltage gain. The matrix converter with an ohmic-inductive load has been simulated for each method for comparison. According to the simulation results, the change which makes the carrier based PWM preferable to use with matrix converters is emphasized as it has no mathematical complexity.

Keywords: Matrix Converters, Carrier Based Pulse Width Modulation, Virtual DC Link, Third Harmonic Injection.

Introduction

Matrix converters (MCs) are being developed since Venturini proposed the first matrix converter topology and the vivid work of mathematical background lying behind his algorithm. The MC topology allows connecting any output phase of the converter to any input phase directly (Venturini, 1980, Rodriguez, 2012).

The voltage gain limit of the Venturini's method was later increased from 0.5 to 0.866 by the Optimum Venturini method (Alesina, 1989) with the third harmonic injection.

Huber adapted the space vector modulation (SVM) to the MCs considering fictitious/virtual rectifying and inverting stages as seen in Fig.1. He separated the input vectors that can be used to manage a virtual DC link (VDCL) and summed up the cascade topology to direct matrix converter topology (Huber, 1985, Şen, 2015).

Huber's work inspired researchers to focus the carrier based PWM (CBPWM) on the VDCL. Although it does not include a mathematical complexity, the CBPWM method is not suitable for VDCL without any improvements or adaptation, because CBPWM works best on DC source whilst VDCL acts as a time varying DC source. To make the CBPWM operate better on the VDCL, some improvements have been proposed such as voltage references with off-set (Yoon, 2006), carrier based SVM (Sandeep, 2016) and strategies for zero common-mode voltage (Xiong, 2016).

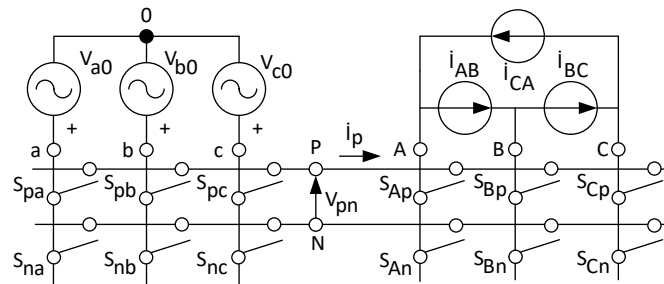


Figure 1: Fictitious rectifying and inverting stages for MC.

In this study, the CBPWM method has been modified to work with time-varying DC link voltage. This modification reduces the total harmonic distortion (THD) of the input current and increases the voltage gain.

Virtual DC Link

A rectifying stage and an inverting stage equivalence of the MC can be observed in Fig.1. To create a VDCL, two of the three input phases with the highest voltage difference should be selected (Rodriguez, 1983). The higher of these two phases will be assigned as P pole and the other as N pole. For example, at the beginning of the sequence in Fig. 2, phase a and phase c will be selected as P and N poles respectively for the VDCL. The sequence for the VDCL will follow the input line voltages as $V_{ac}, V_{bc}, V_{ba}, V_{ca}, V_{cb}, V_{ab}$.

To realize an example switching for the MC, where output phases need to be connected as $V_A = V_P$, $V_B = V_N$ and $V_C = V_P$ while $V_P = V_{an}$ and $V_N = V_{cn}$, the required switching can be performed as seen in Fig.3.

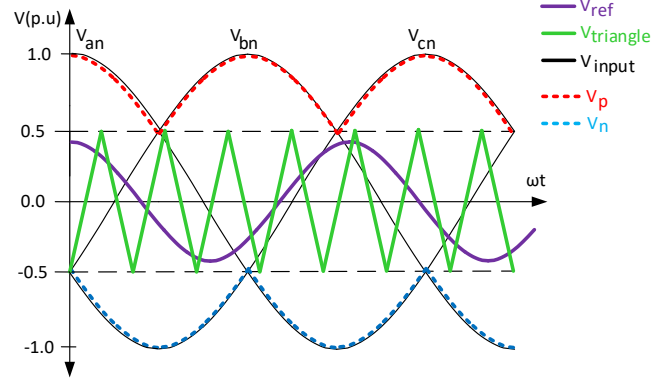


Figure 2: Input phases, an output reference and carrier signal.

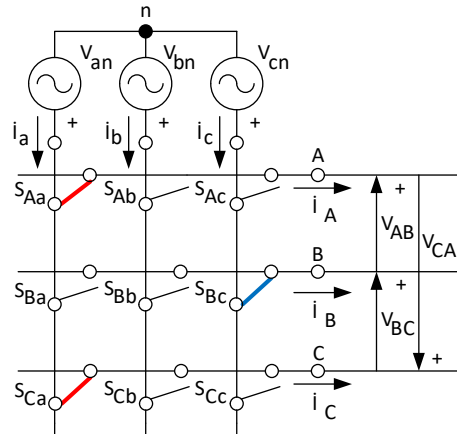


Figure 3: Matrix Converter topology.

Carrier Based Pulse Width Modulation

Carrier based PWM is preferred in applications mostly because this method consists of some comparisons and commutations only without mathematical calculations requiring a software running processor.

A simple carrier-based PWM is used in the compared methods here. An output phase (V_o) is connected to P pole of the VDCL if it's reference (V_{ref}) is greater than the triangular signal ($V_{triangle}$), otherwise it is connected to N pole of the VDCL as expressed in Equ.1.

$$V_o = \begin{cases} V_p & \text{if } V_{ref} \geq V_{triangle} \\ V_n & \text{if } V_{ref} < V_{triangle} \end{cases} \quad (1)$$

In this paper, PWM method is applied to a VDCL instead of a real DC link which does not exist physically.

Third Harmonic Injection

As seen in Fig.2, the maximum sinusoidal output reference amplitude can be up to half of the input amplitude in order not to exceed VDCL limits. However, Alesina and Venturini showed that the limits are not exceeded if third harmonics are injected on the output references (V_{or}) as

$$V_{or} = q \cdot V_{im} \left(\cos(w_o t) - \frac{1}{6} \cos(3w_o t) + \frac{1}{2\sqrt{3}} \cos(3w_i t) \right) \quad (2)$$

where q is the gain and V_{im} is the input amplitude (Alesina, 1989, Wheeler, 2002). One of the new reference signals is shown in Fig.4.

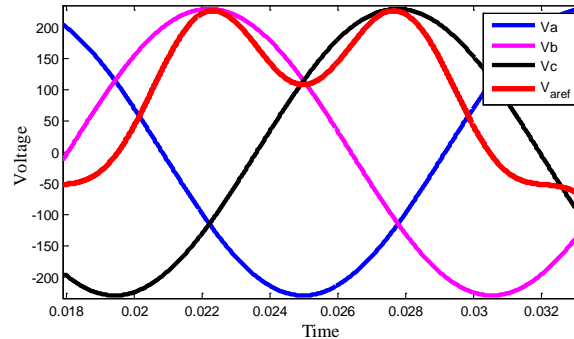


Figure 4: An output reference with the third harmonic injections and the input phases.

Methods

Several methods have been investigated as explained below.

A. Without Any Change on Carrier and References

The carrier signal's amplitude is decided by the DC source voltage when the CBPWM is implemented on traditional converters. As shown in Fig.5, the carrier amplitude in this method is chosen as equal to the input phase amplitude. Output references are left without any injection.

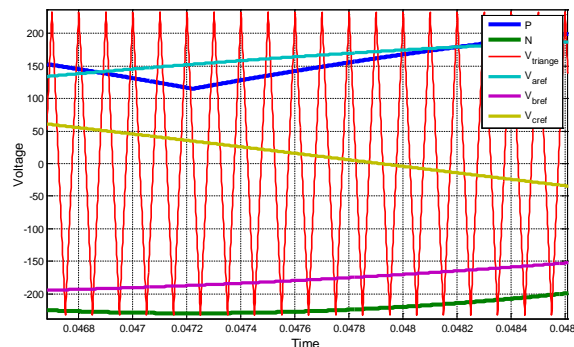


Figure 5: PN Voltage, output references and carrier signal for Method A.

We can conclude that both the output reference signals and carrier signal do not fit in VDCL boundaries.

B. Third Harmonic Injection on References

The only difference of this method from method A, the references with the third harmonics as in Equ.2 are used. The carrier signal's amplitude is kept the same as in method A. Fig.6 shows the PN voltages, output references and carrier signal.

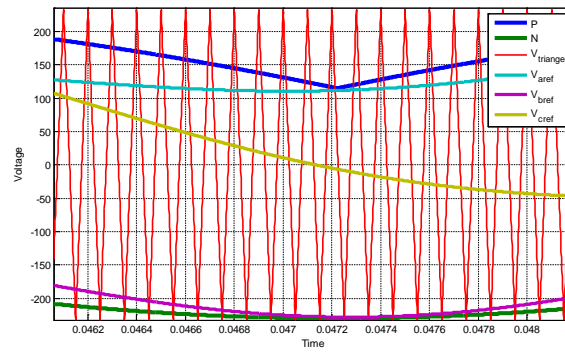


Figure 6: PN voltage, output references and carrier signal for Method B.

With the help of the third harmonic injection, output references fit in the VDCL boundaries. The carrier signal still exceeds the VDCL boundaries.

C. Carrier Signal Scaling and Third Harmonic Injection

To find a coefficient for carrier signals amplitude, the VDCL is considered as a rectified and mirrored input. In details, the input phase with the highest absolute voltage and its negative are considered as P and N poles. The minimum potential difference on this new VDCL is $V_{PN}^{min} = \sqrt{3}/2 \cdot V_{im}$. Thus, the carrier signal is scaled with $\sqrt{3}/2$.

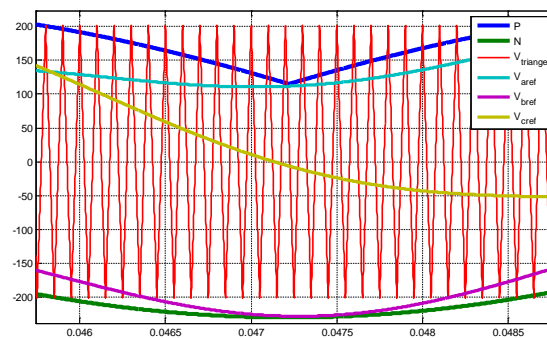


Figure 7: PN voltage, output references and carrier signal for Method C.

As can be seen in Fig.7 the reference signals now fit in the VDCL but the carrier signal still exceeds.

D. Carrier Signal within the VDCL

In this method, the carrier signal has been modulated with the VDCL boundaries without changing its inner frequency. Output references are left without any injection (Oyama, 1989).

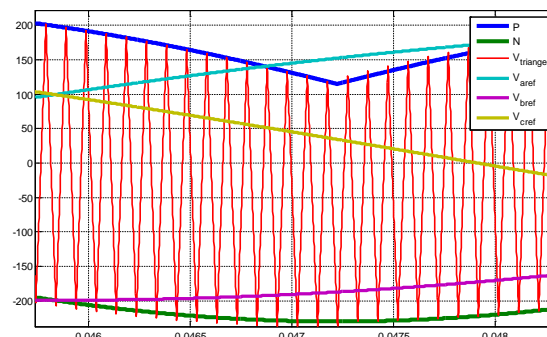


Figure 8: PN Voltage, output references and carrier signal for Method D.

As seen in Fig.8 the carrier signal's envelope is the VDCL boundaries. The output reference signals do not fit in this envelope yet.

E. Carrier Signal within the Envelope and the Third Harmonic Injection

For a better gain and lower THD, the third harmonics are injected to the output references in addition to method D.

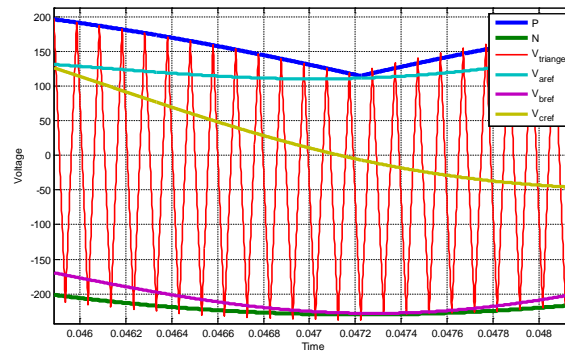


Figure 9: PN Voltage, output references and carrier signal for Method E.

Both the carrier signal and the output references now fit within the envelope as seen in Fig.9.

Simulation Results

The same parameters have been set for simulations of all the methods for a fair comparison. The load is delta connected to the outputs. The simulation duration is chosen long enough for the output currents reach to the steady state.

Simulation duration $t_s = 6/f_o$
 Input phase voltage (V_{im}) = 230V
 Input frequency (f_i) = 60Hz
 Modulation index (q_v) = 0.866
 Carrier signal frequency (f_{car}) = 10kHz
 Load resistance (R) = 10Ω
 Load inductance (L) = 10mH
 Desired Output Line Voltage = 345V

Table 1: Simulation results for $f_o = 40Hz$

Method	Fundamental Amplitude of an Output Line Voltage (V)	Total Harmonic Distortion of Current on Load (%)
A	282.9043	1.1066
B	282.6825	1.0755
C	318.4056	1.9808
D	320.7188	3.5960
E	337.5726	0.3876
Venturini	345.0168	3.1855

Table 2: Simulation results for $f_o = 13Hz$

Method	Fundamental Amplitude of an Output Line Voltage (V)	Total Harmonic Distortion of Current on Load (%)
A	282.8659	0.9871
B	282.5396	0.9991
C	318.1919	1.8688
D	320.9594	2.7880
E	337.7100	0.4013
Venturini	344.9352	3.0207

Table 3: Simulation results for $f_o = 77Hz$

Method	Fundamental Amplitude of an Output Line Voltage (V)	Total Harmonic Distortion of Current on Load (%)
A	282.8659	0.9871
B	282.5396	0.9991
C	318.1919	1.8688
D	320.9594	2.7880
E	337.7100	0.4013
Venturini	344.9352	3.0207

A	282.8270	1.3561
B	282.3991	1.3682
C	317.9041	2.8622
D	320.8001	5.6665
E	337.7002	0.5186
Venturini	345.0375	1.8935

Table 4: Simulation results for $f_o = 111\text{Hz}$

Method	Fundamental Amplitude of an Output Line Voltage (V)	Total Harmonic Distortion of Current on Load (%)
A	282.5176	1.8689
B	282.2460	1.7980
C	317.7653	3.6356
D	319.7730	6.1748
E	337.7133	0.6949
Venturini	344.9660	1.3234

Conclusions

The carrier based PWM methods, which are not preferred so much in the matrix converters due to the inaccuracy to realize the amplitude demand and high total harmonic distortion of the load current, have been investigated in this study. Several methods have been tried to cope with the variable DC link voltage of the matrix converter, which is the main reason for the disadvantages of the carrier based methods. Comparative results for various output frequencies show that method E, where the carrier wave is modulated with the boundaries of the three phase voltages such that the boundaries become the envelope of the triangular wave, yields the lowest total harmonic distortion of the load current. This method uses the third harmonic injections to the output phase voltage references in order to increase the gain limit to 0.866 like the most popular methods. Even though the Venturini's method realizes the desired phase to phase voltage slightly more accurately in amplitude, method E is still proposed since the amplitude inaccuracy can be compensated with a simple amplitude control. This contribution will make the carrier based PWM, which is simple to implement experimentally without a mathematical complexity, preferable in the matrix converters.

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INVESTIGATION OF FACTORS AFFECTING SURFACE ROUGHNESS OF HEAT TREATED 5040 STEEL BY EXPERIMENTAL DESIGN METHOD

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Abstract: One of the main problems to be tried to solve in machining is machinability. Manufacturer seeks answer of how he can produce his product cheaper and more quality. One of the main purposes in machining is to bring surface roughness to the top level. The stage where the most decisive work can be done in improving the product quality is the parameter design phase for both product and process design. In order to determine the most effective parameters and to evaluate the results more efficiently, the Taguchi experiment design technique is preferred to realize the experiments in a shorter time. This performed study was done by the aim of investigating the effect of change in terms of hardness, feed rate, and cutting tool of “Dual Phase” steel, which is a class of HSLA (High Strength Low Alloy) steels that increases usage and importance day by day, on surface quality in turning process in the pieces subjected to reasonable forces in machine, device, car manufacturing. Experimental design In the Minitab statistical analysis program, Taguchi experiment design technique and 9 trials according to L9 orthogonal design. Experiments were performed in dry cutting conditions in CNC Turning Table that has 1.5 kW power and rotates with maximum 2000 rpm. Variance analysis and signal / noise ratio were used in the evaluation of the test results. . It was possible to achieve the intended results with only one third of the number of experiments required in full factorial design (9 experiments instead of 27). In the experiments, the cutting tool type (CBN, Ceramic and Carbide cutter), the feed rate (0,02, 0,04 and 0,06 mm/cycle) and the material hardness (Material with three different hardness values obtained by annealing at 745, 760, and 775 degrees obtained after heat treatment) were used as the independent variable (factor). The mean surface roughness value (Ra) as a dependent variable was determined from measurements taken at 6 different points in three trials. As a result, the most effective parameters on the surface quality are the feed rate, the material hardness (microstructure) and the cutting tool. The results obtained are interpreted together with the evaluations which have been entered into the literature before.

Keywords: Taguchi, Dual Phase, Surface Quality, Machinability.

Introduction

Importance of heat treatment applied in the process of improving mechanical properties has gradually increased with growing technology. Heat treatment applied to steel plays an important role on defining machinability properties of steel (Uzkut and Ark., 2001., Çeviker, 1991., Demir and Ark., 2011). Material technology and cutting tool technology growing in recent years allows machinability of heat treated steels easily and quality (Elbestawi and Ark., 1996, Yaka and Ark., 2016). After heat treatment applied of steels, internal strains occur in material. This causes problems such as warping in workpiece, burning on surface, and micro crack. Arising these problems can be eliminated with various processes applied after heat treatment Çolak, 2006., Daghini ve Nicolescu., 2007., Binali and Ark., 2018).

Dewes et al., processed AISI H13 material with 52 HRC hardness by using WC solid milling machine coated with TiCN. They observed that cutting speed increase temperature, temperature increases as directly proportional with cutting speed, and temperature in cutting area decreases with increasing tool radius. Asilturk and Akkus (2011), investigated effect of cutting speed, cutting depth, and feed rate on surface roughness in turning process of hardened AISI 4140 (51 HRC) with coated carbide. As a result of experimental studies, they showed that feed rate has the most significant effect on Ra and Rz.

Ren at al. (2014) investigated the study about optimization of cutting geometry in last milling process on Ti-5Al-5Mo-5V-1Cr-1Fe alloy with Taguchi method. They aimed at reaching combination to minimize cutting forces and surface roughness, and to optimize cutting speed by changing milling cutter geometry in the study. As a result, they found that multi performance characteristics can be improved with grey-Taguchi method. Zhao (2017), performed an experimental study to understand the effect of cutting edge radius on workpiece machining performance with regards to surface roughness and tool abrasion in AISI52100 steel. Three groups of cutter

(CBN) with 20, 30, 40 μm nominal edge radius were used in the study. Change in cutting edge radius was evaluated with an optical microscope. The effect of surface radius and tool abrasion on cutting edge radius was investigated in different machining conditions with different machining tests by designing three-leveled, two-factored experiments with Taguchi. Variations tends to lower with increasing nominal values of cutting radius, and also, it was resulted that cutting radius has an important effect on surface roughness and tool abrasion.

The situation defined above is an example of typical problem showing up machining tool that is appropriate to tolerance in engineering and research and development studies. It is required to improve surface quality which is a measurement of machinability, to make experiment to investigate effect of tool type, cutting speed and feed rate on performance, and make optimization by evaluating these experiments.

The purpose of this study is to make optimization and investigate effect of material and cutting parameters (feed rate and cutting tool type) on workpiece surface roughness that is an important machinability criteria by doing machinability experiments with turning method on steels used in machine production industry. In this study, dual-phased steel specimen obtained in three different hardness after heat treatment was performed to turning process with three different feed rate by using three different cutter type by evaluating factors affecting turning surface quality after literature review. Results obtained from Taguchi optimization were evaluated with regards to adaptation to literature.

Experimental Study

Used Material and Properties

5040 ERDEMIR quality numbered SAE 1040 Standard Tool produced as hot mill product in Ereğli Iron and Steel Factories (ERDEMIR) T.A.S and given chemical composition in Table 1 was used by preparing 12 mm diameter, and hardness measurement was performed by doing heat treatment.

Table 1: Chemical Composition of 3936 quality steel

Quality	Standard	Chemical Composition (% Weight)					
		C	Mn	P	S	Si	Al
5040	SAE 1040	0.38	0.75	0.010	0.016	0.210	0.058

It was utilized from previous studies to define relevant annealing temperatures. Temperatures values in the study performed related to mechanical properties of materials having same chemical composition (Tayanç and Toktas, 2001).

It was given water in water to turning specimen annealed 30 minutes in 745, 760, and 775 $^{\circ}\text{C}$ temperatures on the purpose of obtaining three different hardness on same material in total. During preparation of specimen, it was waited to chill oven for two different temperatures to prevent different heat treatment conditions. Specimen were subjected to cooling in water after annealing process. Temperature-time diagram (T-t) belong to aforesaid heat treatment was shown in Figure 1.

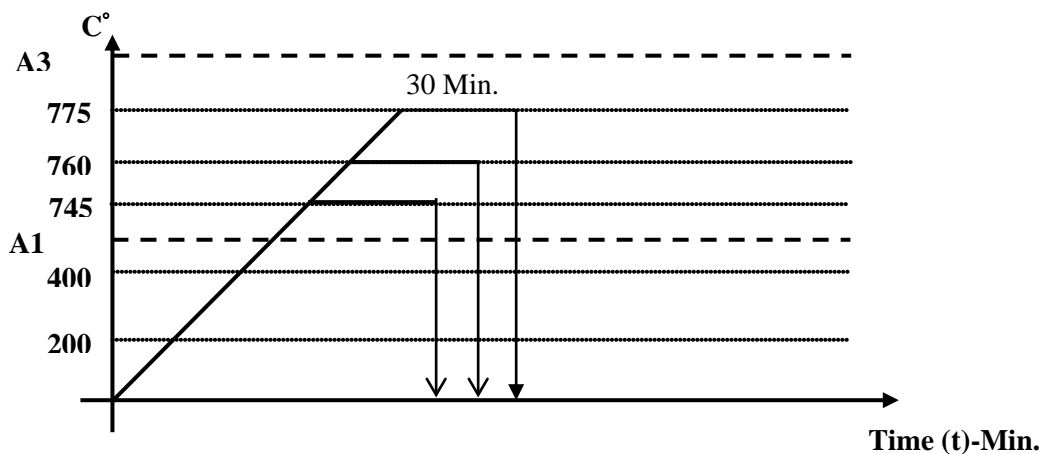


Figure 1. Temperature (T)-Time(t) diagram.

Microhardness Measurement

Hardness measurement of specimens were performed with micro Vickers method in Qness Q10 microhardness test equipment. HV 0,5 load and 10 seconds main loading values were defined as test parameters, and trace image was taken by the help of 40X lens. Hardness measurements of materials were obtained as Vickers (HV) in Qness Q10 microhardness equipment. Results were given in Table 2.

Table 2: Hardness Values

Materil	745°	760°	775°
Meaurement 1 (HV)	174	360	429
Measurement 2 (HV)	175	389	434
Average Hardness (HV)	174,5	374,5	431,5

Surface Roughness Measurement

Surface roughness was measured with TIME TR200 surface roughness equipment. Three measurement trace to parallel and vertical to cutting direction were measured. The mean of three arithmetical average surface roughness measurement (Ra) in the direction and through cutting were used to show surface roughness of specimen.

Choosing Cutting Parameters and its Levels

Experimental studies within study were performed in CNC Turning Table that has 1.5 kW power and rotates with maximum 2000 rpm. Dual phase steels is a new class of high strenght-low alloy steels (HSLA). A cylindrical workpiece made from 5040 number steel having 0,38 % C ratio that is produced by ERDEMIR as special wheel steel was processed with Al₂O₃ coated Cementite Carbide, Ceramic, and CBN cutting tools by applying three different feed rate in dry cutting conditions in the study. Cutting area order is shown in Figure 2. Factors used in machining and its levels were defined with user experience and were specified in Table 3.

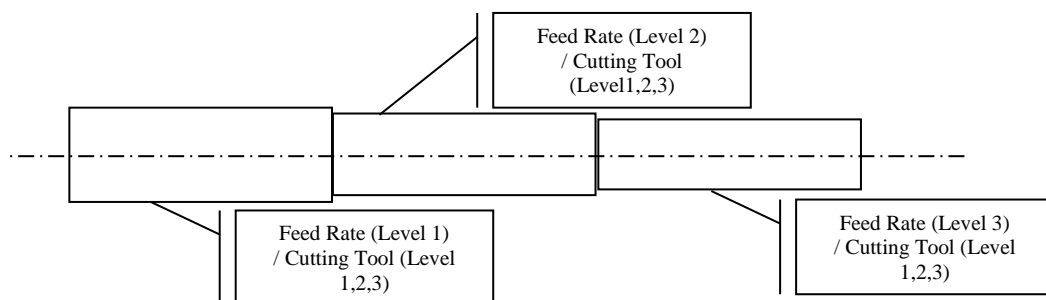


Figure 2. Cutting Area Order

Fishbone diagram is one of output in designing experiments. A fishbone diagram can be created to see relations defined factors to each other's exactly (Şirvancı, 1997). This diagram specifies all factors representing product or process quality and affecting measured values (Savaskan at al., 2004). It was decided variable and constant factors with the help of fishbone diagram. Factors affecting machinability are collected under four main categories (cutting parameters, rigidity, workpiece, cutting tool) as shown in Figure 3.

Values of variable parameters except factors that has to be constant and that cannot be controlled were taken as compatible with real working environment values as much as possible. Because cooling liquid usage will have positive effect to surface quality, experiments were planned in dry condition to keep experiment numbers in certain amount.

Table 3: Cutting Parameters

Factors	Unit	Symbol	Level 1	Level 2	Level 3
Cutting Tool	-	A	Carbide	Ceramic	CBN
Feed Rate	Mm/dev	B	0,02	0,04	0,06
Heat Treatment /Hardness	/Hv0.5	C	745°C	760°C	775°C

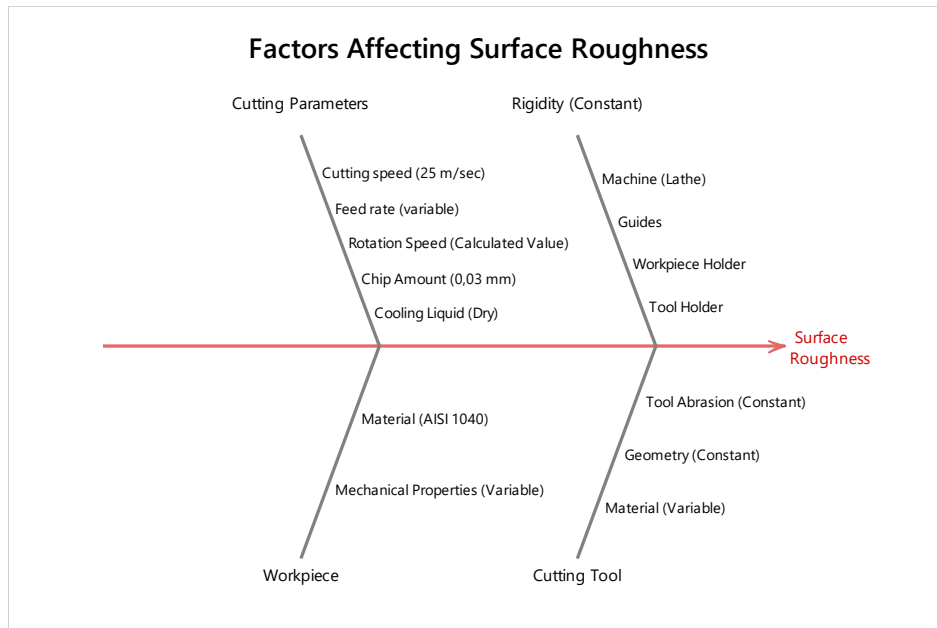


Figure 3. Evaluation of Factors Affecting Surface Roughness with Fishbone Diagram

Taguchi Experiment Design

Choosing optimum process conditions is an extremely important subject since it defines surface quality of produced pieces and dimensional sensitivity. Contact surfaces of machine elements working together are desired to finish with particular rough, especially in machine design. Sometimes, sensitive surfaces are required, and sometimes rough surfaces are suitable to work machine properly, as well. Therefore, it is important to define surface roughness in design step, and to control in production step. After, surfaces can be operated in desired roughness values (Karayel, 2009). It is needed to optimize surface quality and to define optimum cutting parameters on the purpose of machining machine pieces as suitable to environment they will work. For this purpose, feed rate, cutting tool, and material hardness was defined as parameters to use in this study. Machining experiments were performed by considering Taguchi one patterned (each factor was taken three levels) L9 orthogonal design. Experiment index was given in Table 4.

Table 4: Taguchi L9 experiment design

Experiment Nu.	Control Factors		
	Cutting Tool (A)	Feed Rate (B)	Hardness (C)
1	1	1	1
2	1	2	2
3	1	3	3
4	2	1	2
5	2	2	3
6	2	3	1
7	3	1	3
8	3	2	1
9	3	3	2

Analysis of S/N Ratios

Taguchi experiment design and analysis were performed in Minitab 16.2 package program, and basic leveled (three level) L₉ orthogonal index was used. “Smallest-the best” formula specified equation 1 was used to evaluate obtained Signal-Noise Ratios (S/N).

$$\frac{S}{N} = -10 * \log \left[\frac{\sum_{i=1}^n Y_i^2}{n} \right] \quad \text{Eq. (1)}$$

S/N ratios were calculated by using “smallest-the best” equation after obtained surface roughness ratios in machining experiments of ERDEMIR 5040 quality steel according to performed Taguchi L9 experiment design. Surface roughness values and S/N ratios obtained after machining were shown in Table 5.

Table 5: Surface roughness values and S/N ratios obtained after machining

Experiment Nu.	Control Factors			Average Surface Roughness Value (Ra) μm	S/N Ratios (dB)
	Cutting Tool	Feed Rate	Hardness		
1	1	1	1	2,148	-6,6407
2	1	2	2	1,359	-2,6644
3	1	3	3	1,083	-0,6926
4	2	1	2	2,012	-6,0726
5	2	2	3	3,118	-9,8775
6	2	3	1	3,727	-11,4272
7	3	1	3	0,180	14,8945
8	3	2	1	0,432	7,2903
9	3	3	2	0,570	4,8825

Effect of control factors on surface roughness values was analyzed by using S/N response table. S/N response table was given in Table 6 for surface roughness. This table, which is created with Taguchi method to get optimum surface roughness value, shows optimum levels besides factor effect range. S/N values of control factors for surface roughness were shown in Figure 4.

Table 6: S/N response table for surface roughness

Level	Cutting Tool	Feed Rate	Hardness
1	-3,3325	0,7271	-3,5925
2	-9,1258	-1,7505	-1,2848
3	9,0225	-2,4124	1,4415
Delta	18,1482	3,1395	5,0340
Effect Range	1	3	2

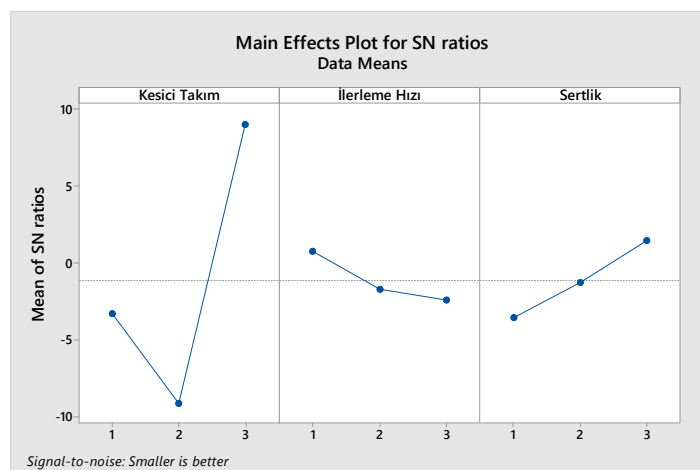


Figure 4. S/N values of control factors for surface roughness

Optimum levels of control factors for surface roughness for A cutting tool (CBN-Level 3), B feed rate (0,02 mm/cyc-Level 1), C Hardness (775 C° Heat Treatment, Level 3) was measured 0,180 μm surface roughness value. However, anticipated S/N ratio is 13,47 and average value is 0,0501778 μm in Minitab program when optimum levels are given.

Prediction	
S/N Ratio	Mean
13,4744	0,0501778

Evaluation of Experiment Results

Change in surface roughness depending on cutting tool and feed rate were explained in Figure 5 in turning ERDEMIR 5040 quality steel. While surface roughness values are almost equivalent in 0,02 mm/cyc for carbide ceramic cutter, surface roughness values showed an increase in 0,04 and 0,06 mm/cyc for ceramic cutters. Using CBN cutters in 0,02-0,04-0,06 feed rate increased surface roughness. Results correcting performance of CBN cutters, which supports optimization obtained from S/N ratios are clearly seen in graph. The best surface roughness values were obtained with CBN cutters in each three feed rates.

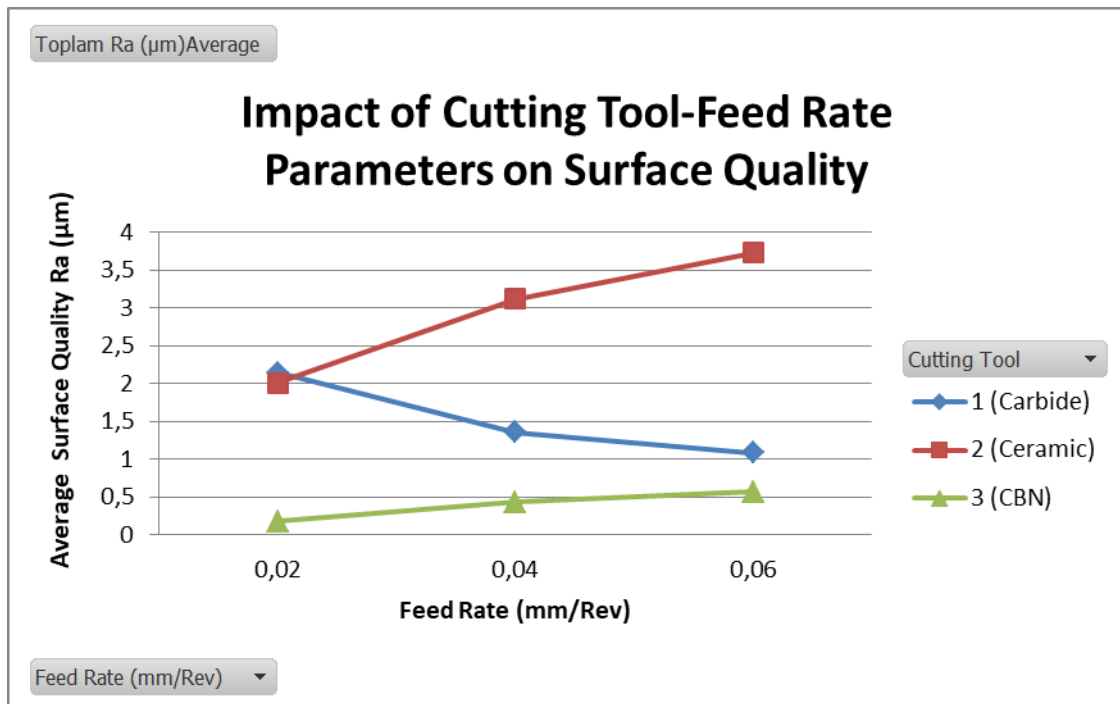


Figure 5. Change of surface roughness depending on cutting tool and feed rate in turning ERDEMIR 5040 Quality Steel

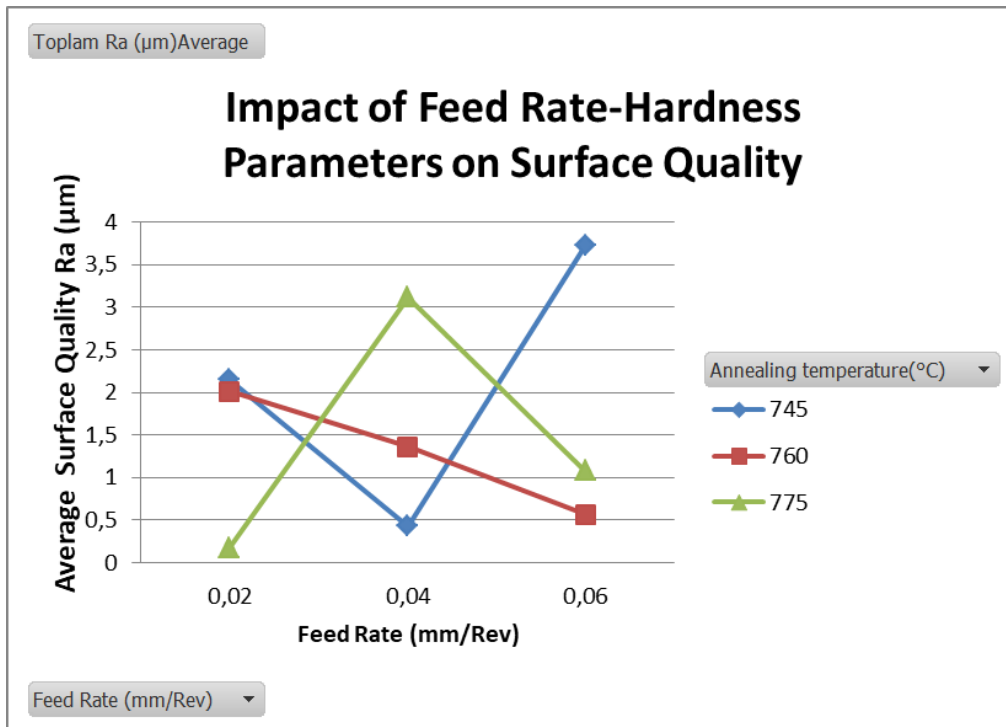


Figure 6. Change of surface roughness depending on hardness and feed rate in turning ERDEMİR 5040 Quality Steel

Change of surface roughness depending on hardness of workpiece and feed rate of cutting tool was explained in Figure 6. Lowest surface roughness in 0,02 mm/cyc feed rate was obtained from steel heat treated at 775 °C. Almost equivalent surface roughness values in same feed rate were obtained in steels heat treated at 745 ve 760 °C. Surface roughness value decreased when feed rate increased in steel heat treated at 760 °C. Ideal cutting conditions for every three cutters were occurred in medium steel heat treated at 760 °C, and a decrease in surface roughness was observed depending on feed rate (3,5,16).

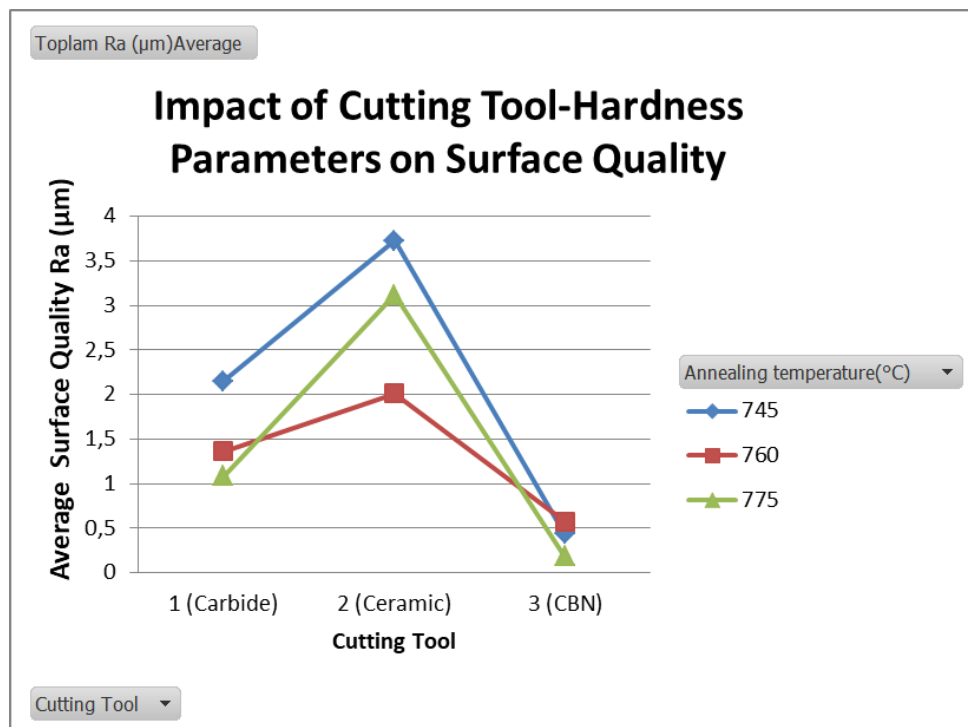


Figure 7. Change of surface roughness depending on cutting tool and heat treatment (hardness) in turning ERDEMİR 5040 Quality Steel

Change in surface roughness depending on cutting tool and hardness level is explained in Figure 7. While CBN cutters exhibits the best performance for every three hardness, surface roughness value in ceramic cutters is higher than carbide cutters. Better surface quality was obtained with CBN cutters when high hardenability steel is used. This can be explained in two ways. Ceramic cutters were more unstable depending on heating in the effect of increasing friction forces when martensite distribution in material micro structure condensates, and CBN cutters kept stability. Tool abrasion in non-homogenous micro structure resulted in increase in surface roughness by increasing cutting surface (3,16).

Results

In this study, three different paramaters were evaluated and optimized with regards to machinability because Taguchi experiment design has wide usage area, and it enables to obtain results with both less experiments and lower costs compared with traditional experiment design.

Optimisation of cutting parameters affecting surface roughness values obtained from turning of ERDEMİR 5040 Quality steel was performed in this study. A cutter tool (CBN-Level 3), B feed rate (0,02 mm/cyc, Level 1), C hardness (775 C° heat treated-Level 3) surfce roughness value 0,180 µm was measured for lowest surface roughness value in the study made. According to analyse result, it was seen that the most efficient parameter on surface roughness was feed rate with 68,93 % content. Micro hardness values increased with martensite increase taking place in micro structure depending on heat treatment of ERDEMİR 5040 Quality steel. CBN exhibited the best performance depending on hardness.

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INVESTIGATION OF FLUOROELASTOMER DEGRADATION IN SIMULATED SEVERE ACCIDENT ENVIRONMENT OF NUCLEAR POWER PLANTS

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Abstract: Polymeric materials widely used in safety-related equipment are relatively vulnerable to severe environments such as high temperature and radiation environment during the severe accident. Therefore, to ensure the integrity and performance of the safety-related equipment, degradation effect of severe accident on polymer must be investigated.

In this paper, to evaluate the degradation effect of radiation and heat during normal operating condition and severe accident environment, hardness measurement and tensile test were carried out. And FT-IR analysis was conducted to investigate the molecular structure and bonds. The mechanical properties were not changed significantly in pre-aging, normal operating condition. But radiation of severe accident environment significantly affects the mechanical properties of fluoroelastomer and molecular structure, such as C=O formation.

INVESTIGATION OF THE PROTECTIVE EFFECT OF ASCORBIC ACID AGAINST SILVER NANOPARTICLES BY THE DROSOPHILA COMET ASSAY

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Abstract: Nanotechnology is increasingly used in many different industries, such as personal care products, textiles, drug delivery systems, disinfectant products, dyes and construction materials. The release of these materials, which are frequently used, is also continuing today and is expected to increase gradually. These materials are spread around the environment during production, use and disposal. Silver nanoparticles are a material used in many antimicrobial applications. Oxidative stress is one of the important mechanisms in silver nanoparticle toxicity. It is one of the most important triggers of DNA damage and this damage can cause mutation, cancer and age-related diseases in the human body. Antioxidants fight against oxidative damage by clearing the products of damaged nucleotides and lipids found in the cell or by scavenging radicals. In this study, the protective potential of ascorbic acid (AA) against the toxic effects of silver nanoparticles was evaluated by Drosophila COMET (single cell gel electrophoresis) method. In the COMET experiment, 10 mM silver nanoparticles and AA were administered with 3 different doses (10, 50 and 250 mM). In the results obtained, genotoxicity was observed to decrease in increasing doses of AA

INVESTIGATION ON DEVELOPMENT OF HIGH PERFORMANCE MEDICAL STENTS AS APPLIED WITH MESH STRUCTURES

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Abstract: There are concerns about the occurrence of fatigue fractures caused by stress concentrations due to different shape structures and manufacturing methods in conventional stents, and then new stents having high strength and high flexibility are required. Applicable mesh structures for medical stent applications based on the design concepts of high strength and flexibility are designed to solve various problems of conventional stents in this research. The influence of introduced design variables of basic mesh shapes on compression characteristics of meshed stent models are evaluated through finite element analysis using ANSYS Workbench. From analytical results, compressive stiffness of meshed stent models are found to be changed periodically with compressive directions due to the designed basic mesh shapes. Secondly, compressive flexibility of meshed stent models mostly depends on arm's number and shapes of basic mesh shapes. It concluded that the compressive performance of designed meshed stent models in this study can be easily controlled by increase some design variables like angle proportional to the arm length of designed basic mesh shapes and get closed to conventional medical stents with higher strength performances.

Keywords: Medical Stents, Mesh Structure, Finite Elements Analysis, Compressive Stiffness

Introduction

In recent years, stenosis and occlusion have occurred in body lumen such as blood vessels, bile ducts, trachea and other like indispensable for maintenance of human life as in the superficial femoral artery (SFA) occlusion caused by disease. As an effective treatment for such stenosis and occlusion, indwelling of medical stents is performed. The inside of the living body lumen where the stents are placed is a corrosive environment with complicated structures and severe movements. The difficult environment may cause rejection reactions when foreign matter intrudes. Therefore, it is required that medical stent devices applied for the living body lumen have high flexibility, excellent biocompatibility, high strength and durability etc.

However, ready-made conventional medical stents have concerns that the design and manufacturing methods for stent shape structures have caused stress concentrations and then lead to fatigue fractures due to pulsation, or caused neointimal hyperplasia due to strong radial forces generated on the inner wall of the stents ^{[1]~[9]}. Therefore, there are needs for medical stents having high strength and high flexibility capable of following severe movements combined with bending, torsion, expansion and contraction in SFA.

Therefore, the purpose of this research is to design applicable mesh structures ^[10] for medical stent applications to solve the above mentioned problems. Meshed stent models with higher strength and higher flexibility with integral molding are designed and investigated analytically using finite element analysis code ANSYS. The compression characteristics of meshed stent models are examined through finite element analysis and reported in this paper.

Design of Meshed Stent Model with Mesh Structures

Based on the design concepts of mesh structures with high strength and high flexibility ^[10], six types of mesh basic shape are designed in this study and applied for meshed stent models as shown in Figure 1. For these mesh basic shape applied stent models shown in Figure 1, the number of basic mesh shape arranged in stent circumferential direction (hereinafter called "N") is changed from 6 to 8, and the angle affecting to arm length (hereinafter called " θ ") is changed from 0° to 60° . Three design variables, such as mesh line width (hereinafter called " w "), the angle affecting to arm length " θ " and number of basic mesh shape "N" as shown in Figure 2, are introduced for easy understanding. Then meshed stent models are designed for all combinations of N and θ . In addition, hexagonal based meshed stent models ^[11] are also introduced in this research for comparison. The diameter of stent cylinder model is set at 6.0mm, the strut thickness is set at 0.18mm and w is set at 0.1mm as layout sizes of meshed stent models for analytical approaches. These stent model sizes are same as the medical stents used in SFA.

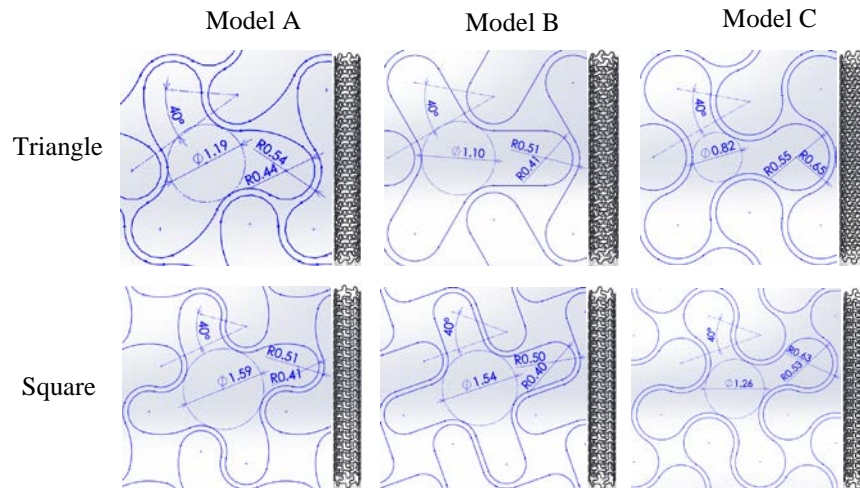


Figure 1.Basic mesh shapes with applied meshed stent models (Triangle and Square)

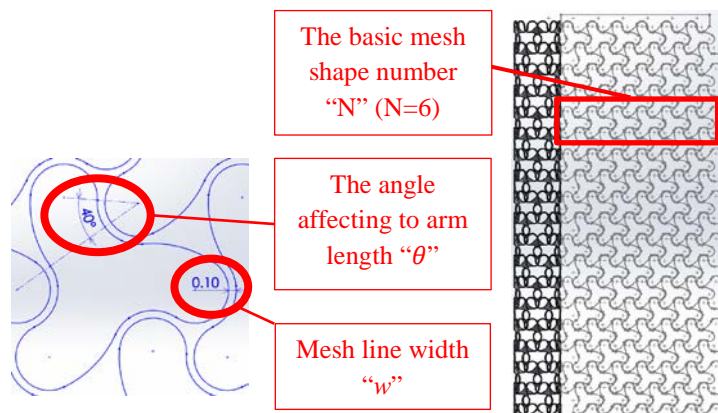


Figure 2.Design variables introduced for analytical approach: mesh line width “w”, the angle affecting to arm length “ θ ” and the number of basic mesh shape arranged in the stent circumferential direction “N”

Evaluation of Compression Characteristics in the Vertical Direction to Cylindrical Axis of Meshed Stent Models

Compression characteristics in the vertical direction to cylindrical axis of meshed stent models were analyzed and evaluated using finite element analysis software ANSYS Workbench. Meshed stent models are sandwiched between flat jigs and applied with compressive load of 10 N in the direction perpendicular to stent cylinder axis as shown in Figure 3. Table 1 shows the material properties and finite element mesh settings for meshed stent modeling. Figure 3 also shows the image of typical finite element mesh of meshed stent model including compressive fixtures.

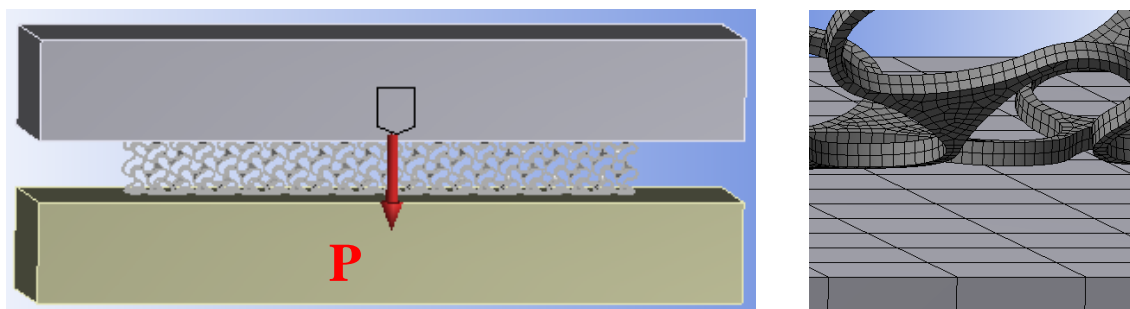


Figure 3.Compression of meshed stent model with flat jigs and typical finite element mesh for meshed stent modeling

Table 1: Material properties of nickel-titanium, and finite element mesh settings

Material	Material	Nickel-titanium alloy
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properties	Poisson's ratio	0.3
	Modulus of longitudinal elasticity [GPa]	75
Finite element mesh setting	Size of elements [mm]	0.09~0.10
	Number of element in thickness direction	2~3

In this research, compression characteristics of meshed stent models are evaluated by calculation of compressive stiffness. Compressive stiffness can be calculated by equation (1) and represents the supporting ability of the meshed stent to blood vessel. Compressive stiffness k is then calculated by fitting the deformation δ with compressive load P applied to the meshed stent model as following.

$$k = \frac{P}{\delta} \quad (1)$$

where k : Compressive stiffness [N/mm]

P : Compressive load [N]

δ : Displacement [mm]

Compressive stiffness characteristics of meshed stent models using regular triangle, square and hexagon based mesh shapes

In this section, compressive stiffness of meshed stent models using regular triangle, square and hexagon based mesh shapes are evaluated with fixed w at 0.1 mm and different N and θ . Analyses are carried out to examine the periodicities of meshed stent models due to different basic mesh shapes by rotating the compressive directions round the cylindrical axis from 0° to an angle obtained by dividing 360° by N . Typical compressive stiffness results of different meshed stent models are shown in Figure 4.

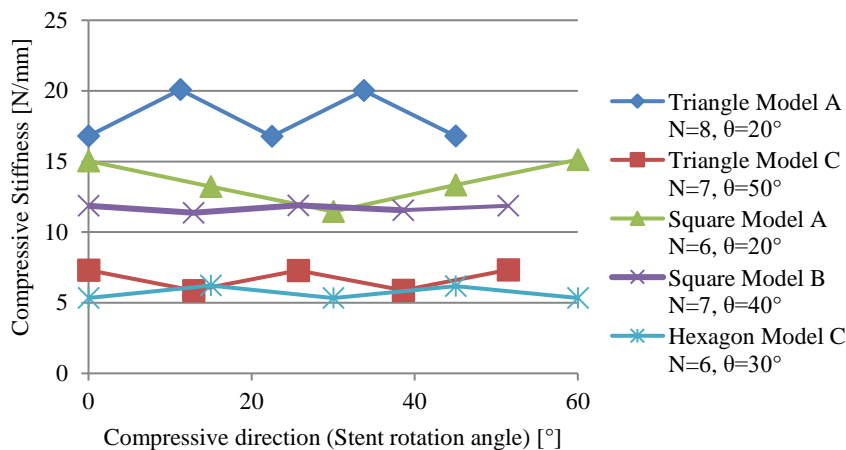


Figure 4. Compressive stiffness of meshed stent models with respect to compressive direction

From these results, it can be seen that the compressive stiffness shows periodicity with the change of the compressive direction. It is considered that the major factors for the periodicity are the axisymmetric basic mesh shapes combined with their numbers used for the meshed stent models.

Maximum deviation in compressive stiffness caused by changing the compressive directions for meshed stent models is found as 7.45 N/mm, which is obtained from Square based Model A with $N=8$ and $\theta=40^\circ$ meshed stent model. On the other hand, minimum deviation in compressive stiffness caused by changing the compressive directions for meshed stent models is found as 0.01 N/mm obtained from Square based Model C with $N=7$ and $\theta=50^\circ$ meshed stent model. In the results of this research, it was found that square based models showed most small deviation in compressive stiffness caused by changing the compressive directions, but it was found that the deviation in compressive stiffness is less likely to occur in the hexagon than the triangle and square. For triangle and square based models, there are many models showing deviation more than 3.0 N/mm in compressive stiffness caused by changing the compressive directions, while for hexagon based models showing less than 2.0 N/mm deviations.

In addition, as a tendency of the changes in compressive stiffness of different compressive direction of the meshed stent model, in the case of square based models, it was found that the deviation in compressive stiffness becomes

sensitive with the even number of mesh shape N . On the other hand, in the case of triangle based model, the deviation in compressive stiffness was not greatly influenced by the number of mesh shape N . It is conceivable that the arrangement of basic mesh shapes on the side of meshed stent models affects these kinds of tendency.

In the case of square based mesh shapes, when the mesh shape boundary shown in Figure 5 is arranged on the side furthest from the compressive surface lines, the stress caused by compressive force is well dispersed and lead to lower compressive stiffness. On the other hand, when the mesh shape center shown in Figure 5 is arranged on the side furthest from the compressive surface lines, stress concentrations tend to be occurred and lead to higher compressive stiffness. When N is an odd number, the mesh shape center appears on one side furthest from the compression surface lines, and a mesh shape border appears on the other side of meshed stent model. However, when N is an even number, it is clearly distinguished either the mesh shape center or mesh shape boundary appears on both sides furthest from the compressive surface lines. Therefore, in the case of square based models, when N is an even number, the deviation between highest and lowest value of compressive stiffness caused by changing the compressive directions tends to be large.

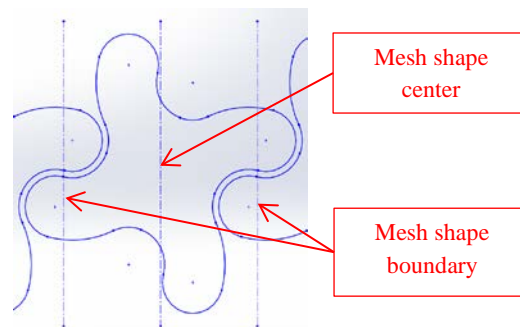


Figure 5. “Mesh shape center” and “Mesh shape boundary” in mesh basic shape

From the above discussion, it is necessary to analyze the compressive stiffness of meshed stent models by changing the compressive direction. Then, it is necessary to introduce the average value of compressive stiffness due to the periodicity to evaluate the compression characteristics of meshed stent model. From these results one can see that there is a concern that the blood vessel wall can't be evenly supported using the meshed stent models, and it is necessary to reduce the periodic changes in their compressive stiffness.

Influence of the angle affecting to arm length θ on the compressive stiffness of meshed stent models in direction perpendicular to the cylindrical axis

In this section, effects of the angle affecting arm length to the compressive property of meshed stent models using triangle, square and hexagon based mesh shapes are to be evaluated with basic mesh shape number N setting at 6, 7 and 8, and fixed w of 0.1 mm. Analyses are carried out with changing θ between 0° and 60° . Obtained typical results are shown in Figure 6.

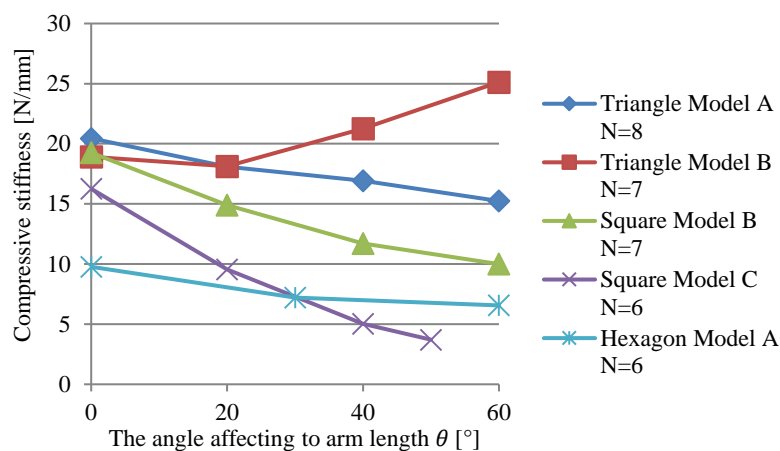


Figure 6. Influence of the angle affecting to arm length θ on the compressive stiffness of meshed stent models

From analytical results, except for triangle Model B, it was found that compressive stiffness is reduced by enlarging θ of all kind of meshed stent models. In particular, in three kind of Model C, the compressive stiffness can be

greatly reduced by increasing the design variable " θ ". In the triangle based models, Model C N8 showed the most reduced compressive stiffness with a large deviation of 12.61 N/mm created when the arm angles change from 0° to 50° . Even with the square based models, Model C N8 showed the most reduced compressive stiffness with a large deviation of 14.66 N/mm created when the arm angles change from 0° to 50° . On the contrary, the compressive stiffness of Model A is hardly to be reduced, like in triangle based Model A within 2.35 N/mm deviations, and like in square based Model A within 4.19 N/mm when the arm angles change from 0° to 60° . By making θ larger for Model C than Model A, it is easier to deepen the curvature of the basic mesh shape, and then improve the flexibility of meshed stent model and lead to different responding.

For triangle Model B, as θ increased, the constant mesh line width portion becomes shorter and then the compressive stiffness of meshed stent model can be considered becoming higher. As shown in Figure 7, in the 20° model, the entire mesh shape is configured with a large constant mesh line width area surrounded in the frame. However, in the 60° model, there are considerably few places where the mesh line width is constant. This is the considered main reason to cause the increase in compressive stiffness of meshed stent model as θ increased.

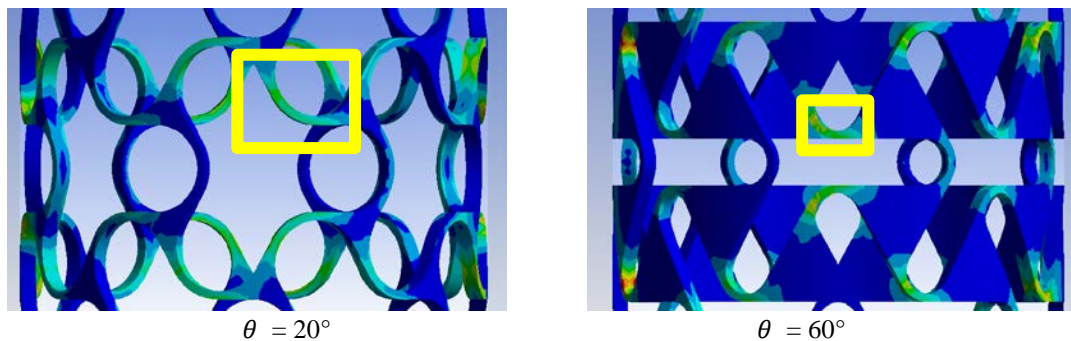


Figure 7.Equivalent stress diagram accompanying with change in the angle affecting to arm length θ (Triangle, Model B, N8)

Also in both triangle and square based models, if θ was the same, the compressive stiffness tended to be smaller in the model with smaller N. On the contrary, with the fixed mesh shape based stent models, the ratio of reduction in compressive stiffness caused by extension of arms is roughly the same regardless of N. For example, in the square based Model C, regardless of N, compressive stiffness decreased by about 40% at 20° model, about 65% at 40° model, about 75% at 60° model compared with 0° model. A similar tendency can also be seen in the ratio of increase for triangle based Model B in which the compressive stiffness increased with θ increased. Even in the other models, with the fixed mesh shape based stent models, the compressive stiffness decreases almost similarly.

From all the analytical results, it can be seen, as a general trend, the triangle based stent models tend to have lower compressive stiffness than square based models. Furthermore, it can also be found that the compressive stiffness tends to be smaller with the hexagon based models than the triangle based models. The hexagon based stent models have overwhelmingly low compressive stiffness with small value of θ , while with θ increased, the triangle based or square based Model C would show lower compressive stiffness.

Evaluation of Compression Characteristics in the Radial Direction of Meshed Stent Models

In this chapter, compression characteristics in the radial direction of meshed stent models are analyzed and evaluated using finite element analysis software ANSYS Workbench. Assuming equally pressure from blood vessel toward to the stent cylindrical center axis is applied on the stent surface, a displacement of 2.0 mm is caused at the surface of the meshed stent model along the pressure direction. Then, from the analyzed reaction force generated on the surface of the meshed stent model, the compressive stiffness of the designed meshed stent model can be calculated. Figure 8 shows the 3D shape of the meshed stent model before/after deformation and the state of finite element mesh for analysis. In addition, the material properties shown in Table 1 are used in analysis, and the setting of finite elements mesh for meshed stent models are shown in Table 2.

In the radial compression analysis, as well as the evaluation of compression analysis in vertical direction to cylindrical axis, compressive stiffness of meshed stent model can be introduced as an evaluation index. Compressive stiffness of meshed stent models by radial compression analysis then can be calculated by equation

(2) based on equation (1).

$$k = \frac{P}{\delta} = \frac{Q}{\Delta D} \quad (2)$$

where k : Compressive stiffness [N/mm]

Q : Reaction force generated on the stent surface [N]

ΔD : Stent diameter deformation amount [mm]

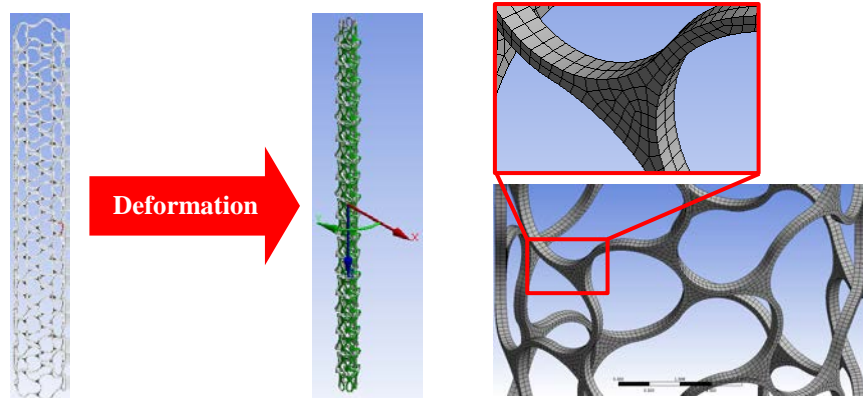


Figure 8.Radial compression analysis of meshed stent models with finite element mesh

Table 2: Finite element mesh setting for radial compression analysis of meshed stent model

Size of elements [mm]	0.08
Number of element in thickness direction	2

Influence of the angle affecting to arm length θ on radial compressive stiffness of meshed stent models

In this section, the influence of the angle of the arm affecting to arm length “ θ ” relative to the radial compression characteristics of different meshed stent models with number of mesh shape N at 6, 7, 8, and fixed mesh line width w at 0.1 mm are evaluated. Analyses are carried out with changing θ from 0° to 60° . Some of typical obtained results are shown in Figure 9.

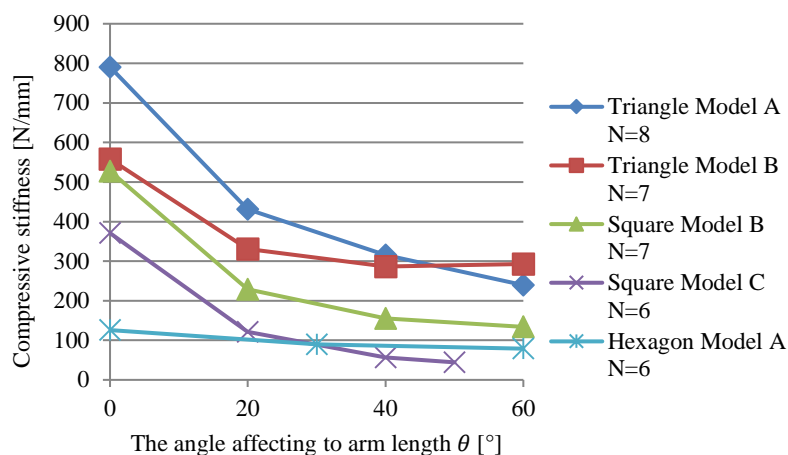


Figure 9.Influence of the angle affecting to arm length θ on the radial compressive stiffness

From the analytical results, it was found that the radial compressive stiffness is reduced by increasing design variable θ in all meshed stent models. In addition, with same number of mesh shape N , radial compressive stiffness of meshed stent models can be most reduced by increasing θ of the Model C. In the triangle based models, the decrease in radial compressive stiffness of Model C N8 was the largest of more than 700 N/mm with angle θ changes from 0° to 50° , which affects the mesh arm length. Even with the square based models, the radial

compressive stiffness of Model C N8 decreased largely close to 700 N/mm with same angle changes from 0° to 50° .

Regarding the Model B, it was found that in the case of square based models, the effects of reducing radial compressive stiffness by extending the arm are larger than that of the Model A. While in the case of triangle based models, the reduction effects are reduced. The radial compressive stiffness of triangle and square based Model B at $N = 8$ and $\theta = 50^\circ$ produced a difference of nearly 200 N/mm. The difference in radial compressive stiffness between triangle and square based other models are shown within 100 N/mm as the largest.

The hexagon based models show smaller radial compressive stiffness than the triangle and triangle based models with smaller " θ ", but the effect of reducing the radial compressive stiffness by extending θ tends to be less. Therefore, when θ is smaller, the radial compressive stiffness of the hexagon based models may be lower than that of the triangle or square based models.

Relationship between vertical compression characteristics to cylindrical axis and radial compression characteristics of meshed stent models

In this section, the relationship between the cylindrical axis vertical compression characteristic and the radial compression characteristic will be examined. Based on the above mentioned analytical results, comparison on square based stent models are shown in Figure 10, in which the horizontal axis shows the vertical compressive stiffness and the vertical axis shows the radial compressive stiffness.

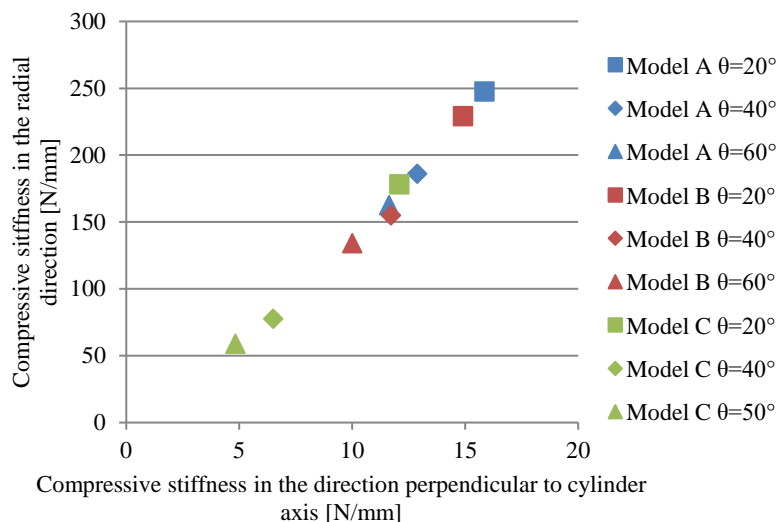


Figure 10. Comparison on cylindrical axis vertical compressive stiffness and radial compressive stiffness of square based N8 stent models

From Figure 10 one can see that radial compressive stiffness is higher than that in cylindrical axis vertical direction. In the case of vertical compression to the cylinder axis, meshed stent models are compressed from one direction, whereas in the case of radial compression, meshed stent models are compressed evenly from all directions, and then lead to higher radial compressive stiffness.

In addition, it was found that for both vertical compression to cylindrical axis and radial compression, the compressive stiffness decreases greatly with θ increased. It means that compression characteristics is very susceptible to the angle affecting to arm length θ of basic mesh shape. It is most effective way to reduce the compressive stiffness of meshed stent models by increasing design variable θ .

Further, strong correlations between vertical compression to cylindrical axis and radial compression can be found from these results shown in Figure 10, The correlation coefficients for different meshed stent Model A, Model B and Model C were found as 0.99, 0.98 and 0.99. These results shown in Figure 10 are from square based N8 stent models, similar tendencies can be observed for all other meshed stent models including hexagonal based models.

Conclusion

Based on the design concepts for mesh structures, meshed stent models are designed for SFA treatment stent

application. Different design variables such as basic mesh shape type, number of mesh shape N and the angle affecting to arm length on the compression characteristics of meshed stent models are investigated using finite element analysis. From analytical results, the following conclusions are obtained.

- (1) Since the compressive stiffness in the direction perpendicular to cylinder axis of meshed stent models vary periodically according to different compressive directions, it is necessary to introduce an average value for the compressive stiffness of meshed stent models.
- (2) Combined with basic mesh shape and design variable of the angle affecting to arm length, the length with constant mesh line width might be extremely short even with large value of the angle affecting to arm length, then cause the increased compressive stiffness in the direction perpendicular to cylinder axis.
- (3) Strong correlations between vertical compression to cylindrical axis and radial compression are found in the meshed stent models.
- (4) Although there are some exceptions, it is possible to reduce the compressive stiffness of meshed stent models by increasing the design variable of the angle affecting to arm length.
- (5) Hexagon based stent models have overwhelmingly low compressive stiffness with small angle affecting to arm length θ , but if θ becomes large, they would have about the same compressive stiffness as triangle or square based stent models.

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IS TURKEY REALLY A GLOBAL COMPETITOR IN YACHT BUILDING INDUSTRY?

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Abstract: As it is well known, Turkey took place near the top of 24m or longer yacht building countries. In the world there are a few leading countries which dominate both production and other processes. In recent years, Turkey is one of the yacht building centers in the world and attracts not only key players' interest but also tourists' with long and beautiful coastal lines and long sunny season. From this point of view, Turkish yacht building industry investigated in terms of design and engineering, yards locations, yacht types, project length, installed engine, transmission or propulsion systems, navigation and telecommunication systems, generator, hull and superstructure materials and classification in this study. According to the results, it can be said that Turkey has lots of advantages to compete with the leading players of this industry but must be focused on added value activities to increase its share from the market.

Keywords: Yacht, Super or Mega Yacht, Turkish Yacht Building Industry

Introduction

Shipbuilding is one of the essential industries of the industrialized countries and it can be classified as commercial and pleasure in terms of type of vessels such as container ship or yacht, respectively. Both building activities are important due to provided added values. Moreover, shipbuilding industry can be assumed as strategic when high tech buildings such as battleship taken into consideration. This strategic industry not only provides military contributions to national security but also to all partners such as suppliers that established in the regions or countries. Therefore shipbuilding is an industry that creates added value. In the world, there are some long-established firms that manufacture or produce shipbuilding related products, tools, and etc. Therefore shipbuilding is an industry that has inter-linkages. For example design and building activities of projects can be done in different locations. Installations can be supplied from different countries. And, finally projects can be finished in a yard.

Term of yacht explained by Aydın (2015), Göksel (2006, 2003), Dear and Kemp (2005), Atmaca (2007), Akyürek (2013), Simpson and Weiner (2001). Yacht building is sub-branch of shipbuilding industry. But it is utterly different from this industry due to some properties such as added value, building duration, investment, and etc. (Turkish Chamber of Shipping, 2015). Yachts are much more emotional than other types of vessels due to perceptions of the potential user or owner. Also, building processes requires more attention and skill because of the exterior and interior designs, expectations, requirements, etc. Seaworthiness, large cabin accommodations, beauty, and high speed are the general characteristics of yacht design (Skene, 1904). According to Aydın (2015) design phase of the yacht projects has important effects on building processes. And building processes starts with the conceptual designs that performed to reveal demands or requirements. Then following steps take place till the delivery.

- Research and development phase (design detailing and engineering)
- Perfecting or purification phase (layout improvement, 3D modeling and detailed construction drawings)
- Building and installations (hull, superstructure, mock-ups and installations)
- Launch and delivery phase

Because of lots of factor such as limited space, function, environmental and climate conditions, and etc. taken into consideration, interior design of yachts has influences on furniture as construction, functionality and aesthetic shape (Stancu et al. 2006). According to Altın (2014) boats became more qualified and functional when furniture became qualified and yachts have been fitted by fixed or movable unique furniture.

According to Duman (2015) yacht interiors, indeed, did not reflect the architectural design codes to ensure physical and psychological comfort of human on-board. Comfort on board also depends on noise and vibration. Pais et al. (2017) and Aydın et al. (2015) stated the importance of noise and vibration damping not only to fulfill the class

requirements but also ensure comfortable interiors.

Gurler (2013) stated that owner of a yacht has perception or feeling that he or she is the member of a certain social group. Also, showing interest to yachts or taking sea journeys may indicate wealth in social sphere (Ryan, 2006). Boats, historically, are indicators of wealth and social status. And, yachting started in 17th century and divided into two; first period till 1815 and second period from 1815 to 1903 (Clark, 1903). From this date, technological developments alter the yachts as everything. Nowadays, yachting industry has been incomparable expanded and evaluated (Nicolantonio, et al, 2015). Then, bigger, more luxury, faster, more comfortable yachts built thanks to developments. This situation was well-explained by Naujok (2002) as boats which are longer than 11m require lots of technologies. And as Payne and Siohan (2008) stated, customers or potential users demanded or wished comfortable, functional, and aesthetic yachts. Therefore these were resulted increase in costs. According to Newing (2013) building smaller yachts without sacrificing quality is the simplest way to decrease costs and design phase is the beginning of cost control. But, this means limited interior or exterior for everyone and everything. Therefore, wealthy people demand everything larger even if the yacht can accommodate a few instead of tens of guests (Newing, 2013). Another way to reduce the cost of a yacht is chartering but lots of owners do not charter their yachts (Newing, 2013).

Khufu, 4500 years old boat, buried in the Keops pyramid (Göksel, 2006) and Azzam yacht, built by Lürssen in Germany, confirms this wealth and social status case from past to present, respectively. Yachts are vessels associated with wealth and luxury (Tokol, 2010, 2013). Yachts, especially luxury ones, represent the status and high social value (Nicolantonio et al. 2015). According to Göksel (2003, 2004) yachts are getting similar to each other in terms of paint, hull and superstructure due to conservative approach and un-scrutinizing. Customers or builders should reflect their authentications to the projects to eliminate this formation. And, as it is well known custom yachts are the best examples of this. For semi-custom or mass-production yachts, this can be somewhat achieved by individualization of interiors by offering some alternatives.

Turkey is one of the twenty countries which are able to design and build different types of vessels with high quality (Ozturk, 2014). General Directorate of Exports (2016) stated that Turkish yards took a great step in yacht building but especially in mega-yacht. According to Aydın and Yilmaz Aydın (2016) Turkey has achievement on yacht building industry but same was not valid for design activities especially for interior design. There can be lots of factors which result this issue but one of the main ones might be the lack of education in this area. But, in recent years a few universities in Turkey focused on this issue to increase share of design projects. When leading yacht builder countries reviewed, it's seen that they far-back started technical education on engineering and design of yachts as Griffiths (1988) mentioned. And, sufficient and developed yacht building industry and sub-industry were already established in these countries. But regarding Turkey, progress started from 90s and this must be taken into consideration.

In Turkish yacht building industry, share of material and labor force in total cost are 60% and 40%, respectively (BAKA, 2012). According to BAKA (2012) domestic share in yacht production in Turkey was around 30%. But, Aydın (2012, 2015) stated that lots of things are import especially for luxury yacht projects. So, can Turkey be assumed as a global competitor in yacht building when value added components of yacht are imported. From this point of view, the aim of this study is figuring out this issue in terms of design, yard, length over all (LOA), yacht type, engine, hull and superstructure materials.

According to Merendino (2014) Turkey has low-cost labor force to thank for being in competition with the leading yacht builder countries such as Italy, Germany and Holland. When, Global Order Book data evaluated, Turkey took place near the top in terms of total length of yachts which longer than 24m. When location and four season climate of Turkey taken into consideration, this achievement not only be related with only low-cost labor cost but also quality of the craftsmanship. Four season climate and famous long coastline with world-ranking touristic facilities provide opportunities to yacht building industry in Turkey. Tandoğan (1998), Turkish Chamber of Shipping (2015), National Marine Manufacturers Association (2016), Yilmaz and Yetgin (2016), Sevinc and Guzel (2016), Nicolantonio et al. (2015), and Sariisik et al. (2011) mentioned the importance of yacht tourism. Martinez (2009) compared yachts in terms of minimal-space space tourism. Cerveira et al. (2012) draw attention to take into consideration of disabled people in designing of sailing yacht.

According to Balance Technology Consulting GmbH (2014) European builders are still forefront partners in terms of developers of special vessel types such as yachts. And, they presented the key partners of European shipbuilding industry which produces from paintings to complete solutions. According to Balance Technology Consulting GmbH (2014) cost savings are one of the important competitive factors and numerous European firms, supply shipbuilding industry, has moved to Asia to have advantages of cost savings. Merendino (2014) stated that Azimut-

Benetti, one of the Italian leading yacht builders, strengthened the production lines which established in Turkey to overcome crisis or provide cost advantage. Aydin (2015) stated that yacht building is a labor-intensive activity and developed countries dislocating their production activities to the countries that provide low labor-cost. Lots of firms started to produce in Turkey because of not only low labor-cost but also high quality production (National Marine Manufacturers Association, 2016). But, they supply the production with value added activities such as design, electronic tools or equipment, and advanced technologies. Therefore, they gain not only competitive advantages but also dependent partners. Another important issue that must not be ignored is regulations to protect environment. Severe sanctions force lots of builders dislocate their production activities to countries that have no or scarcely any environmental regulations. Celebi et al. (2010) expressed that not only environmental protections should be provided by Turkish yards but also safety and health requirements. Occupational health and safety (OHS) in production period is an important issue and according to firms it is a cost increasing factor. But, this industry poses lots of dangers such as contacting with or inhalation of hazardous fiber reinforced plastic (Frassine et al. 2014). Insufficient and improper working environments also threaten the OHS (Tekin, 2013). Aydin and Koc (2015) investigated yacht interior production in Turkey in terms of compliance with OHS regulations and they stated that it's not a pretty sight.

Builders, designers, suppliers or providers, owners, and operators are the parties on the market but builders act as a node that link all the parties together in yacht market (Johansson et al. 2014). Yan (2008) reviewed Taiwan's yacht industry on the basis of two firms and stated that it is a global competitor in the market since the millennium without receiving insignificant subvention. Boote et al. (2012) mentioned challenging growth of Turkey in the yacht building industry. And, this is true when market share of 24m or longer yachts were taken into consideration. But, yachts, especially big ones and long-running custom projects, attract attention but they take a small share of the whole yacht market (GOB 2014). So, taking place near the top does not prove success on the whole yacht market.

From this point of view, this study tried to investigate Turkish yacht building industry on the basis of built yacht projects which were 24m or longer.

Materials and Methods

This study was conducted as a survey using list of yachts (24 meters and longer) which were ordered from Turkey's yards and started to build. In this study, the term of "yacht" is used to denote a vessel used for pleasure purpose and smaller than 24m yachts were not taken in consideration. List prepared by comprehensive and accurate data of The Global Order Book (GOB) includes the years of 2011 to 2017. According to GOB, data obtained by yards also cross-referenced with other sources. Then, all data was cross-checked before analysis. Obtained data classified by the following topics;

- Design and engineering (Naval Architecture, Exterior and Interior Designs)
- Yards locations
- Yacht types
- Project length
- Engine
- Transmission or propulsion systems
- Navigation systems
- Telecommunication systems
- Generator
- Hull and superstructure materials
- Classification firm and origin

Results and Discussion

Total of 225 projects, built by 57 different builders, were evaluated in this study. 148(66%) and 54(24%) of them are motor yacht (MY) and sailing yacht (SY) respectively. Average LOA (Length Overall) of these projects was 42.75m and maximum and minimum LOA were 24 and 141m respectively. But as seen in Table 1, when 141m projects neglected max and average LOA values were 87m and 42.32m, respectively. Also distribution of the projects length according to design and engineering origin is seen in this table. Projects lengths, exterior and interior design done by domestic designers, were smaller than foreigners. According to results, 115(51%), 123 (55%) and 124 (55%) of 225 projects belongs to foreigners in terms of Naval Architecture, exterior and interior design respectively. Beside data was not available (N/A) for 33(15%), 25(11%), and 32(14%) of 225 yacht projects in terms of naval architecture, exterior and interior design, respectively. According to Cain et al. (2013:10) Turkey was not listed in top 5 in terms of yacht designs completed in 2012. But according to Mee et al. (2011) Turkey

listed as 5th in terms of yacht designs completed in 2010.

Table 1: LOA values according to design and engineering origin.

LOA (m)	Naval Architecture		Exterior Design		Interior Design		Total (225p)
	Foreign (115p)	Domestic (77p)	Foreign (123p)	Domestic (77p)	Foreign (124p)	Domestic (69p)	
Avrg.	43.36	43.8	46.93	37.75	46.95	36.72	42.75*
Min	24.68	24	24.68	24	24.68	24	24
Max	141*	81	141**	67.4	141*	63	141**

*p: projects, *42,32m when 141m project neglected, **87m when 141m project neglected*

Number of yards, just builder of the evaluated projects, in Antalya, İstanbul, Muğla, Kocaeli, Yalova and Zonguldak are 20, 16, 15, 2, 2 and 1 respectively. According to results seen in Table 2, İstanbul, Antalya and Muğla can be assumed as heart of the yacht building industry in Turkey. This may be explained by being an attractive tourism destination, reachability and strong industrial composition. Yachts built in Istanbul are bigger than others when compared with other location and 141m project not taken into consideration. It can be related to length of yards too.

Table 2: Cross tabulation between yard location and LOA values.

LOA (m)	Yard Locations						Total (225p)
	Antalya (77p)	İstanbul (84p)	İzmit (12p)	Muğla (36p)	Yalova (13p)	Zonguldak (1p)	
Avrg.	38.63	46.32	39.97	44.37*	42.9	41.4	42.75***
Min	24.5	25.3	25.2	24	30	41.4	24
Max	70	81	87	141**	58	41.4	141****

*p: projects, *41.61m when 141m project neglected, **77m when 141m project neglected, ***42.32m when 141m project neglected, ****87m when 141m project neglected.*

148 (65.8%), 54 (24%) and 16 (7.1%) of the 225 yacht projects are MY (Motor Yacht), SY (Sailing Yacht) and EX (Explorer) respectively. A great majority of the 224 projects were engineered and designed by foreigners. Engineering and design origin of these projects were classified by yacht types in Table 3. According to this, foreigners have an important impact on yacht building industry in Turkey.

Table 3: Yacht types and their design and engineering properties.

Yacht Type	Naval Architecture			Exterior Designer			Interior Designer		
	Foreign	Domestic	N/A	Foreign	Domestic	N/A	Foreign	Domestic	N/A
Ex	8	6	2	10	5	1	9	4	3
MY	79	48	21	83	49	16	87	43	18
CT	1	1	0	1	1	0	1	1	0
SF	4	0	0	4	0	0	4	0	0
SY	23	22	9	25	21	8	23	20	11
Total	115 (51%)	77 (35%)	32 (14%)	123 (55%)	76 (34%)	25 (11%)	124 (55%)	68 (31%)	32 (14%)

CAT, MTU and MAN are the most preferred engine brands for 159 (71%) yacht projects as seen in Table 4. And, 85.3% of 225 yacht projects' engines are imported and there was no data for 14.7% of them. When marine engine industry of Turkey is taken into consideration, it can be said that probably 100% of them could be imported. This is a global fact because these are the leading engine supplier for lots of vehicle types. According to Global Order Book (2015) around 50.7%, 33.9% and 8.4% of 513 (24m or longer) yachts' engines are MTU, CAT, and MAN,

respectively.

Table 4: Cross-tabulation of yacht type and engine brands.

Yacht Type	Engine Brand										Total
	CAT	Cummins	Iveco	MAN	Mitsubishi	MTU	Scania	Volvo	Yanmar	N/A	
Ex	7	0	0	2	0	2	0	0	1	4	16
MY	60	1	0	16	1	47	0	0	5	18	148
CT	1	0	0	1	0	0	0	0	0	0	2
SF	2	0	0	0	0	0	0	2	0	0	4
SY	14	9	2	6	1	1	7	4	0	10	54
Total	84	10	2	25	2	50	7	6	6	32	224*

*1 missing value

Diesel engines are one of the primary sources of power needed to move vessels. Total power of engine varies according to displacement and hull form. In addition, speed of the vessels not only depends on these parameters but also size, diameter and location of propeller, curve and number of blades.

There are lots of yacht building materials which differ each other by their advantages and disadvantages such as weigh, usability, bondability, weldability and etc. Wood is one of them and according to Aydın (2015) its importance for building material is reducing day by day while increasing for interior or decorative purpose. Classification of used materials according to yacht type for 224 yacht projects is seen in Table 5. Steel and Aluminum are the most common used material for hull and superstructure not only in general but also for MY and EX yacht projects. Wood is most common used superstructure material for SY.

Table 5: Hull and Superstructure materials of yachts.

Yacht Type	Hull Material					Total	Superstructure Material					Total
	Al	C	S	W	N/A		Al	C	S	W	N/A	
Ex	0	2	13	0	1	16	9	5	1	0	1	16
MY	1	41	82	24	0	148	60	45	17	26	0	148
CT	0	1	1	0	0	2	1	1	0	0	0	2
SF	1	2	0	1	0	4	1	2	0	1	0	4
SY	5	7	23	19	0	54	13	7	12	22	0	54
Total	7	53	119	44	1	224*	84	60	30	49	1	224*

*1 missing value, Al: Aluminum, C: Composite, S: Steel, W: Wood

Geographical location has some influences to both tourism and yacht building industry in Turkey. Muğla and Antalya is one of the coastlines constitute the Turkish Riviera or Turquoise Coast. Blue voyage along the Turkish Riviera, Aegean and Mediterranean seas, is carried out for decades with local gullet schooners. Gulets are traditional sailing vessels that have two or three mast and in general built by wood. This situation is clearly seen in Table 6. Almost half of Sailing Yachts (SY) built or are being built in Muğla. But great majority of these sailing yachts are constructed by steel and aluminum instead of wood as seen in Table 7.

Wood is one of the earliest construction material that human being used but advancing technology provides an opportunity to use different materials that have some better properties than wood. Aluminum, Composites (FRP, GRP, etc.), Steel and wood are the most common used materials for yacht construction. Hull and superstructure material of a yacht can be the same or not. Steel and aluminum are the most preferred construction materials for Hull and Superstructure as seen in Table 5 and 7.

Table 6: Yacht types classified by yard location.

Yacht Type	Yard Location							Total
	Antalya	İstanbul	Kocaeli	Muğla	Yalova	Zonguldak	N/A	
Ex	7	6	1	2	0	0	0	16
MY	55	60	11	10	11	1	0	148
CT	0	2	0	0	0	0	0	2
SF	3	1	0	0	0	0	0	4
SY	12	14	0	24	2	0	2	54
Total	77	83	12	36	13	1	2	224*

*1 missing value

Table 7: Construction material by yard location.

Yard Location	Hull Material					Superstructure Material					Total
	Al	C	S	W	N/A	Al	C	S	W	N/A	
Antalya	5	33	27	11	1	24	37	2	13	1	77
İstanbul	0	9	51	23	0	45	12	1	25	0	83
Kocaeli	0	10	2	0	0	2	10	0	0	0	12
Muğla	2	0	25	9	0	13	0	13	10	0	36
Yalova	0	1	12	0	0	0	1	12	0	0	13
Zonguldak	0	0	1	0	0	0	0	1	0	0	1
Total	7	53	118	43	1	84	60	29	48	1	222*

*3 missing value, Al: Aluminum, C: Composite, S: Steel, W: Wood

Yacht projects must be surveyed by some classification societies to verify conformance with the regulatory standards. These standards, composed by members of Societies, govern the design, construction, maintenance and operation of vessels. There are 12 classification societies According to International Association of Classification Societies Ltd. Some of these members, expect Türk Loydu (TL), is seen in Table 8. Türk Loydu (TL) is an authorized classification institute by EU and according to 94/25/EC directive it is able to evaluate of conformity of manufactured vessels to labeling them with CE sign. There is no data available for 69 (31%) yacht projects and it may seriously affect the share. However, RINA is the most preferred classification societies for yachts built or are being built in Turkey. And, only 7 (3%) of 224 projects are classified by Turkish authorities.

Table 8: Classification properties of yachts.

Yacht Type	Classification										Total
	ABS	BV	CE	CE/RINA	GL	LR	RINA	RINA/TL	TL	N/A	
Ex	3	2	0	0	0	1	4	0	0	6	16
MY	12	11	2	2	4	11	60	0	0	46	148
CT	0	0	0	0	0	0	2	0	0	0	2
SF	0	0	0	0	2	0	0	0	0	2	4
SY	0	0	1	0	0	5	28	1	4	15	54
Total	15	13	3	2	6	17	94	1	4	69	224*

*1 missing value, ABS: American Bureau of Shipping, BV: Bureau Veritas, CE: Conformance Européenne, RINA: Registro Italiano Navale, GL: Germanischer Lloyd, LR: Lloyd's Register, TL: Türk Loydu

Share of labor and material cost for yachts built in Antalya Freezone in 2011 are 40% and 60%, respectively. And engine (25%), furniture (20%), electric & wiring (18%), structural parts (15%), paint and varnish (12%) and deck parts (10%) are shares of material cost of a yacht (BAKA, 2012). Yacht building industry in Turkey is import-weighted in terms of high value added product, material, equipment or machinery usage. And, when compared with the competitors, world class but relatively low-cost labor is the strongest side of the industry (Aydın, 2015). Also Aydın (2012) stated that yards that build luxury yachts prefers to work with world-famous designers or firms to increase perception of their firm image and quality.

Almost all yachts propulsion and navigation systems were imported and fitted. There are lots of paint or varnish types for yacht painting such as PU, epoxy, synthetic and etc., and almost all projects painted or varnished with imported coating materials.

According to Turkish Chamber of Shipping (2015) followings are advantages of Turkish yacht or boat building industry.

- Educated and skilled labor force
- World class production quality
- Acceptable costs
- Qualified and sufficient sub-industry
- Modern and technologic foundations
- Easy access to worldwide markets
- Favorable climate

It can be mentioned that there is skilled, educated and relatively low-cost labor force but According to Aydin (2012) industry face with the deficiency of enough skilled labor force when new yards or builders take place or business volume increase. This situation is so clear especially at locations that have non-clustered yacht builders and suppliers.

Except qualified and sufficient sub-industry, almost all captions listed above were confirmed by the reviewed literature. Lack or under qualified, interrupted or insufficient supplier is the primary concern of any type of production and as seen in the tables Turkish yacht building industry has this problem and has been fighting with this issue. And, according to National Marine Manufacturers Association (2016) Turkey is one of the boat exporter countries to US boat market and tries to get share in expensive markets with improving its engineering know-how instead of using cheap labor force advantage. Keep in mind that, subsidiary or partners of international companies take position in Turkish yacht building industry that located at Tuzla, Antalya Free Zone and etc. From this point of view, lots of important actor of this industry is in close connection to each other.

Conclusion

Some of the tables clearly express that yacht building sector in Turkey is dependent to the imported raw material, end products or components that required for building process. But, industry exports pretty much of the builds as a final product. Besides, according to results lots of core activities such as design and engineering are being done by foreigners. And value added parts or technical equipment such as engine, communication devices and etc., are being imported while constructing a yacht in Turkey. Maybe it's due to lack of powerful sub-industry of marine industry. And, import based production increase the costs even if Turkey still has low-labor cost advantage. Therefore industry and related sub-industries must be supported by the government to provide much more added value.

Shipbuilding industry of Turkey provided contributions to economy and it looks like it will continue to do this (Anon, 2014). But, from this point of view, it can be said that results presented in this study confirm that yacht building industry in Turkey is a bit foreign dependent about lots of value added things. Thus, economic impact of this industry may not be well understood and it would be unsatisfactory for the local economy.

So, there is an ironic situation for Turkey, when a great majority of value added things are being exported from competitors such as Italy, Holland, Germany, United States, United Kingdom, then can it be said that Turkey is a global competitor in yacht building industry? It makes little sense but we can say yes when industry and sub-industries run with domestic goods, tools, equipment and etc.

In yacht building industry, there are some exceptional cases such as using tropical wood species and it cannot be supplied by the domestic way due to their rarity and endemism. Therefore such materials must be export oriented for lots of leading yacht builder as Turkey.

Consequently, it is obvious that Turkey is one of the center and leading yacht builders in the world in terms of some criteria such as total project length. But, Turkey must be focused on high added value activities.

Concerning with only 24m or longer yacht projects and aforementioned investigation topics are the limitations of this study. And, it can be thought that result of this study may not reflect the whole industry. Therefore, a

comprehensive study should be conducted to figure out an extensive structural analysis of industry.

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İŞ YERİ UYGULAMA EĞİTİMİNDE ÖĞRENCİLERİN BAŞARI DURUMLARININ DEĞERLENDİRİLMESİ

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Özet: İş Yeri Uygulama Eğitimi; öğrencilerin eğitim kurumlarında gerek teorik gerekse pratikte edindiği bilgi ve tecrübelerin, uygulamaya dökülebilmesi ve pekiştirilebilmesi adına İş Yeri Uygulama Eğitimi dersi adı altında, tam zamanlı olarak iş yerlerinde yapacakları yeni bir eğitim modelidir. Bu yeni eğitim modelindeki eğitim süreci 15 haftadır. Devam zorunluluğu %90'dır. Devam zorunluluğu yüksek bir oranda tutularak öğrencinin bu eğitimden elde edeceği edinimlerin maksimum düzeyde olması amaçlanmıştır. Öğrencilerimizin İş Yeri Uygulama süreci boyunca hem üniversite hem de çalıştığı iş yerinde sorumluları bulunmaktadır. Çalıştığı kurumdaki sorumlu kişi "İş Yeri Eğitim Sorumlusu", üniversitedeki sorumlu kişi de "İzleyici Öğretim Elemanı" olarak adlandırılmaktadır. İş Yeri Eğitim Sorumlusu öğrencinin çalıştığı firmada bulunduğu bölümde yetkili amiri olmaktadır. İş Yeri Eğitim Sorumlusu öğrencilere meslek alanlarıyla alakalı işler vermek, öğrencilerin devam durumlarını takip edip sisteme işlemek, dönem sonunda öğrencilerin başarı durumlarını değerlendirmekle görevlidir.

Bu çalışmada amaç; öğrencilerimizin İş Yeri Uygulama Eğitimi sürecinde başarı durumlarının değerlendirilmesi sisteminin doğru olup olmadığını sorgulamaktır. Çalışmanın kapsamı 62 firmada çalışan 108 öğrenci tarafından oluşmaktadır. Öğrencilerimizin başarı durumunun değerlendirmesinde oran olarak İş Yeri Eğitim Sorumlusunun verdiği notun %50'si İzleyici Öğretim Elemanının verdiği notun %50'si alınmıştır. Öğrenci stajdan başarılı olmak için 100 üzerinden 60 almak zorundadır. Başarılı olamaması durumunda İş Yeri Uygulama Eğitimi tekrarlamaktadırlar. Hem İş Yeri Eğitim Sorumlusuna hem de İzleyici Öğretim Elemanına eşit oranda not verme yetkisi bulunmaktadır. Öğrencilerimizin İş Yeri Eğitim Sorumlularından alınan geri dönüşlerde, uygulanan not verme sisteminin eşit olması, öğrencinin hem iş yerinde yaptığı çalışmalara hem de İzleyici Öğretim Elemanına vereceği rapora aynı özeni göstermesini sağlamaktadır. Çalışma sonucunda; 62 firmadan 56'sı olumlu dönüş sağlamıştır. Çalışmada firmaların ve öğretim elemanlarının verdiği notlar değerlendirilmiş ve tartışılmıştır. Sonuç olarak bu sistem, öğrencinin hem iş yerinde bulunduğu çalışmalara pozitif katkı sağlamış, hem de yaptığı işleri raporlama kabiliyetini geliştirmiştir.

LAZER NOKTA KAYNAĞI İLE KAYNATILAN AISI 304 PASLANMAZ ÇELİKLERİN MİKROYAPI VE MEKANİK ÖZELLİKLERİN İNCELENMESİ

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Özet Bu çalışmada, AISI 304 östenitik paslanmaz çelik sacları lazer nokta kaynağı yöntemi kullanılarak birleştirilmiştir. Lazer kaynak yöntemi görece olarak yeni bir kaynak yöntemidir. Diğer kaynak yöntemlerine göre lazer ışının kolaylıkla yönlendirilebilmesi ve yüksek miktarda enerjinin, küçük noktalara odaklanabilmesi nedeniyle oldukça ileri bir kaynak yöntemidir. Aynı zamanda diğer kaynak yöntemlerinin kullanılmadığı durumlar için geliştirilmiş bir kaynak yöntemi kullanılarak temassız yüksek enerjili bir ışın işlemi olan lazer ışınının en önemli üstünlüğü çok güçlü olmasıdır. Lazer kaynağı, teknolojik şartlara bağlı olarak, iki temel prensipten birini esas alarak gerçekleştirilmektedir. Bunlar; Derinlemesine nüfuz eden lazer kaynağı ve İletim lazer kaynağıdır.

Lazer nokta kaynağı yöntemi ile birleştirilen AISI 304 östenitik paslanmaz çelik numunelerin kaynak ara yüzeylerinin mikroyapı incelemesi yapılmıştır. Yapılan birleştirme sonucunda iki çeliğin hatasız ve boşluksuz olarak kaynatıldığı gözlemlenmiştir.

Anahtar Kelime: AISI 304, Lazer Kaynağı, Lazer Nokta Kaynağı

Giriş

Kaynak ile malzeme birleştirme özellikle metal işlenen sanayilerde çok yoğun olarak kullanılan bir üretim yöntemidir. Levha veya blok malzemeden üretilen nispeten basit parçalar daha sonra kaynak yardımı ile birleştirilerek daha karmaşık şekilli parçalara ulaşabilmektedir. Kaynak ile malzeme birleştirmenin temeli, herhangi bir dış enerji kaynağı ile birleştirilecek iki malzemenin birleşim bölgesinin ve eğer varsa dışarıdan eklenecek dolgu maddesinin yüksek enerji ile ısıtılarak malzemelerin eriyip birbirine yapışmasının sağlanmasıdır (Dahotre, 2008) (Timings, 2008).

Günümüz endüstrisinin vazgeçilmez malzemeleri arasına giren paslanmaz çelikler esas itibari ile demir, karbon ve çoğu zamanda nikel içeren alaşımlar olup başlıca özelliklerini kroma borçludurlar. Demir alaşımlarının korozyon dayanımlarını arttırmak için geliştirilmiş bir türü olan paslanmaz çeliklerin, uygulama alanlarının her geçen gün artarak devam etmesinin temel nedeni koroziy ortamlarda, mekanik özelliklerini yitirmeden gösterdikleri yüksek korozyon dirençleridir. Paslanmaz çeliğin paslanmazlık özelliğine sahip olabilmesi için en az % 12 Cr içermesi gerekir (Anil, 1982).

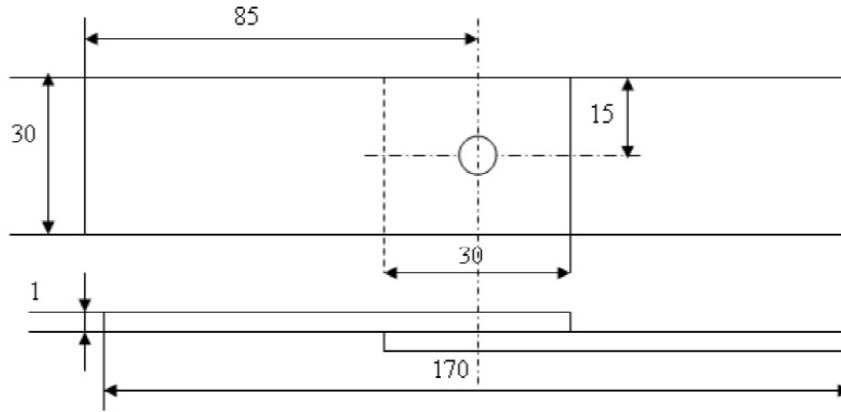
304 kalite paslanmaz çelik, östenitik paslanmaz çeliğin temel çeşitlerinden biri olup, dünyada en yaygın olarak kullanılanıdır. Üretim kolaylığının yanı sıra, birçok ortamda farklı şekillerde kullanılabilmesi, süneklik özelliğinin yüksek olması, haddemeyle sertleştirilebilir olması ve mükemmel bir korozyon dayanımına sahip olması bu kalite paslanmaz çeliğin kullanım açısından tercih sebeplerindendir. Bu paslanmaz çeliğin kalitesi; kimyasal bileşiminin, mekanik özelliğinin, kaynak yapılabilirliğinin ve korozyon-oksidayson direncinin fiyatına oranla çok iyi olması sebebiyle tercih edilir. Bu paslanmaz çeliğin kalitesi piyasada kolay bulunabilirlik açısından, kolay şekil verilebilmesi açısından ve rahat kaynak yapılabilmesinden ötürü en sık tercih edilen paslanmaz kalitelerinden birisidir. Aşırı zorlu ortamlar için uygun olmasa dahi, standart koşullarda fiyat-performans açısından en üstün paslanmaz kalitelerinden birisi olan 304 kalite paslanmaz, özellikle günlük hayatta hemen hemen her alanda kullanılmasıyla günlük hayatın bir parçası haline gelmiştir.

304 kalite paslanmaz çelik kimya, petrokimya, ev aletleri, endüstriyel mutfaklar, otomotiv yan sanayi, gıda sanayi ve vb. gibi geniş bir kullanım sahasına sahiptir.

Malzeme ve Metot

Bu çalışmada AISI 304 östenitik paslanmaz çelik malzeme kullanılmıştır. Kaynatılan numunelere ait şematik

gösterim Şekil 1’de verilmiştir. Ferritik paslanmaz çeliğe ait kimyasal ve mekanik özellikler Tablo 1 ve 2 de sunulmuştur.



Şekil 1. Lazer nokta kaynağı ile kaynatılacak numune şematik gösterimi

Tablo 1 ve 2 de östenitik paslanmaz çeliğe ait kimyasal ve mekanik özellikler görülmektedir.

Tablo1. 304 Kalite östenitik paslanmaz çelik malzemenin kimyasal bileşenleri (% Ağırlık) (A.Ş., 2015)

Standart Adı	Kalite	%C	%Cr	%Ni	%Mn	%P	%Si	%S
ASTM 304	304	0,08	18,00-20,00	8,00-10,50	0,045	1	2	0,03

Tablo2. 304 Kalite östenitik paslanmaz çelik malzemenin mekanik özellikleri (A.Ş., 2015)

Çekme Mukavemeti	Min. 515 MPa
%0,2 Akma Mukavemeti	Min. 205 MPa
Uzama %	Min. %40
Sertlik (Brinell)	Maks. 201 HB
Sertlik (Rockwell)	Maks. 92 HRB
Sertlik (Vickers)	Maks. 210 HV

Diğer östenitik kaliteler gibi, tavllanmış şekildeki 304 kalite paslanmaz çelik neredeyse manyetik değildir. Fakat soğuk haddelendikten sonra önemli ölçüde manyetik özelliğe sahip olabilir. (Tavlama ile tersine çevrilebilir.) Diğer östenitik paslanmaz çeliklerde olduğu gibi 304 kalite paslanmaz çelikler de ancak soğuk haddeleme ile sertleştirilirler. 1.000 MPa’ ı aşan kopma mukavemet değerlerine ulaşılabilir ve talep edilen miktar ürün şekline bağlı olarak da özel soğuk haddelenmiş, mukavemeti yüksek ürün elde edilir. Tavlama işlemi 304 kalite paslanmaz çelikte uygulanan ana ısıl işlemdir. Bu işlem 1.010-1.120 °C’ ye kadar ısıtılıp, hızlı bir şekilde soğutma ile genelde suya daldırma – gerçekleştirilir (Çelen, 2006).

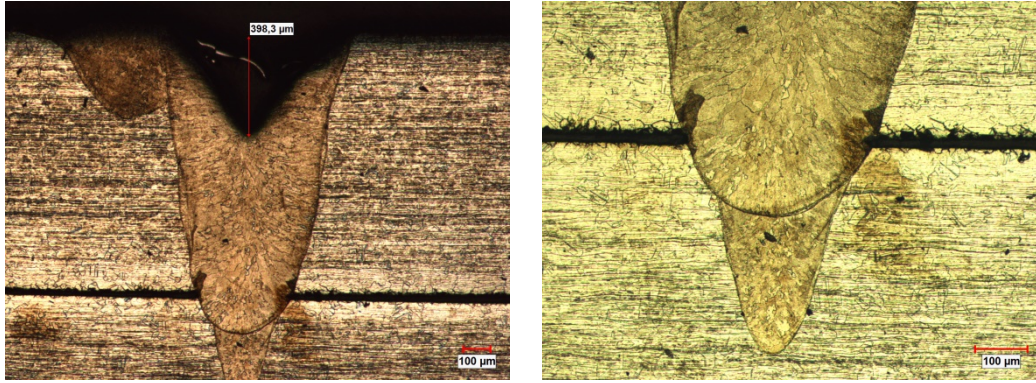
Çalışmada kimyasal bileşimleri Tablo.1’de verilen AISI 304 östenitik paslanmaz çelik saclar kullanılmıştır. Numuneler yüzeylerindeki atıklarından temizlenir. Malzemelerin kaynaklı birleştirilmesinin özelliklerini tayin edebilmek için lazer nokta kaynağı yapılan paslanmaz çelik sac malzemeler çok küçük boyutlarda olduğundan dolayı zımpara yapabilmek güçtür, bu yüzden rahatlıkla zımpara yapabilmek adına, mikro yapı çalışmaları için üç

adet numune hazırlanarak bakalite alınır. Bakalite alınan paslanmaz çelik malzeme numuneleri sulu zımpara makinasında çeşitli hassasiyeti olan (600,800,1000 ve 1200) zımpara kâğıtlarıyla sırasıyla zımparalama işlemine tabi tutulur. Zımparalama işlemi biten malzemeler parlatma işlemine tabi tutulur.

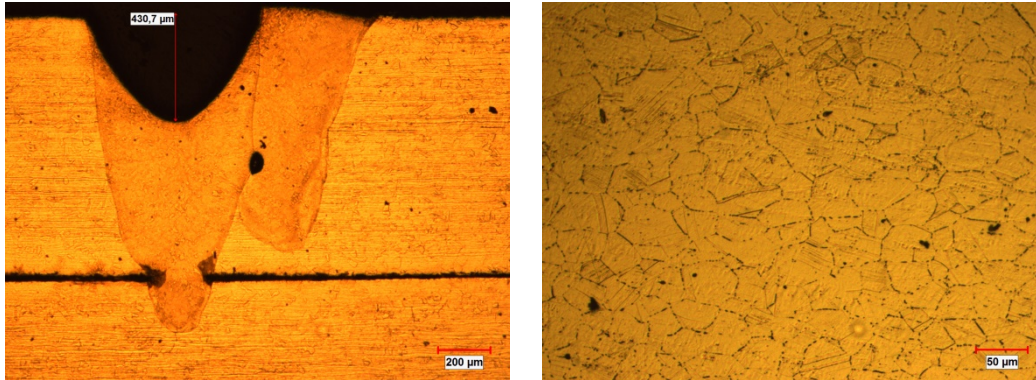
Bulgular ve Tartışma

AISI 304 östenitik paslanmaz çelik sac malzemeler kullanılarak lazer nokta kaynağı ile kaynatılmış deney numunelerinin hazırlanmasından sonra mikro yapıları incelemek suretiyle yapılması gereken elektrolitik dağlama işlemi için oksalik asit-su karışımından oluşan bir çözelti hazırlanır. Hazırlanan bu karışımın içerisinde elektrolitik dağlama işlemi ile malzemelerin dağlaması işlemi yapılır. Bu işlemden sonra numune yüzeyini asitten arındırmak için saf alkolle temizlik işlemi yapılır. Numunelerin mikroskopta mikro yapı incelemeleri yapılarak tane yapıları incelenir.

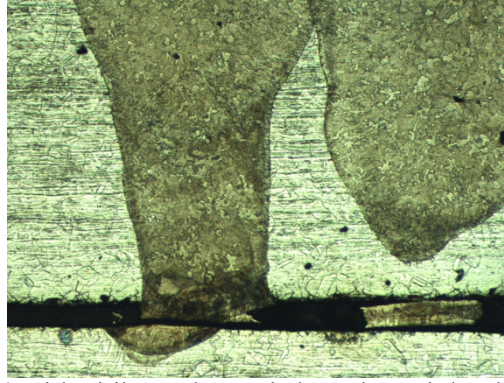
Numunelerin mikro sertliklerini ölçmek için ise Metkon mikro sertlik ölçüm cihazı ile 10 saniye 500 gr yük uygulanarak sonuçlar alınmıştır. Elde edilen veriler doğrultusunda ana malzemenin ortalama sertlik değeri 257,4 g/mm2 olarak ölçülmüştür. Lazer nokta kaynaklı birleştirmenin ortalama sertlik değeri 224,975 g/mm2 olarak ölçülmüştür. İfade edilen değerlere göre ana malzemenin daha sert bir yapıya sahip olduğu gözlemlenmiştir.



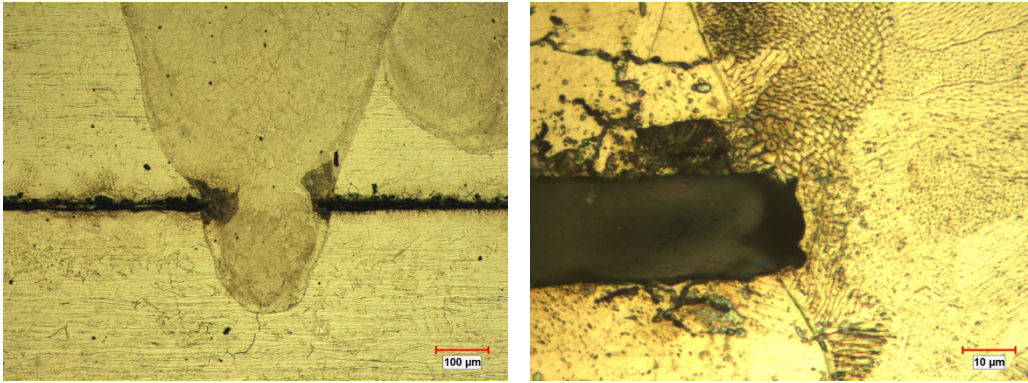
Şekil 2. Birleştirilen malzemelerin optik görüntüleri



Şekil 3. Birleştirilen malzemenin kaynak metalinin farklı büyültmelerdeki optik mikroskop görüntüleri



Şekil 4. Birleştirilen malzemenin kaynak yapılırken kayması



Şekil 5. Farklı büyütmelerde dentritik yapıların gözlenmesi

Lazer nokta kaynak yöntemi ile birleştirilen AISI 304 kalite östenitik paslanmaz çelik malzemenin optik mikroskop görüntüsü Şekil 2’de verilmiştir. Şekilde görüldüğü gibi kaynak edilen malzemenin yüzeyinde çöküntüler olduğu birleştirme için seçilen parametrelerin ve kaynak öncesi hazırlıkların yeterli olmadığı görülmektedir. Yapılan lazer nokta kaynağı nedeniyle malzeme yüzeyinde ve kaynak dikişlerinin olduğu kısımlarda karbür çökeleklerinin olduğu gözlemlenmiştir. Bu tip kaynak yöntemlerinde birleştirme esnasında elde edilen kaynak şekli ve nüfuziyet geometrisi kaynak cihazının gücü, seçilen kaynak voltajı, amperi ve ilerleme hızına bağlıdır (Uzun, 2010) (Köse, 2015).

Bu kaynak yönteminde malzeme çok hızlı bir şekilde ergime sıcaklığına ulaşması ve hızla soğuması sonucu bir yapı ortaya çıkmakta ve oluşan yapı çok ince olduğu ve yüksek büyütmeli görüntülerin alınması ile gözlenmektedir.(Şekil 3). Optik görüntülerinden kaynak metalinin oldukça küçük tanelere sahip olduğu görülmektedir.

Şekil 4’ de görüldüğü üzere kaynak yapılırken malzemede kayma meydana geldiği için kaynak nüfuziyetinde sıkıntı olduğu saptanmıştır.

Mikroyapı görüntüleri incelendiğinde ana malzemenin östenitik yapıda iken kaynak dikişinin dentrit kollarından oluşan mikroyapıda olduğu tespit edilmiştir.(Şekil 5)

Sonuçlar

Bu çalışmada AISI 304 kalite paslanmaz çeliğin lazer nokta kaynak yöntemi ile birleştirilebilirliği incelenmiştir. Deneysel çalışmalar sonucunda elde edilen deneysel sonuçlar aşağıda verilmiştir.

- 1 mm kalınlığındaki AISI 304 kalite paslanmaz çelik levhalar lazer nokta kaynağı ile hatasız birleştirilmiştir.
- Sadece tek taraftaki sac levhada yaklaşık olarak 400 mikronluk ezilme olduğu görülmüştür.
- Mikro sertlik ölçümleri incelendiğinde lazer nokta kaynak dikişi sertliğinin ana malzeme sertliğinden daha düşük olduğu görülmüştür.
- Mikroyapı görüntüleri incelendiğinde ana malzeme östenitik yapıda iken kaynak dikişinin dentrit kollarından oluşan mikroyapıda olduğu tespit edilmiştir.

Öneri olarak lazer nokta kaynaklarında kaliteli birleştirmelerin sağlanabilmesi için öncelikle kaynak parametrelerinin iyi seçilmesi gerekmektedir.

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LINEAR MULTISECRET-SHARING SCHEMES

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Abstract: Cyclic codes form an important class of linear codes. These codes have a rich algebraic structure. Secret sharing is a major topic of cryptography. In this paper, we present a multisecret-sharing scheme based on cyclic codes. This scheme is linear in the sense of that form of each secret. Its security improves on that of multisecret-sharing schemes.

Keywords: Secret sharing, linear multisecret sharing scheme, cyclic code.

I-Introduction

Secret sharing schemes were examined by Blakley (Blakley, 1979) and Shamir (Shamir, 1979) in 1979. Shamir's scheme is a (t, n) -threshold secret sharing scheme and this scheme was based on polynomial interpolation. A (t, n) -secret sharing scheme is a method of distribution of information among n participants such that $t > 1$ can reconstruct the secret but $(t - 1)$ cannot.

In a secret sharing scheme there are some participants and a dealer. The dealer has a secret and distributes it to the other participants. In a minimal t -subset of participants recover the secret while combining their shares. These subsets are called the minimal access sets.

Another secret sharing scheme is the multisecret-sharing scheme. This scheme was proposed in (Horn, 1995), (He, 1994), (Li, 2016), (Pang, 2005), (Yang, 2004), (Çalkavur et al, 2017). In the multisecret-sharing schemes (Li, 2016), (Pang, 2005), (Bai, 1993) there is a set of p secrets can be shared at once and each participant needs to keep one share is called secret share. In these schemes all p secrets are recovered at once or all p secrets cannot reconstruct. To recover the secret the participants need to submit a *pseudo-share* computed from their secret share instead of the secret share itself.

In this work we propose a new multisecret-sharing scheme based on cyclic codes. We give a secret reconstruction algorithm based on generator polynomial of the code. We analyse the security and performance of the scheme by means of cyclic code theory. We calculate the number of minimal coalitions in this scheme. We introduce the access structure of this scheme and define its accessibility degree and explain its linearity.

We conclude by a comparison between our scheme and the three main other code-based schemes in the literature: Massey's scheme (Massey, 1993), Ding et al (Ding, 1997) and (Çalkavur et al, 2017) multisecret scheme.

The rest of this paper is organized as follows. The next section gives the basic preliminaries used in the paper. Section III presents the proposed scheme, analyses its security and defines the accessibility degree of the scheme. Section IV contains the said comparison and against cheating. Section V collects concluding remarks.

II-Background and Preliminaries

In this section we give the basic preliminaries and some necessary mathematical information used in this work.

A. Linear Codes

Let q be a prime power and denote the finite field of order q by F_q . An $[n, k]$ -code C over F_q is a subspace in $(F_q)^n$, where n is length of the code C and k is dimension of C . The dual code of C is defined to be the set of those vectors $(F_q)^n$ which are orthogonal to every codeword of C . It is denoted by C^\perp . The code C^\perp is an $[n, n - k]$ -code. A generator matrix G for a linear code C is a $k \times n$ matrix for which the rows are a basis of C . A parity-check matrix for a linear code C is a generator matrix for its dual code C^\perp . It is denoted by H .

Let C be an $[n, k]$ -code over F_q with generator matrix G . C contains q^k codewords and can be used to communicate any one of q^k distinct messages. We encode the message vector $x = x_1 x_2 \cdots x_k$ as the codeword xG .

If G is a generator matrix for C , then $C = \{ uG \mid u \in (F_q)^k \}$. The map $u \rightarrow uG$ maps the vector space q^k onto a

k -dimensional subspace of $(F_q)^n$.

B. Cyclic codes

A code C is cyclic if

1. C is a linear code,
2. any cyclic shift of a codeword is also a codeword, whenever $a_0 a_1 \cdots a_{n-1}$ in C , then so is $a_{n-1} a_0 a_1 \cdots a_{n-2}$ (Hill, 1986).

Theorem 1. Let C be a non-zero cyclic code. Then,

1. there exists a unique polynomial $g(x)$ of smallest degree in C ,
2. $C = \langle g(x) \rangle$,
3. $g(x)$ is a factor of $x^n - 1$ (Hill, 1986).

Definition 1. In a non-zero cyclic code C the monic polynomial of least degree, given by Theorem 1, is called the generator polynomial of C (Hill, 1986).

Lemma 1. Let $g(x) = g_0 + g_1 x + \cdots + g_{n-k} x^{n-k}$ be the generator polynomial of a cyclic code. Then g_0 is non-zero (Hill, 1986).

Theorem 2. Suppose C is a cyclic code with generator polynomial $g(x) = g_0 + g_1 x + \cdots + g_{n-k} x^{n-k}$ of degree $n - k$. Then $\dim(C) = k$ and a generator matrix for C is

$$G = \begin{pmatrix} g_0 & g_1 & g_2 & \cdots & g_{n-k} & 0 & 0 & \cdots & 0 \\ 0 & g_0 & g_1 & \cdots & g_{n-k-1} & g_{n-k} & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \cdots & \vdots & \vdots & \vdots & \cdots & \vdots \\ 0 & 0 & 0 & \cdots & 0 & g_0 & g_1 & \cdots & g_{n-k} \end{pmatrix}.$$

This means $aG = (a_0 + a_1 x + \cdots + a_{k-1} x^{k-1})g(x)$, where $a = (a_0, a_1, \cdots, a_{k-1}) \in (F_q)^k$ (Hill, 1986).

C. Secret Sharing Schemes

In this section we should think about a case of some malicious behaviors lying among participants which are called cheaters. They modify their shares in order to cheat.

If a group of participants can recover the secret by combining their shares, then any group of participants containing this group can also recover the secret.

Definition 2. An access group is a subset of a set of participants that can recover the secret from its shares. A collection Γ of access groups of participants is called an access structure of the scheme. An element $A \in \Gamma$ is called a minimal access element. Hence a set is a minimal access group if it can recover the secret but no proper subset can recover the secret. Let $\bar{\Gamma}$ be the set of all minimal access elements. We call $\bar{\Gamma}$ the minimal access structure (Kim, 2016). Determining the minimal access structure is a hard problem (Ding, 2000).

Now let us consider the accessibility of an access structure of secret sharing scheme based on binary linear code. Let $P = \{P_1, P_2, \cdots, P_m\}$ be a set of m participants and let A_p be the set of all access elements on P .

Definition 3. The accessibility index on P is the map $\delta_p(\Gamma): A_p \rightarrow \mathbb{R}$ given by

$$\delta_p(\Gamma) = \frac{|\Gamma|}{2^m}$$

for $\Gamma \in A_p$, where $m = |P|$. The number $\delta_p(\Gamma)$ will be called the accessibility degree of structure Γ (Carreras, 2006).

III_Multisecret-Sharing Schemes and Cyclic Codes

A. Scheme Description

In this section, we examine a new multisecret-sharing scheme based on cyclic codes.

Consider an $[n, k]$ -cyclic code C over F_q . We construct now a multisecret-sharing scheme based on C .

Let $(F_q)^k$ be the secret space and $(F_q)^n$ be the share space. In the multisecret-sharing scheme the dealer uses a share function $f: (F_q)^k \rightarrow (F_q)^n$ to compute the shares among the n participants. The sharing function is chosen as $f(s) = sG$, where $s = (s_0, s_1, \dots, s_{k-1}) \in (F_q)^k$ is the secret and G is a $k \times n$ matrix over $(F_q)^n$ with rank k . Assume for convenience $s \neq 0$. Thus $c = sG$ is a nonzero codeword of the code C .

In this scheme, the n participants recover the secret by combining their shares as follows.

1. get the generator polynomials and matrices of cyclic code,
2. choose the polynomial for each generator polynomial such that

$$sG = (s_0 + s_1x + \dots + s_{k-1}x^{k-1})g(x), \quad (1)$$
 where $\deg(g(x)) = n - k$.
3. get s by solving the linear system (1) of rank k .

Proposition 1. The motivation for condition 2 above is the following inequality: $2 \leq k < n$.

Proof. With the above notation it is clear that $k \neq 0$.

Assume that $k = 1$. In this case the secret consists one entry and then the scheme cannot be multisecret.

If $k = n$, then $\deg(g(x)) = n - k = 0$. This means the generator polynomial is 1. Since $k = n$, the secret has size of n .

Corollary 1. If $\deg(g(x)) = n - k \geq 2$, then the multisecret-sharing scheme can be constructed based on $[n, k]$ -cyclic code.

Proof. By Proposition 1, while $n - k \geq 2$ it can be mentioned about multisecret-sharing. Otherwise it will be single secret-sharing.

An immediate corollary is the following.

Corollary 2. The multisecret-sharing scheme satisfied the hypothesis of the above theorems is also a (k, n) -threshold secret sharing scheme, where k is dimension and n is length of cyclic code C .

Proof. In this scheme, there are n participants and the secret has size of k . So, the result follows.

Now we have to remind an important theorem about linearity of the multisecret-sharing scheme in (Ding, 1997).

Theorem 3. A multisecret-sharing scheme defined over the above secret and share spaces is linear if and only if its share function is of the form

$$f(s) = sG,$$

where $s = (s_0, s_1, \dots, s_{k-1}) \in (F_q)^k$ and G is a $k \times n$ matrix over $(F_q)^n$ with rank k .

Corollary 3. The multisecret-sharing scheme based on the cyclic code with generator matrix G is a linear (k, n) -threshold scheme.

Proof. It is easily seen from Theorem 3.

B. Statistics on Coalitions

Theorem 4. Let C be a q -ary $[n, k]$ -cyclic code with generator matrix G . In a multisecret-sharing scheme based on C while $n - k \geq 2$, the number of minimal coalitions is $\binom{n}{k}$.

Proof. Recall that our scheme is a (k, n) -threshold secret sharing scheme. This means k out of n participants can recover the secret. These k participants consist of minimal access sets. So the number of minimal coalitions is $\binom{n}{k}$.

C. Accessibility Degree

The accessibility degree for multisecret-sharing scheme based on cyclic codes can be defined as follows.

Definition 4. Let $P = \{P_1, P_2, \dots, P_m\}$ be a set of m participants and let A_p be the set of all access elements on P . The accessibility index on P is the map $\delta_p(\Gamma): A_p \rightarrow \mathbb{R}$ given by

$$\delta_p(\Gamma) = \frac{|\Gamma|}{q^m}$$

for $\Gamma \in A_p$, where $m = |P|$. The number $\delta_p(\Gamma)$ will be called the accessibility degree of structure .

Example 1. Lets find all the ternary cyclic codes of length 4 and write down a generator matrix for each of them.

Over $GF(3)$, the factorization of $x^4 - 1$ into irreducible polynomials is

$$x^4 - 1 = (x - 1)(x^3 + x^2 + x + 1) = (x - 1)(x + 1)(x^2 + 1).$$

So there are $2^3 = 8$ divisors of $x^4 - 1$ in $F_3[x]$ each of which generates a cyclic code. By Theorem 1, these are the only ternary cyclic codes of length 4. The codes are specified below by their generator matrices

Generator Poynomial	Generator Matrix
11	(I_4)
$x - 1$	$\begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 1 \end{pmatrix}$
$x + 1$	$\begin{pmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix}$
$x^2 + 1$	$\begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix}$
$(x - 1)(x + 1) = x^2 - 1$	$\begin{pmatrix} -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{pmatrix}$
$(x - 1)(x^2 + 1) = x^3 - x^2 + x - 1$	$\begin{pmatrix} -1 & 1 & -1 & 1 \end{pmatrix}$
$(x + 1)(x^2 + 1) = x^3 + x^2 + x + 1$	$\begin{pmatrix} 1 & 1 & 1 & 1 \end{pmatrix}$
$x^4 - 1$	$\begin{pmatrix} 0 & 0 & 0 & 0 \end{pmatrix}$

Now we construct a linear multisecret-sharing scheme based on this cyclic code. First we consider the generator polynomial $g(x) = x + 1$. Since $\deg(g(x)) = 1$ that is $n - k = 1$, $k = 3$. Let the secret vector be $s = (s_0, s_1, s_2)$, where $s_i \in F_3$, $i = 0, 1, 2$. We can encode s as follows.

$$(s_0 + s_1x + s_2x^2)g(x).$$

Let $s_0 = 1, s_1 = 0, s_2 = 1$. Therefore we write

$$(1 + x^2)(1 + x).$$

We know that this product is equal to sG , where G is the generator matrix. So

$$(1 + x^2)(1 + x) = (s_0, s_1, s_2) \begin{pmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix}.$$

We obtain $s_0 = 1, s_1 = 0, s_2 = 1$ by solving the linear system: $s = (101)$. The generator polynomial $(1 + x)$ gives a $(3, 4)$ -threshold scheme for multisecret-sharing. The accessibility degree for this scheme is

$$\frac{3}{3^4} = 0,037.$$

Second we consider the generator polynomial $g(x) = x^2 + 1$. Since $\deg(g(x)) = 2, k = 2$. Let the secret vector be $s = (s_0, s_1)$ and consider $(s_0 + s_1x)g(x)$.

Let $s_0 = 1, s_1 = 0$.

$$1. (1 + x^2) = (s_0, s_1) \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix}.$$

By solving the linear system we find $s_0 = 1, s_1 = 0: s = (10)$.

The generator polynomial $(1 + x^2)$ gives a $(2, 4)$ -threshold scheme for multiset-secret-sharing. The generator polynomial $(1 + x)$ gives a $(2, 4)$ -threshold scheme for multiset-secret-sharing. The accessibility degree for this scheme is

$$\frac{2}{3^4} = 0,024.$$

Note that the multiset-secret-sharing scheme cannot construct by using the generator polynomials $x^3 - x^2 + x - 1, x^3 + x^2 + x + 1, x^4 - 1$.

IV-Comparison with Other Schemes

We summarize the comparison with other code-based secret sharing schemes in the following table, where we denote by A, B, C the number of participants, the size of a secret, the number of coalitions for an $[n, k]$ -code over F_q .

System	Massey	Ding et al.	Çalkavur-Solè	This paper
A	$n - 1$	n	n	n
B	q	q^k	q^k	$q^k - 1$
C	$\binom{n}{k}$	$\binom{n}{k}$	$\geq \binom{n}{d-t}$	$\binom{n}{k}$

t is the error-correcting capacity of code.

A. Against Cheating

In single-secret sharing schemes some participants may present a falsified share for cheating. This problem is the same as for single-secret sharing in multiset-secret-sharing. By the connection between linear multiset-secret-sharing schemes and linear codes established by Theorem 3.

Our scheme has been constructed based on cyclic codes. Cyclic codes have a rich algebraic structure. They are splitted the classes by the generator polynomials. This means the codewords are generated by their generator polynomial. We need the genarator polynomial to recover the secret. The polynomial which is multiplied by the generator polynomial consists the pieces of secret. Thus, recovering the secret depend on the choice of generator polynomial. So the secret cannot be recovered by any polynomial.

The linear multiset-secret-sharing scheme based on cyclic codes is attractive in against cheating. This scheme is more resilient to algebraic attacks due to the reconstruction algorithm.

V-Concluding Remarks

In the present article, we have constructed a new linear multiset-secret-sharing scheme based on cyclic codes. The reconstruction algorithm is based on generator polynomial of code. Moreover, in this study we introduce the access structure of this scheme and define its accessibility degree.

We refer to approach considered in the paper as the coding approach since

1) in single-secret sharing the secret is a component of the codeword corresponding to the information vector and the shares form all components of the codeword corresponding to the information vector,

2) in multisecret-sharing the multisecret is exactly the information vector and shares form the exact codeword corresponding to the information vector.

The advantage of the coding approach is that a cyclic code has the exclusive generator polynomials and matrices. So each share vector is a codeword of the codes generated by this generator matrix. It is important that choice of generator polynomial has some special properties, this scheme stands well, in particular in terms of security.

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MERMER İÇEREN BETONLARIN YÜKSEK SICAKLIKTAKİ DAYANIMLARININ BELİRLENMESİ

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Özet: Doğal taş bakımından, jeolojik yapısı itibarıyla zengin bir potansiyele sahip olan ülkemizde, bugünkü verilere göre 4 milyar m³ işletilebilir mermer, 2,8 milyar m³ işletilebilir traverten, 1 milyar m³ granit rezervi bulunmaktadır. Türkiye genelinde, 1500 civarında mermer ocağı, 1100 civarında mermer çıkartan şirket bulunmaktadır. Bu mermer ocaklarından mermer çıkartılırken bir çok atık madde ve doğa kirliliği de oluşmaktadır. Bu çalışmada, Burdur bölgesinden temin edilen atık mermer ağırlıkça farklı oranlarda kullanılarak betonlar üretilmiştir. Üretilen betonlarda su, çimento sabit tutularak agrega yerine ağırlıkça % 5, 10, 15, 20, 25 oranlarında atık mermer kullanılmıştır. Üretilen betonların yoğunlukları, su emmesi, basınç dayanımları, ve yüksek sıcaklık altındaki dayanımları belirlenmiştir. Atık mermer oranı arttıkça betonlarda bir düşüş görülmekte fakat hedeflenen basınç dayanımlarına ulaşıkları görülmektedir. Atık mermerlerin beton sektöründe değerlendirilmesi ile ekonomiye ve çevreye olumlu katkı sağlayacaktır. Yüksek sıcaklık altındaki katkılı betonun basınç dayanımlarında ise 300 °C’ de bir nebze düşmüş olsa bile standartların içinde kaldığı görülmektedir.

Anahtar Kelimeler: Beton, Atık Mermer

DETERMINATION OF HIGH TEMPERATURE RESISTANCE OF CONCRETE CONTAINING MARBLE

Abstract: In our country, which has a rich potential in terms of natural stone and geological structure, there are 4 billion m³ of processed marble, 2,8 billion m³ processed travertine and 1 billion m³ of granite reserves according to today’s data. Around Turkey there are about 1500 marble quarries and about 1100 companies removing marble. While removing marble from those marble quarries there exist a lot of waste materials and it leads to nature pollution. In this study, by using waste marble obtained from Burdur and its environment in different rates in weight concrete has been produced. In the concrete produced, waste marble is used in proportion of 5, 10, 15, 20, 25% by weight instead of aggregate by keeping water and cement constant. The density, water absorption, compressive strength and strength under high temperature of the produced concrete has been determined. While increasing the amount of waste marble a decrease in the concrete is observed but it is seen that they reach the compressive strength that is target. Putting waste marble to good use in concrete industry will positively contribute to the economy. It is observed that the compressive strength of reinforced concrete under high temperature is still within the standards even though it has decreased to a little at 300 °C.

Keywords: Concrete, Marble Waste

Giriş

İnsanoğlunun en büyük ihtiyaçlarından birisi barınma’ dır. Bu yüzden yapı sektörü hep gündemde kalmış ve her an daha güzel, pratik yöntemler geliştirmeye yönelik çalışmalar devam etmiştir. Günümüz dünyasında ise her alanda olduğu gibi bu alanda da temel gaye, en kısa zamanda en az harcama ile çözüme ulaşmaktır. Günümüzde kullanımda ortaya çıkan ihtiyaçlar nedeni ile, çeşitli özellikleri geliştirilmiş veya üretim ve uygulama teknikleri farklı bazı özel betonlar yaygın biçimde kullanılmaktadır (Sarıkaya, 2014). Beton; çimento, su, agrega ve gerektiğinde katkı maddelerinin (mineral, kimyasal, fiber vb) belirli şartlar ve oranlarda karıştırılmasıyla elde edilen, başlangıçta şekil verilebilen plastik formda olup, zamanla çimento ve su arasındaki kimyasal reaksiyonun gelişmesiyle (hidratasyon) sertleşerek mukavemet kazanan, harç fazı ve agregadan oluşan kompozit bir yapı malzemesidir (Özel, 2007). Beton, sertleşmiş çimento hamuru ve agregalardan meydana gelen heterojen yapıdaki bir malzemedir (Hossain, K.M.A., 2006.). Betonun yangına karşı dayanıklı bir malzeme olduğuna inanılmasına rağmen, yapılan çalışmalar betonun yüksek sıcaklıkta önemli hasarlara uğradığını göstermiştir (Phan, L.T., 1996). Taze betonda işlenebilirlik, sertleşmiş betonda ise dayanım ve dayanıklılık özellikleri betonda aranan en önemli niteliklerdir. Ayıca betonun en ekonomik şekilde üretilmesi beton teknolojisi için çok önemlidir. İstenilen nitelikte iyi bir beton ancak kaliteli malzemeler ve deneyimli elemanlarla belirli kurallara ve standartlara uyularak yapılabilir

(Neville, 1993). Betonda bileşime giren malzemeler özel olarak oranlandığı zaman karışım herhangi bir yere dökülebilir ve ebadı ile kalıpların şeklini alabilen plastik bir kütle meydana getirir (Baradan, 1997).

Çimento hamuru, ısınma esnasında önemli fiziksel ve kimyasal değişimlere uğradığından en kararsız beton bileşenidir. Çimento hamurunun davranışında, 100–200 °C civarındaki düşük sıcaklıklarda buharlaşabilen su etkin rol oynamaktadır. Kimyasal ayrışma ve suyunun kaybı 100 °C'nin üzerindeki sıcaklıklarda, termal etkiler ise 600 °C'nin üzerindeki sıcaklıklarda daha önemli olmaktadır. Kimyasal ayrışma ve bağ suyunun kaybı çimento hamurunun mikro yapısında değişikliklere neden olur. Çimento hamurundaki kimyasal bağlar, kohezif kuvvetler, porozite ve gözenek boyut dağılımı değişikliğe uğrar (Khoury, G.A., 1992). Betona yeni özellikler kazandırmak ve bazı özelliklerini de belirgin olarak arttırmak için, beton içerisine lifler katılmaktadır (Arslan, A. ve Ulucan, Z. Ç.,1997). Günümüzde betonda yaygın olarak kullanılan lifler; çelik, polimer (polipropilen, PVA), cam ve karbon esaslıdır. Betona lif katmak; betonun çekme ve eğilme dayanımını, düktilitesini, enerji tüketme kapasitesini ve çatlak gelişim karakteristiklerini geliştirmek için kullanılan en etkin yöntemlerden biridir (Şimşek, O., 2004).

Doğal kaynaklar ülkelerin ekonomik kalkınmasında önemli bir yere sahiptir. Günümüzde ekonomik kalkınma o ülkenin sahip olduğu maden kaynakları miktarı ve maden ürünlerinin tüketimi ile paralellik göstermektedir. Ülkemizde ve yurt dışında mermere olan talep hızla artmakta ve bunun sonucu olarak mermer sektörü ile uğraşan işletmelerin de sayısının artmasına neden olmaktadır. Bu işletmelerin büyüklüğü ve yoğunluğuna bağlı olarak çamur ve parça mermer atıklar açığa çıkmaktadır. Mermer atıklarının kullanılabilir tarım arazilerine boşaltılması çevre sağlık ve doğal görünüme bozucu etki yapmakta ve çevrecilik açısından olumsuz bir tepki oluşturmaktadır. Bununla birlikte, ocak ve işletmelerde yapılan üretime göre oluşan atıkların miktarları % 75' lere ulaşmaktadır. Bu nedenle mermer atıklarının değerlendirilmesi konusunda bulunabilecek seçenekler, mermer fabrika işletmecilerine, ülke ekonomisine, çevre ve ekolojiye önemli katkıda bulunulacağı düşünülmektedir. Mermer, blok veya kesilmiş parlatılmış olarak ihrac edilmektedir. Doğal taş ihracatında katma değeri en yüksek ürün, işlenmiş mermer ve işlenmiş travertendir. Sektörün ihracat potansiyeli, yatırımlara paralel olarak hızla gelişmektedir. 2003-2012 arasında doğal taş ihracatımız % 246 artışla 1,5 milyon tondan 5,2 milyon tona yükselmiştir. Dünya doğal taş ihracat sıralamasında daha birkaç yıl öncesine kadar sekizinci sırada yer alan Türkiye doğal taş sektörü, 2006 yılı itibari ile beşinci sıraya yükselmiştir. Özellikle mermer ve traverten ihracatında 2009 yılında da Çin, İtalya ve İspanya'yı geride bırakarak en fazla ihracat gerçekleştiren ülke olmuştur. Türkiye doğal taş üretim değerleri Çizelge 1'de verilmiştir.

Çizelge1. Türkiye doğal taş üretim değerleri (İMMİB, 2014)

Maden Adı	Üretim (m ³)									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
İgnimbrit	7.705	39.820	5.282	20.174	18.486	26.313	66.794	52.055	55.873	8.984
Mermer	1.300.637	1.207.584	1.578.730	1.855.740	2.801.757	2.262.537	2.715.601	3.352.070	4.086.222	4.488.947
Oniks	176	57	451	2.578	5.663	2.145	2.322	2.113	7.678	4.867
Traverten	198.730	601.068	696.545	1.017.672	995.065	759.118	1.002.866	879.319	1.685.049	760.549
Toplam	1.507.248	1.848.529	2.281.008	2.896.164	3.820.971	3.050.113	3.787.583	4.285.557	5.834.822	5.263.347

İşletmelerden açığa çıkan parça atıklar, (işlenmiş kırık mermer parçası) olarak kısmen döşeme ve dolgu malzemesi olarak kullanılsa da genellikle fabrika çevresinde görünümü bozuk büyük yığınlar oluşturmaktadır. Bazı büyük ölçekli fabrikalarda bu atıklar kırıcılardan geçirilerek dolgu malzemesi şeklinde maliyetine satılmaktadır (Uğur, 1996). Küçük boyutlu parça artıklar, kırıcılardan kırılarak yol inşaatında alt temel, temel tabakası olarak ve betonda agrega malzemesi olarak kullanılmak üzere, istenilen boyutlarda malzemeler elde edilebilir. Kimyasal yapıların genel olarak yol inşaatında kullanılan malzemelerin özelliklerine (kalkerli yapıya) sahip oldukları görülmektedir. Bu artıkların büyük miktarlarda kullanımı ile geri kazanım artırılacak, görüntü kirliliği nispeten önlenecek ve arazilerin olumsuz yönde kullanımı azaltılacaktır (Ceylan, 2000). Bu çalışmada, Burdur ve yöresinde işletilen mermer ocaklarından ve fabrikalarından elde edilen atık mermerleri, belirli oranlarında ağırlıkça agrega yerine konularak betonlar üretilmiştir.

Materyaller

Çalışmada, beton üretiminde Uşak ilinden edilen agrega ve Burdur bölgesinden çıkan bej atık mermer kullanılmıştır. Karışımlarda % 40' ı ince agrega ve % 60' ı kaba agrega kullanılmıştır. Betonlarının karışım hesapları, üretilen betonun plastik kıvamda ve en büyük tane çapı 16 mm olacak şekilde TS 802 yöntemine göre hesaplanmıştır. Deneyisel çalışmalarda suya ilave katkı olarak Levelcon 1200 yüksek performanslı beton üretiminde kıvam korumalı ve yüksek oranda su azaltan kimyasal katkı kullanılmıştır. Çimento olarak Burdur

Bucak'ta bulunan As Çimento Fabrikası'nda üretilmiş CEM I 42,5 R çimentosu kullanılmıştır. Kullanılan çimento, normal agregası ve atık mermerin kimyasal özellikleri Çizelge 2' de ve çimentonun fiziksel ve mekanik özellikleri Çizelge 3.' de verilmiştir.

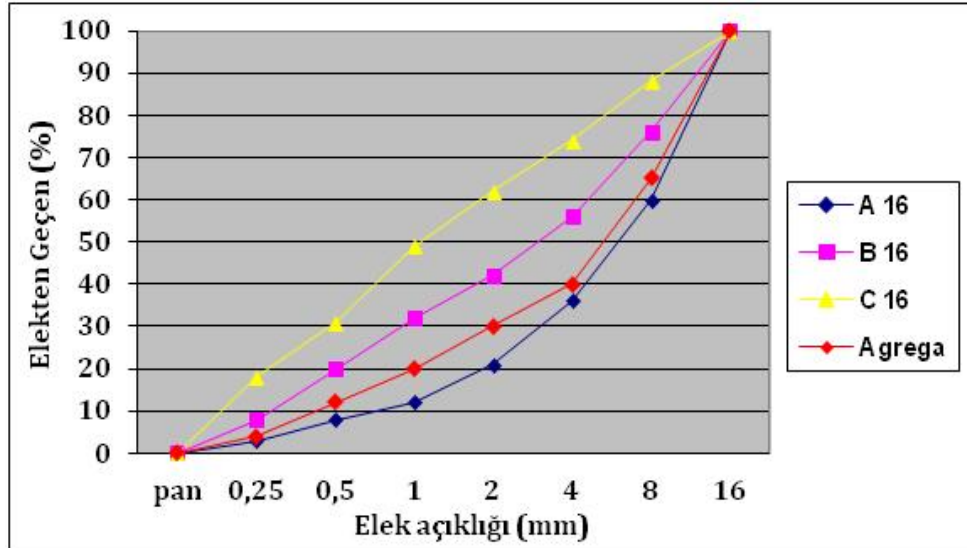
Çizelge 2. Betonda kullanılan çimento, normal agregası ve atık mermerin kimyasal özellikleri

Bileşen	CEM I 42,5 R (%)	Normal Agregası (%)	Atık Mermer (%)
SiO ₂	20.02	2.75	0.38
Fe ₂ O ₃	3.52	1.29	0.06
Al ₂ O ₃	5.16	-	-
CaO	63.46	0.2	53.85
MgO	1.03	2.8	0.34
SO ₃	2.74	-	-
Kızdırma Kaybı	2.35	-	-

Çizelge 3. CEM I 42,5 R çimentosunun fiziksel ve mekanik özellikleri (As Çimento, 2010)

Bileşen	PÇ 42,5
Özgül Ağırlık (gr/cm ³)	3.124
Donma Başlangıcı (minute)	180
Donma Sonu (minute)	280
Hacim Genleşmesi (mm)	1.10
2 günlük basınç dayanımı (N/mm ²)	26.60
28 günlük basınç dayanımı (N/mm ²)	49.60

Beton bileşimlerinde normal agregası kullanılarak TS EN 206-1' e göre C30 betonları üretilmesi hedeflenmiştir. C30 betonu için w/c oranı 0,40 alınmış ve üretilcek betonun kuru plastik kıvamda ve maksimum dane çapı 16 mm olacak şekilde birim hacim ağırlık yöntemine göre yapılmıştır. İyileştirilmiş ve beton yapımında kullanılacak olan normal agregası ve atık mermerin granülometri eğrisi ise Şekil 1' de verilmiştir. Üretilen betonların yapımında kullanılan agregası kodları ise Çizelge 4' de, karışıma giren atık mermerli betonların 1 m³ beton bileşimleri ise Çizelge 5.' de verilmiştir.



Şekil 1. İyileştirilmiş ve beton yapımında kullanılacak olan normal agregası, ve atık mermer ortak granülometri eğrisi

Çizelge 4. Üretilen atık mermerli betonların karışım yüzdeleri

Numunenin Kodu	Normal Agregası (%)	Atık Mermer (%)
N	100	---
NK	100	---
NM-5	95	5
NMK-5	95	5
NM-10	90	10
NMK-10	90	10
NM-15	85	15
NMK-15	85	15
NM-20	80	20
NMK-20	80	20
NM-25	75	25
NMK-25	75	25

Çizelge 5. Karışıma giren atık mermerli betonların 1 m³ beton bileşenleri (kg/m³)

Numunenin Kodu	Su	Çimento	Katkı	Normal İnce Agregası	Normal Kaba Agregası	İnce Atık Mermer	Kaba Atık Mermer
N	160	400	-	722	1111	-	-
NK	160		3.2	722	1111	-	-
NM-5	160		-	686	1055	36	56
NMK-5	160		3.2	686	1055	36	56
NM-10	160		-	650	1000	72	111
NMK-10	160		3.2	650	1000	72	111
NM-15	160		-	614	944	108	167
NMK-15	160		3.2	614	944	108	167
NM-20	160		-	578	889	144	222
NMK-20	160		3.2	578	889	144	222
NM-25	160		-	542	833	180	278
NMK-25	160		3.2	542	833	180	278

Uşak Üniversitesi Yapı Malzemeleri Laboratuvarında yapılan çalışmalarda 12 seri beton üretilmiştir. Bunlar C30, katkısız ve katkılı beton serileridir. Katkılı beton serilerinin üretiminde süper akışkanlaştırıcı katkı maddesi kullanılmıştır. Karışımlarda maksimum dane çapı 16 mm seçilmiştir ve bütün karışımların granülometrisi aynı kalmıştır.

Karışıma giren agrega, mermer, su ve çimento üretilecek betonun koduna göre önceden tartılıp hazırlanmıştır. Karışım suyu olarak Sondaj suyu kullanılmıştır. Harcı karıştırmada kullanılacak düşey eksenli cebri karıştırıcı mikser su yardımı ile nemlendirilmiştir. Önce agregalar mikser'e katılarak beş dakika karıştırılmış, daha sonra çimento katılarak üç dakika daha bileşimdeki kuru maddeler karıştırılmıştır. Daha sonra mikser deki karışıma gerekli su ilave edilerek karıştırma üç dakika daha sürdürülmüştür. Çeşitli deneylerde kullanılmak üzere sarsma tablası üzerindeki 100 mm× 100 mm × 100 mm boyutlu küp kalıplara harç üç aşamada konmuş ve her aşamada 10 saniye sarsma tablası aleti ile sarsılmıştır. Numunelerin üstü ıslak keten örtü ile örtülerek 24 saat kalıp içinde bırakılmış, bu sürenin sonunda lastik takozlar yardımıyla kalıptan çıkarılmıştır. Numuneler deneylerin yapılacağı güne kadar kür havuzunda saklanmıştır. TS EN 1363-2' ye uygun olarak numuneler üzerinde yüksek sıcaklık deneyi yapılmıştır.

Yüksek sıcaklık deneyi için Uşak Üniversitesi Yapı Malzemeleri laboratuvarında bulunan ısınma hızı 6°C/dk olan 1200 °C kapasiteli Protherm HLF 150 laboratuvar tipi fırın kullanılmıştır. Numuneler 100°C, 300°C, 600°C ve 900°C, sıcaklıklarda 1 saat süre ile bekletilmiştir. Numuneler fırın içerisinde yaklaşık 2 °C /dk' lık soğuma hızı ile oda sıcaklığına kadar soğutuldu. Çalışmada kullanılan fırına ait bir fotoğraf Şekil 2'de gösterilmiştir.



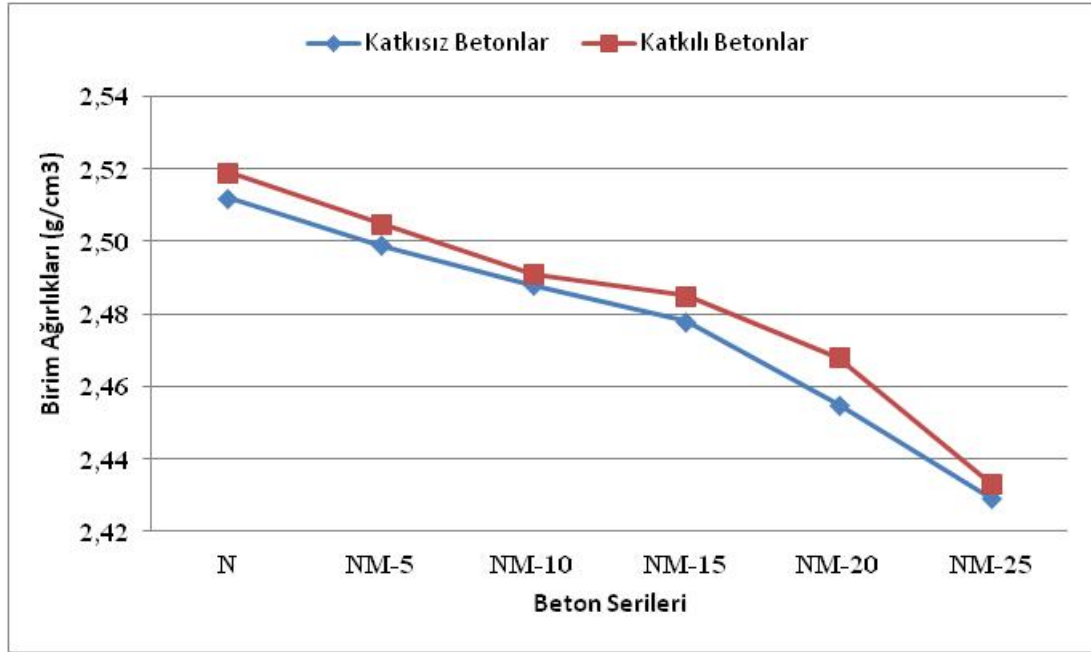
Şekil 2. Yüksek Sıcaklık Fırını

Bulgular

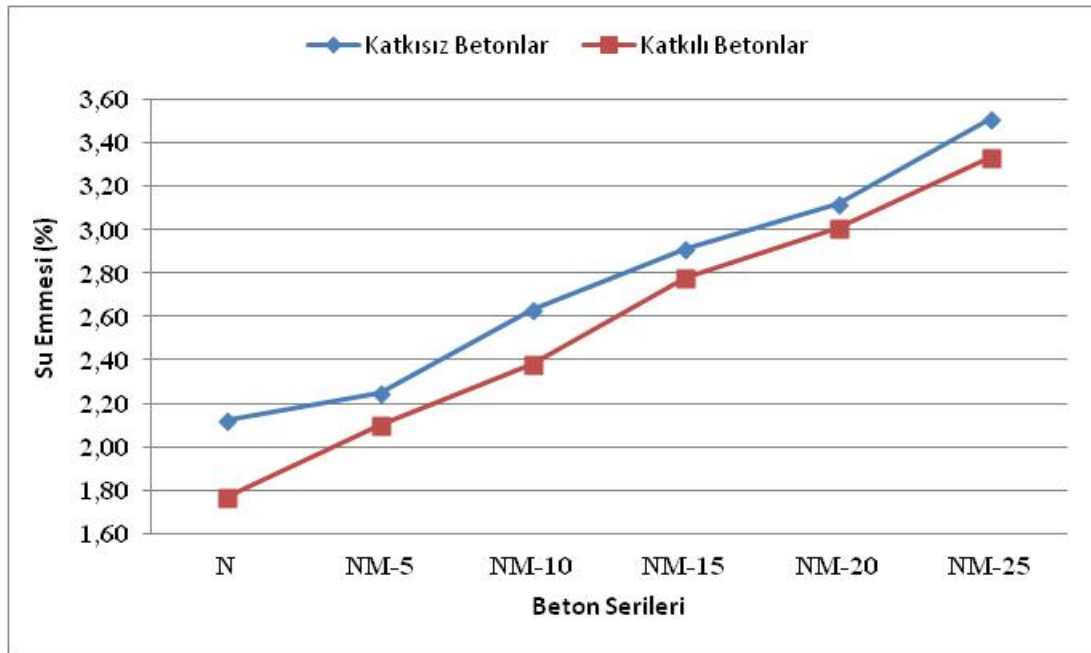
Atık mermer den elde edilen C30 betonlar için, betonların birim ağırlıkları, su emmeleri, basınç dayanımları ve yüksek sıcaklık altındaki basınç dayanım sonuçları Çizelge 6'da verilmiştir. Atık mermerli betonların birim ağırlıkları, su emmeleri, basınç dayanımları ve yüksek sıcaklık altındaki basınç dayanımları ile ilgili şekiller Şekil 3–8.' de verilmiştir.

Çizelge 6. Betonların fiziksel ve mekanik özellikleri

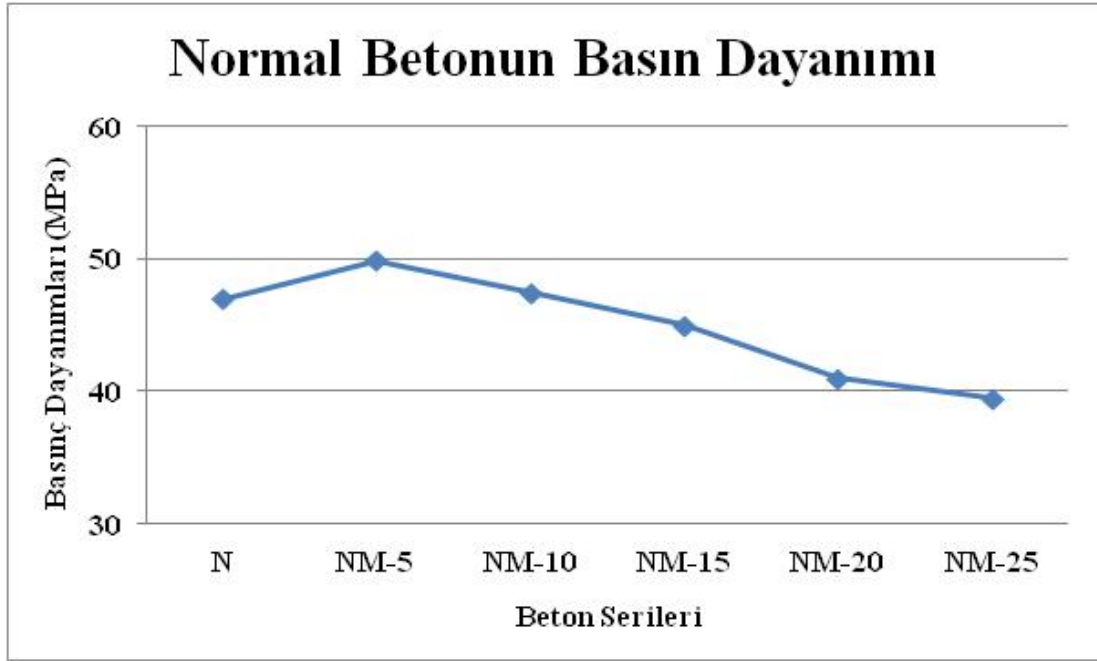
Beton Serileri	Birim Ağırlıkları (g/cm ³)	Su Emmesi (%)	28 günlük Basınç Dayanımları (MPa)	100(°C) Basınç Dayanımı (MPa)	300(°C) Basınç Dayanımı (MPa)	600(°C) Basınç Dayanımı (MPa)	900(°C) Basınç Dayanımı (MPa)
N	2.512	2.12	47.01	51.52	38.12	23.01	10.95
NK	2.519	1.77	47.43	52.11	40.52	24.11	12.88
NM-5	2.499	2.25	49.87	54.74	45.26	28.21	0.00
NMK-5	2.505	2.10	58.27	61.17	55.12	34.91	0.00
NM-10	2.488	2.63	47.47	49.12	42.41	27.17	0.00
NMK-10	2.491	2.38	52.59	55.56	53.11	31.59	0.00
NM-15	2.478	2.91	44.98	45.38	40.11	25.15	0.00
NMK-15	2.485	2.78	49.89	52.12	48.46	30.13	0.00
NM-20	2.455	3.12	41.05	41.58	35.35	23.22	0.00
NMK-20	2.468	3.01	48.34	49.89	44.14	28.11	0.00
NM-25	2.429	3.51	39.45	39.55	32.01	22.22	0.00
NMK-25	2.433	3.33	46.31	47.68	41.11	28.55	0.00



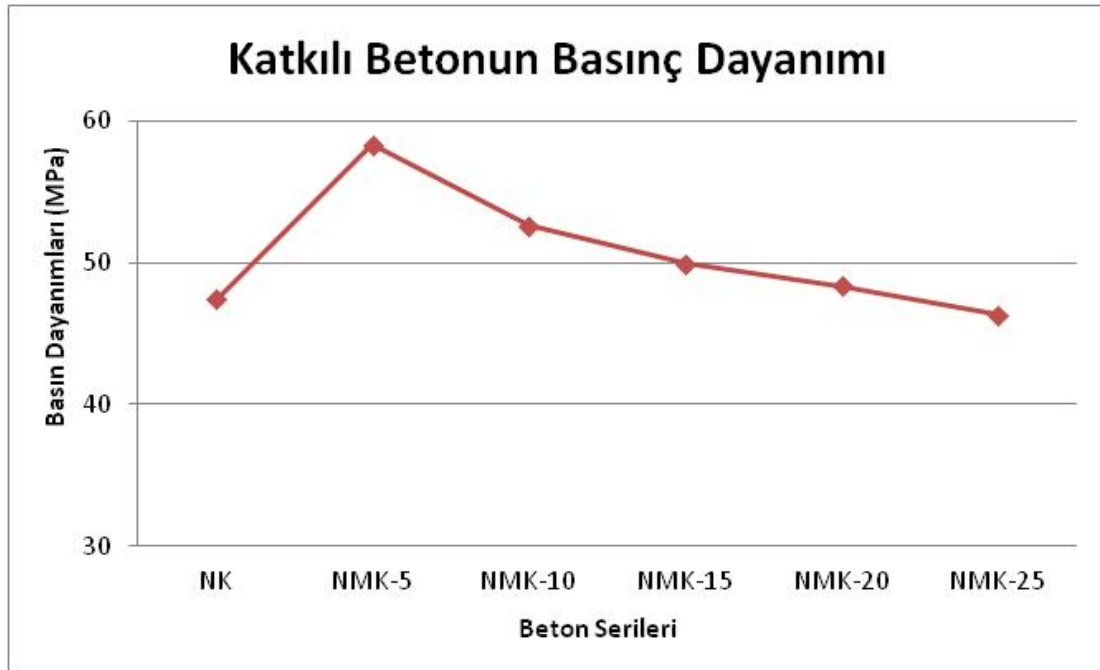
Şekil 3. Betonların birim ağırlıkları



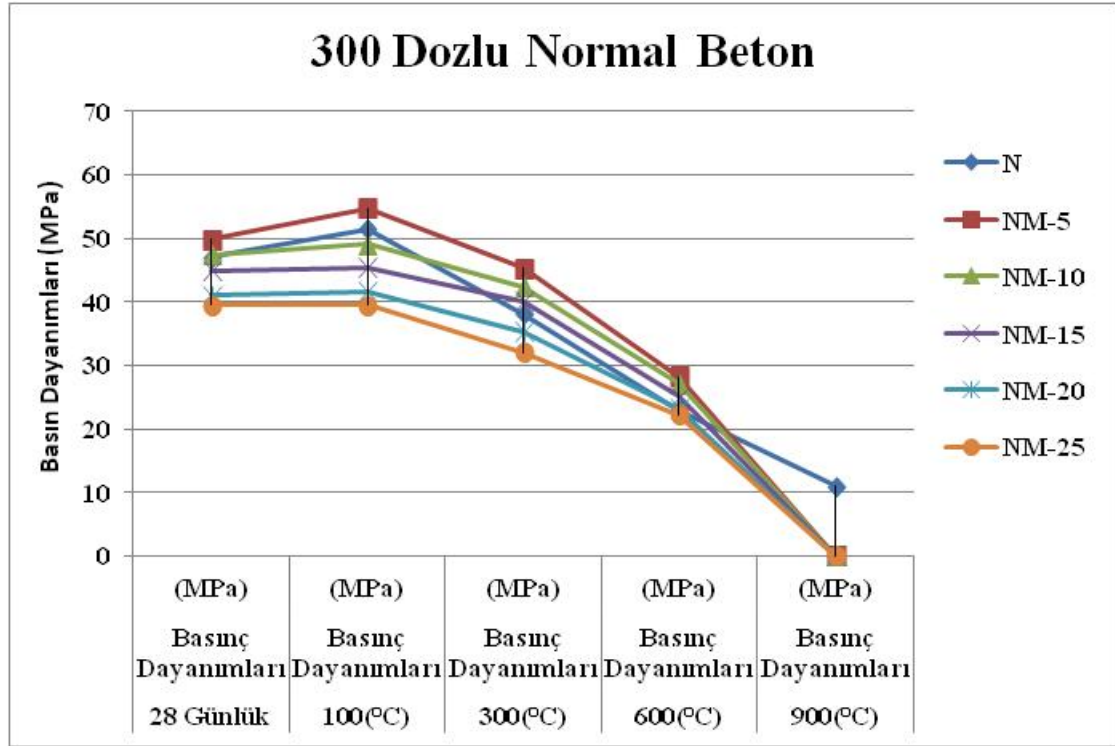
Şekil 4. Betonların su emme yüzdeleri



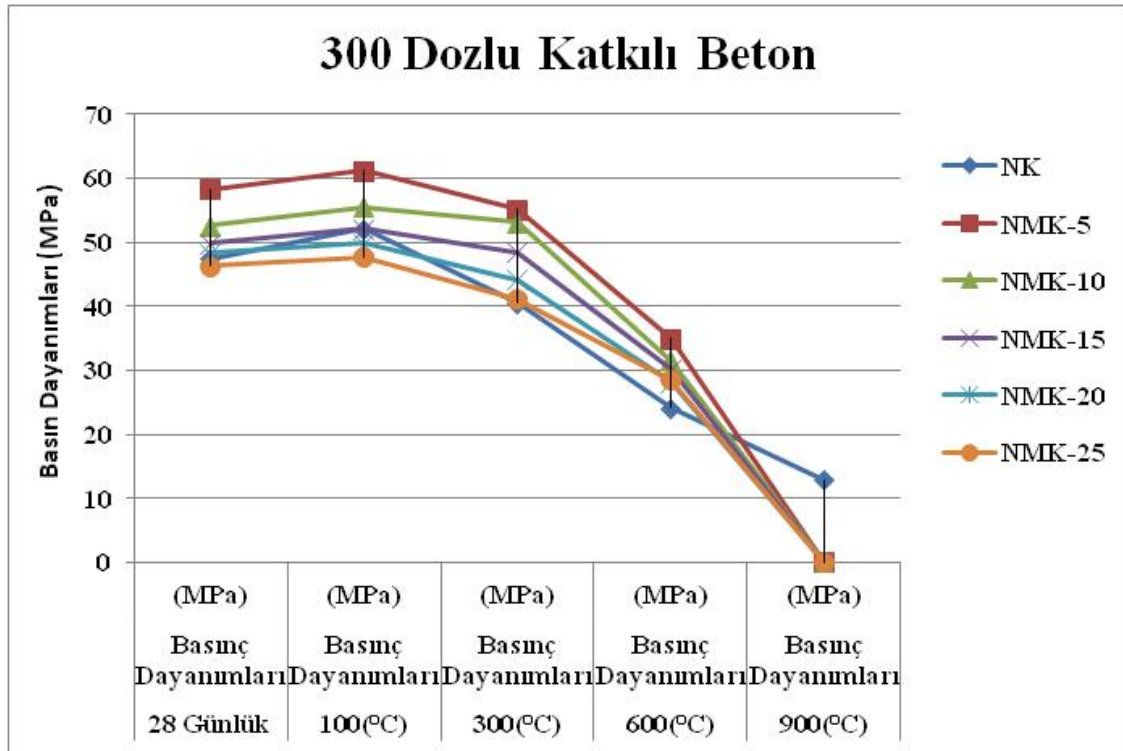
Şekil 5. 300 Dozlu Normal Betonların 28. günlük basınç dayanımları



Şekil 6. 300 Dozlu Katkılı Betonların 28. günlük basınç dayanımları



Şekil 7. 300 Dozlu Normal Betonların yüksek sıcaklık altındaki basınç dayanımları



Şekil 8. 300 Dozlu Katkılı Betonların yüksek sıcaklık altındaki basınç dayanımları

Sonuçlar

Agrega yerine kullanılan atık mermer oranı arttıkça betonların basınç dayanımları % 5’li betonda artmıştır. Atık mermer oranı %5’i geçince küçük bir düşüş görülmekte ancak hedeflenen basınç dayanımlarına ulaşıldıkları görülmektedir. Katkı kullanılması atık mermerli betonlarda basınç dayanımına önemli bir katkı sağladığı görülmektedir. Agregası yerine kullanılan atık mermer oranı arttıkça beton numunelerinin birim ağırlık değerlerinde azalma gözlenmekte iken, su emme oranında ise artış görülmektedir. Normal betonlarda %25 oranına kadar katkı kullanmak sureti ile atık mermer kullanılması ile betonların istenilen standartlarda üretilebileceği görülmüştür. Atık mermerlerin beton içinde kullanılması ile ülkemizde hızla artış gösteren mermer sektörünün atık sorunu ve çevre kirliliği sorunlarına katkı sağlayacağı düşünülmektedir. Yüksek sıcaklık altındaki katkılı betonun basınç dayanımlarında ise 300 °C’ de bir nebze düşmüş olsa bile standartların içinde kaldığı görülmektedir. 600 °C’ den sonra ise yarı yarıya bir düşüş gözlenmekte olup, 900 °C’ den sonra normal betonlar dayanım göstermekte fakat mermerli betonlar ise hiçbir dayanım göstermemektedir.

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MgB₂ SÜPERİLETKEN ÖRNEKLERİNE Ti EKLENMESİNİN MANYETİK KALDIRMA KUVVETİ ÖZELLİKLERİ ÜZERİNE ETKİSİ

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Özet: Farklı sıcaklıklarda külçe MgB₂'ye Ti eklenmesinin kaldırma kuvveti özellikleri üzerine etkilerinin detaylı araştırması bu çalışmada sunuldu. Örneklerin hepsi magnezyum tozundan (%99,8), amorf nano-Bor tozundan (\geq %95) ve Titanyum tozundan (%99,98) hazırlandı. Yüksek sıcaklıklarda Magnezyumun buharlaşmasını önlemek için ağırlıkça %10 fazla Magnezyum kullanıldı. Ti tozu ekleme seviyeleri, MgB₂ tozlarının ağırlıkça 0; 2,5; 5; 7,5; 15; 25; 35 olarak ayarlandı. Bu karıştırılmış tozlar bir buçuk saat öğütüldü ve 26 mm çapında pelletler (385 MPa) basınç altında preslendi. Pelletler Al₂O₃ bota yerleştirildi, krom tüpün içine konuldu ve vakumlandı. Vakum sürecinden sonra 675°C'de 2 saat sinterleme işlemi yerine getirildi. Isıl işlem boyunca yüksek saflıkta 8 bar Argon gazı krom tüp içerisine akıtıldı. Isıl işlemten sonra, MgB₂ örnekler oda sıcaklığına fırın içerisinde soğutuldu. Düşük sıcaklık manyetik kaldırma kuvveti ölçüm sistemi (MLFMS) kullanılarak, dikey kaldırma kuvveti ölçümleri, 20 K ve 25 K sıcaklıklarında sıfır alan altında soğutma (ZFC) ve alan altında soğutma (FC) rejimlerinde, yanal kaldırma kuvveti ölçümleri 25 K sıcaklıkta alan altında soğutma (FC) rejiminde yapıldı. Bu sistemde manyetik alan kaynağı olarak, eksensel olarak polarize edilmiş $\mu_0 M=0,48$ T manyetizasyonlu (19 mm çapında ve 10 mm yüksekliğinde) silindirik NdFeB kalıcı mıknatısı (PM) kullanıldı. Kalıcı mıknatıs hem eksensel hem de radyal yönde MgB₂ örneklerin altında kolayca hareket edebilecek şekilde yerleştirildi. MgB₂ örnekler bütün sıcaklıklarda literatüre göre yüksek kaldırma kuvveti sergilediler. ZFC rejimi altında 20 K ve 25 K'de, ağırlıkça % 5; 7,5; 2,5; 15 Ti eklenmiş örnekler, sırasıyla saf numuneden daha yüksek bir dikey kaldırma kuvveti sergiledi. FC rejimi altında 20 K ve 25 K'de, saf numuneye kıyasla ağırlıkça % 5; 2,5; 7,5 Ti eklenmiş numuneler, sırasıyla, daha yüksek çekici kuvvet değerlerine sahip oldukları görüldü.

Keywords: MgB₂, Ti, Kaldırma Kuvveti

Introduction

1911 yılında Hollandalı fizikçi Kamerling Onnes 4,2 K'in altında soğutulduğu zaman cıvanın DC öz direncinin aniden sıfıra düştüğünü keşfetti ve bu yeni olguyu süperiletkenlik olarak adlandırdı (Rose ve Rhoderick, 1980). Zaman ilerledikçe fizikçiler, süperiletkenler için önemli özelliklerden biri olan mükemmel diyamanyetizmadan haberdar oldular. 1933 yılında Meissner ve Ochsenfeld bir küre manyetik alan içerisindeyken kürenin kritik sıcaklığının altına kadar soğutulduğunda, kürenin manyetik akıyı dışladığını buldular (Meissner ve Ochsenfeld, 1933), Bundan sonrada hem teorik hem de deneysel çalışmalar daha da hız kazandı ve süperiletkenlik alanında önemli buluşlar ortaya atıldı.

Jun Akimitsu ve ekibi, MgB₂ metal alaşımının 39 K geçiş sıcaklığında süperiletken olduğunu buldular (Akimitsu, 2001; Nagamatsu, 2001). Geçiş sıcaklığı 100 K'nin üzerinde birçok yüksek sıcaklık süperiletkeni olmasına rağmen, MgB₂ süperiletkenine olan yoğun ilginin nedenleri; MgB₂ bileşiminde geçiş sıcaklığı, intermetalik süperiletkenlerin (Nb₃Ge T_c=23 K) yaklaşık iki katı olması ve düşük sıcaklık süperiletkenleri içerisinde en yüksek geçiş sıcaklığına sahip olması (Buzea ve Yamashita, 2001); MgB₂, iki element, Magnezyum ve Bor'dan meydana gelmesinden dolayı sentezlerinin, kimyasal yapılarının çok kolay olması ve ucuza sentezlenmesi; MgB₂ süperiletkeni, diğer süperiletkenlerle karşılaştırıldığında, süperiletken akımları daha iyi taşımasından dolayı daha yüksek kritik akım yoğunluğuna sahip olması, düşük sıcaklıklarda yüksek kritik akım yoğunluğu (J_c) ve yüksek tuzaklanınış manyetik alan (H_c) göstermesi (Buzea ve Yamashita, 2001; yüksek sıcaklık seramik süperiletkenlerinde büyük sorun olarak görülen tane sınırı etkisi MgB₂ süperiletkenlerinde olmamasından dolayı uygulamada potansiyel bir aday olarak görülmesi; bakır temelli süperiletkenlerden daha uzun koherens uzunluğuna sahip olması (Zhu, 2001); yüksek sıcaklık seramik süperiletkenlerden daha düşük anizotropiye sahip

olmasından kaynaklanır.

MgB₂ süperiletkenlerin birçok uygulama alanı mevcuttur. MgB₂ külçe süperiletkenlerin uygulama alanları; manyetik perdeleme (uzay uygulamaları, ölçüm sistemleri), kaçak akım sınırlayıcıları (indüktif silindirler), Kablolar (süperiletken mıknatıslar ve anahtarlar için), elektrik motorları (relaktans rotoru, lineer motor, senkronize motor), RF cihazları (filtreler, antenler), kalıcı mıknatıslar (PM) (manyetik kaldırma (levitation) sistemleri, manyetik yataklama, manyetik ayırma) olarak özetlenebilir (Giunchi, 2011).

Son yirmi senede, süperiletkenlerin manyetik enerji depolamada ve manyetik olarak havalanmış trenlerde (Maglev) kullanımı büyük dikkat çeker. Manyetik kaldırma, bir cismin herhangi bir fiziksel desteğe ihtiyaç duymaksızın havada kalması olayıdır. Süperiletken manyetik kaldırma, uygulanan alan ve süperiletken içindeki akımlar arasındaki etkileşmeden kaynaklanır. Süperiletken ve kalıcı mıknatıs arasındaki bağlı hareket, kalıcı mıknatısın manyetik alanı ve süperiletken içinde indüklenen akım arasında manyetik kuvvet oluşumuna sebep olur. Bu kuvvet sayesinde sürtünmeden kaynaklanan enerji kaybı yok denecek kadar az olmaktadır. Süperiletkenlerin manyetik kaldırma kuvveti özelliklerinden yararlanılarak manyetik olarak havalanmış taşıma sistemleri (Maglev), sürtünmesiz manyetik yatak ve enerji depolayan dönen çark gibi sürtünmeden kaynaklanan enerji kaybının en aza indirilebileceği sistemler, günümüzde birçok araştırma laboratuvarlarında geliştirilmeye çalışılmaktadır. Ancak bu uygulamaların neredeyse tamamı manyetik alan altında yüksek kritik akım yoğunluğu (J_c) gerektirir.

MgB₂'nin süperiletken özellikleri, kimyasal ekleme ya da katkılama, termo mekanik süreç, mekanik alaşım (Yanmaz, 2009), sıcak pres (Shinohara, 2008) ya da proton ışınlaması gibi metotlarla iyileştirilebilir. Bu metotlar arasında kimyasal ekleme ya da katkılama yüksek manyetik alanlar altında MgB₂'nin kritik akım yoğunluğunu geliştirmedeki basit ve etkili tekniktir (Tripathi, 2014a; Tripathi, 2014b). Malesef temiz MgB₂'nin kritik akım yoğunluğu doğal kusur eksikliklerinden dolayı artan manyetik alanla keskin bir şekilde düşer (Bugoslavsky, 2001). MgB₂'de kimyasal ekleme ya da katkılama, sadece fazlardan çivileme merkezleri sağlamaz aynı zamanda tane iletkenliğini ve tane içi band saçılmasını geliştirir. Bunlar da MgB₂'deki kritik akım yoğunluğunu geliştirmeye yardım eder (Dou, 2005). Süperiletkenlerde manyetik alanı tuzaklayan çivileme merkezleri kaldırma kuvveti için büyük önem teşkil eder. Çünkü çivileme merkezi ne kadar güçlü olursa, kaldırma kuvveti de o kadar güçlü olur. Çeşitli çalışmalar, manyetik kaldırma kuvvetinin kritik akım yoğunluğuna güçlü bir şekilde bağlı olduğunu gösterdi (Öztürk, 2009). Maglev sistemlerinde daha fazla yük taşıma kapasitesi için kaldırma kuvvetinin büyük olması istenir.

Bu çalışmada, yüksek manyetik kaldırma kuvvetine sahip külçe MgB₂ süperiletken örneklerin elde edilmesi amaçlandı. Bunun için külçe MgB₂ süperiletken örnekler, ağırlıkça belli oranlarda (%0 (saf MgB₂), %2,5; %5, %7,5; %15; %25; %35) Ti eklenerek üretildi. Üretilen bu örneklerin manyetik kaldırma kuvveti ölçüm sistemi ile sıfır alan altında ve alan altına soğutma rejimlerinde farklı sıcaklıklarda kaldırma kuvveti ölçümleri alındı. Böylece Maglev uygulamaları için en yüksek kaldırma kuvveti özelliklerine sahip olan örnekler belli edildi.

Materials and Methods

Bu çalışmada örneklerin hepsi; magnezyum tozu (Mg) (Alfa Aesar, %99,8 saflıkta), amorf–nano-bor tozu (B) (Aldrich, ≥%95), Titanyum tozu (Ti) (Aldrich, %99,98) kullanılarak “katıhal tepkime metodu” ile hazırlandı. Saf MgB₂ süperiletkenini üretmek için magnezyum ve bor tozları 1:2 sitokiyometrik oranlarda tartılarak 2 g'lık toz karışım elde edildi ve agat havanda bir buçuk saat öğütüldü. Daha sonra ayrı olarak hazırlanmış olan 2 g'lık Mg ve B karışımlarına, ağırlıkça %2,5; %5; %7,5; %15; %25 ve %35'lik oranlarda Ti eklenerek elde edilecek MgB₂ örnekleri de agat havanda bir buçuk saat öğütüldü. Magnezyumun yüksek buharlaşma özelliğinden dolayı, yapıyı terk etmesi durumunda oluşacak stokiyometrik kaymayı önlemek ve Magnezyumun buhar basıncından yararlanmak için ağırlıkça % 10 oranında fazla Mg karışımlara eklendi (Serquis, 2003). Homojen bir şekilde karıştırılan tozlar 26 mm çapında silindirik kalıpta 10 ton/cm² basınç altında preslendi. Pelletler, Al₂O₃ bota yerleştirildikten sonra krom tüp içine yerleştirildi ve sonra, silindirik fırının merkezine yerleştirildi. Tüpün ve bağlantı borularının vakumu alınarak tüp içerisinde ısıtma işlemi süresince yüksek saflıkta 8 bar Ar gazı verildi. 675°C de iki saat ısıtma işlemi gerçekleştirildi. Isıtma işleminden sonra krom tüp fırından çıkarıldı ve vakum altında, Ar gazı basıncında oda sıcaklığına gelene kadar soğuması beklendi.

Düşük sıcaklıklardaki dikey ve yanal manyetik kaldırma kuvveti ölçümleri, TÜBİTAK tarafından desteklenen 110T622 nolu proje ile tasarlanan, 2013/13638 patent numaralı "Düşük Sıcaklık Manyetik Kaldırma Kuvveti Ölçüm Sistemi (MLFMS)" kullanılarak Recep Tayyip Erdoğan Üniversitesi Katıhal Araştırma Laboratuvarı'nda gerçekleştirildi (Çelik, 2016). Elde edilmiş olan örneklerin manyetik kaldırma kuvveti ölçümleri, Şekil 1'de verilen MLFMS kullanılarak, manyetik alan altında soğutma (Field Cooling, FC) ve alansız soğutma rejimlerinde (Zero Field Cooling, ZFC), 20K ve 25K sıcaklıklarında yapıldı.



Şekil 1. Manyetik Kaldırma Kuvveti Ölçüm Sistemi (Celik, 2016).

MgB₂ süperiletken örneğin hemen altında, hem eksensel hem de radyal yönde hareket edebilen silindirik NdFeB kalıcı mıknatısı (PM) (19 mm çapında ve 10 mm kalınlığında) şekil 1’de verilen sistemde manyetik alan kaynağı olarak kullanıldı. Dikey kaldırma kuvveti (F_z), mıknatısın üst yüzey merkezi ve örneğin alt yüzey merkezi arasındaki düşey mesafeye bağlı olarak bilgisayar kontrolünde kesintisiz ölçüldü. MgB₂ örnekleri, mıknatısın 50 mm üstündeyken (manyetik alanının ihmal edilebildiği mesafe) dikey ZFC ölçümleri için oda sıcaklığından aşağı soğutuldu. Sonra mıknatıs ile örnek arasındaki minimum uzaklık 1,5 mm olana kadar PM yükseltildi ve ilk konumuna indirildi. Bu yolla ZFC rejiminde dikey mesafenin fonksiyonu olarak dikey kaldırma kuvveti ölçüldü. MgB₂ örnekleri, mıknatısın 1,5 mm üstündeyken dikey FC ölçümleri için oda sıcaklığından aşağı soğutuldu. Böylelikle örnekler NdFeB kalıcı mıknatısın manyetik alanı altında soğutuldu. Mıknatıs eksensel yönde manyetize olduğu için mıknatıs bu durumda süperiletken örneğe maksimum manyetik alan uygulamaktadır. Sonra NdFeB kalıcı mıknatısı 50 mm uzaklığa kadar indirildi ve tekrar 1,5 mm’lik ilk konuma yükseltildi. Bu yolla FC rejiminde dikey mesafenin fonksiyonu olarak dikey kaldırma kuvveti ölçüldü. Yatay mesafenin fonksiyonu olarak yatay kaldırma kuvveti ölçümleri FC rejiminde 25 K sıcaklıkta yapıldı. MgB₂ örnekleri, mıknatısdan 0 mm yatay ve 1,5 mm dikey mesafedeyken soğutuldu. Bu ölçümlerde çalışma yüksekliği (WH) ve soğutma yüksekliği (CH) 1,5 mm seçildi. Mıknatıs, örnek yüzeyini altından x-eksenine paralel bir şekilde hareket ettirildi. Mıknatıs yatay olarak hareket ederken, maksimum yatay mesafe 10 mm seçildi ve dikey mesafe sabit tutuldu. Her döngü için, mıknatıs $x=0$ mm’den $x=+10$ mm’ye ve sonra tekrar geriye $x=0$ mm’ye ve oradan $x=-10$ mm’ye ve tekrar $x=0$ mm’ye hareket ettirildi.

Results and Discussion

Süperiletken malzemeler ile mıknatıs arasında gözlenen manyetik kaldırma olayı, süperiletken malzeme üzerine uygulanan dış bir manyetik alanın malzemede indüklenen perdeleme akımları tarafından dışarılanmasından (Meissner olayı) kaynaklanır. Meissner durumunda malzeme manyetik alanı tamamıyla dışarılar ve itici bir kuvvet oluşur. Maglev sisteminin iki anahtar parametresi düşey kaldırma kuvveti ve yanal kılavuzlama kuvvetidir. Bunlar gerçekte, uygulanan alan ve süperiletkende indüklenen akım arasındaki etkileşmeden kaynaklanan toplam Lorentz kuvvetinin bileşenleridir (Song., 2005). Süperiletkende tuzaklanan akı, eğer mıknatıs yatay veya düşey olarak hareket ederse onu başlangıç pozisyonu olan denge konumuna geri çekecektir.

Manyetik kaldırma kuvveti, süperiletkenin sahip olduğu manyetik moment ve manyetik alan gradyenti ile orantılı olup aşağıdaki şekilde verilir (Murakami, 1991):

$$F = m \left(\frac{dH}{dz} \right) ; m = MV ; M = AJ_c r \quad (1)$$

Burada m , süperiletken manyetik moment; dH/dz , manyetik kaynak tarafından oluşturulan alanın düşey z eksenine boyunca değişim oranı; M , birim hacimdeki manyetik moment; V , numune hacmi; A , numune geometrisine bağlı bir sabit; J_c , süperiletkenin kritik akım yoğunluğu ve r , uygulanan dış manyetik alanı dışarılamak için süperiletkende oluşan perdeleme akım halkasının yarıçapıdır. Manyetik kuvvet temelli uygulamalar için istenilen yüksek kaldırma kuvveti değerleri, m , dH/dz ya da r değerlerini büyütürken elde edilebilir. m ve r üzerinde

çalışılacak süperiletken malzemenin özelliklerinden olduğu için malzeme kalitesi ve üretim yöntemine bağlı olarak değişkenlik gösterir. Diğer taraftan dH/dz bileşeni dışarıdan uygulanan manyetik alanın kaynağına bağlı olarak değişir. Süperiletken üretim tekniğine bağlı malzeme kalitesi (Kim, 2001), süperiletken numuneye yapılan katkılar (Öztürk, 2009; Öztürk, 2012), süperiletkenin alanlı veya alansız soğutma şartlarına bağlı manyetik geçmişi (Jiang vd., 2012), süperiletken manyetik kaldırma kuvvetini etkileyen etkenlerdir. Süperiletken ile mıknatıs arasındaki manyetik kuvvetin, süperiletkenin manyetik alan altında (Field Cooling, FC) ve alansız (Zero Field Cooling, ZFC) soğutma durumlarına da bağlı olarak değiştiğini gösteren birçok çalışma yapılmıştır (Hull vd., 1999). Mıknatıs ve süperiletken arasında daha büyük kaldırma kuvvetinin (itici kuvvet) ZFC durumunda, daha fazla çekici kuvvetin ise FC durumunda sağlanacağı belirtilmiştir (Moon, 2004).

Bu çalışma, MgB_2 örnekleri ağırlıkça belirli oranlarda (%0 (saf MgB_2), %2,5; %5, %7,5; %15; %25; %35) Ti eklenmesinin MgB_2 'nin kaldırma kuvveti özelliklerini geliştirmesi için yapıldı. Literatüre bakıldığında MgB_2 süperiletkeninin kaldırma kuvveti üzerine çalışmaların son yıllarda yoğunluk kazandığı görülmektedir (Erdem, 2014; Savaşkan, 2014; Tripathi, 2014; Perini, 2009; Yanmaz, 2010). Literatürde MgB_2 süperiletkenine Ti eklenmesinin MgB_2 'nin kaldırma kuvveti özellikleri üzerine etkilerinin incelenmemiş olduğu görülmüştür.

Şekil 2 ve 3, katkısız ve Ti eklenmiş külçe MgB_2 örneklerinin 25 K sıcaklığında ZFC ve FC rejimlerinde, dikey manyetik kaldırma kuvvetinin dikey mesafeye göre değişim grafiklerini gösterir. Şekil 2'deki 1 ve 2 işaretleri sırasıyla, mıknatısın örneğe ve örnekten uzağa doğru hareketini gösterir. Mıknatıs süperiletkene doğru hareket ettiğinde, süperiletkenin hissettiği manyetik alan artar. Bu durum manyetizasyonu (M) artırarak kaldırma kuvvetini artırır (Murakami vd., 1991). Diğer bir deyişle mıknatıs örnekten uzağa hareket ettiğinde, dış alan azalır. Şekil 2'de görüldüğü gibi mıknatıs, MgB_2 örneklerinin yüzeyine doğru hareket ettiğinde dikey kaldırma kuvveti artar. Şekilde görüldüğü gibi, örnek ile mıknatıs arasındaki uzaklık değiştikçe kaldırma kuvvetinin değişimi histeresis bir davranış sergiler. Ti eklenmiş MgB_2 külçe örneklerinin 25K sıcaklıktaki maksimum kaldırma kuvvetleri (itici) Tablo 1'de verildi. Tüm örneklerin MgB_2 'nin kritik sıcaklığına yakın bir sıcaklıkta ölçüm alınmasına rağmen, itici kaldırma kuvvetlerinin literatüre göre yüksek değerde olduğu görüldü. Tablo 1'den ZFC rejiminde, ağırlıkça %15 Ti ekleme miktarına kadar itici kaldırma kuvveti saf MgB_2 örneğin itici kaldırma kuvvetinden büyük olduğu görüldü. %15 Ti eklemesi ile beraber itici kaldırma kuvvetinin saf örneğe göre düştüğü bulundu. Şekil 2'den en yüksek itici kaldırma kuvvetine sahip örneğin 11,65 N değer ile %5 Ti eklenmiş MgB_2 örneğe ait olduğu bulundu. Süperiletken taşıyıcı uygulamalarında alansız soğutma yöntemi (ZFC) büyük manyetik kaldırma kuvvetine ve düşük kararlılığa neden olurken, alan altında soğutma yöntemi (FC) yüksek kararlılığa ve süperiletken içerisinde tuzaklanan manyetik akıdan dolayı düşük kaldırma kuvvetine neden olur. Şekil 3'teki 1,2 ve 3,4 işaretleri sırasıyla, mıknatısın örnekten uzağa ve örneğe doğru hareketini gösterir. Şekil 3'te 25K sıcaklıkta FC rejimi altında yapılan ölçümlerde yine %15 Ti eklemesine kadar çekici kaldırma kuvvetinin saf örneğe göre daha yüksek olduğu bulundu. %15 Ti eklemesi ile beraber çekici kaldırma kuvvetinin saf örneğe göre düştüğü bulundu. Tablo 1'e bakıldığında, 25K sıcaklıktaki en yüksek çekici kaldırma kuvveti değerine -3,36 N değeri ile %5 Ti eklenmiş örneğin sahip olduğu bulundu.

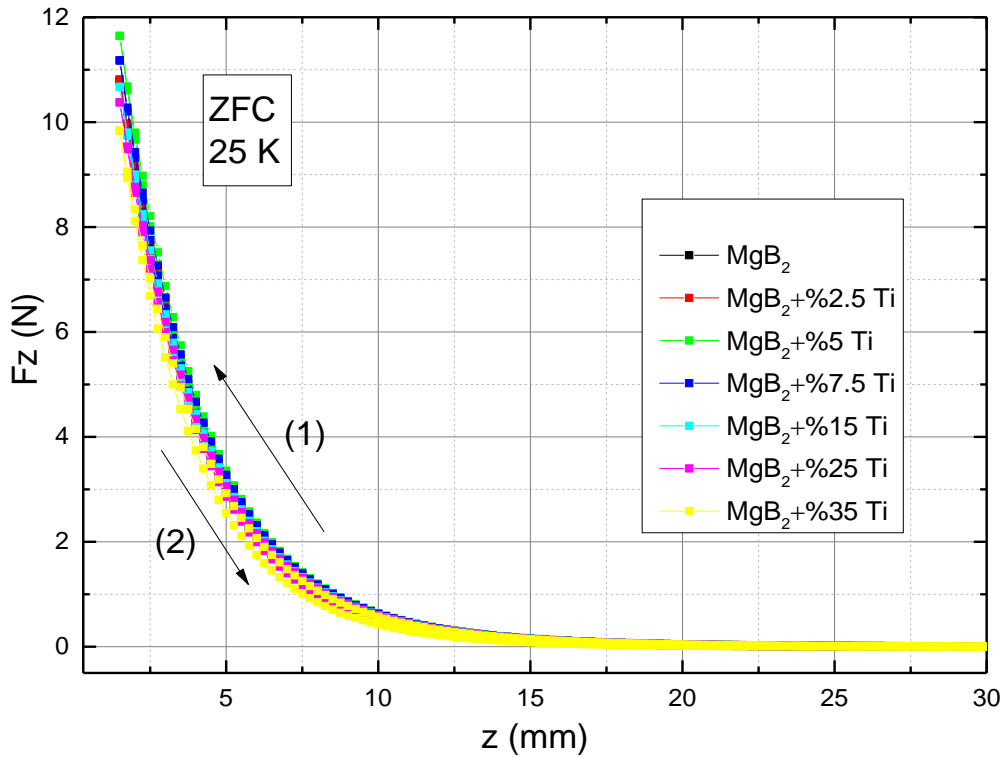
Şekil 4 ve 5, katkısız ve Ti eklenmiş külçe MgB_2 örneklerinin 20 K sıcaklığında ZFC ve FC rejimlerinde, dikey manyetik kaldırma kuvvetinin dikey mesafeye göre değişim grafiklerini gösterir. Kaldırma kuvvetini etkileyen diğer bir etkende süperiletken örneğin sıcaklığıdır. Süperiletken örneğin sıcaklığı geçiş sıcaklığından başlayarak azaltıldıkça manyetik kaldırma kuvveti değerlerinin arttığı gözlenmiştir (Jiang, 2002). Şekil 4 ve 5'te görüldüğü gibi, ölçüm sıcaklığı 20K'ne düştüğü zaman itici ve çekici kaldırma kuvveti değerlerinin arttığı gözlenmiştir. Tablo 1'e bakıldığında ölçüm sıcaklığının 25K'den 20K'e düştüğü zamanki kaldırma kuvveti değerlerinin daha fazla olduğu görülmektedir. Şekil 4 ve 5'teki iç grafiklerde, ağırlıkça Ti ekleme miktarlarının maksimum dikey kaldırma kuvvetine göre grafikleri verilmiştir. Ti eklenmiş MgB_2 külçe örneklerinin 20K sıcaklıktaki maksimum kaldırma kuvvetleri (itici ve çekici) Tablo 1'de verildi. Tüm örneklerin itici kaldırma kuvvetlerinin literatüre göre yüksek değerde olduğu görüldü. Tablo 1'den 20 K sıcaklıkta ZFC rejiminde, ağırlıkça %25 Ti ekleme miktarına kadar itici kaldırma kuvveti saf MgB_2 örneğin itici kaldırma kuvvetinden büyük olduğu görüldü. %25 Ti eklemesi ile beraber itici kaldırma kuvvetinin saf örneğe göre düştüğü bulundu. Şekil 4'ten en yüksek itici kaldırma kuvvetine sahip örneğin 11,92 N değer ile %5 Ti eklenmiş MgB_2 örneğe ait olduğu bulundu. Şekil 5'te 20K sıcaklıkta FC rejimi altında yapılan ölçümlerde %15 Ti eklemesine kadar çekici kaldırma kuvvetinin saf örneğe göre daha yüksek olduğu bulundu. %15 Ti eklemesi ile beraber çekici kaldırma kuvvetinin saf örneğe göre düştüğü bulundu. Tablo 1'e bakıldığında, 20K sıcaklıktaki en yüksek çekici kaldırma kuvveti değerine -3,52 N değeri ile %5 Ti eklenmiş örneğin sahip olduğu bulundu.

Maglev ulaşım sistemlerinde manyetik kaldırma kuvveti kadar önemli olan bir diğer kuvvet ise manyetik rayların üzerinde aracın kararlı hareketini sağlayan, yanıl manyetik kuvvettir. Yanıl manyetik kuvvet, Maglev (Manyetik Olarak Havalanmış Ulaşım Araçları) araçlarında kılavuzlayıcı kuvvettir. Mıknatıs dengeli konumuna geri getiren bu yanıl kuvvet, kaldırma kuvvetinin yanında, sistemin kararlılığının bir göstergesidir (Hull, 2000). Maglev

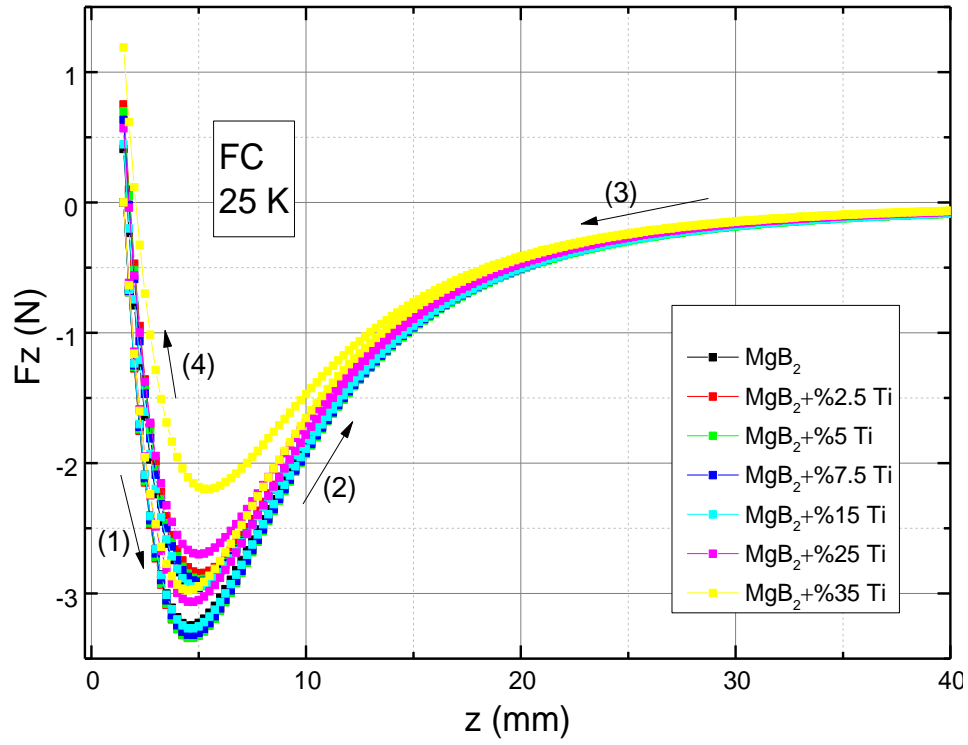
sistemlerinin yük taşıma kapasitesinin ve yanal kararlılığının istenen düzeye getirilmesi için manyetik kaldırma ve kılavuzlama kuvveti değerlerinin artırılarak iyileştirilmesi gerekmektedir. Dikey manyetik kaldırma kuvveti ölçümleri alansız soğutma (ZFC) ve alan altında soğutma (FC) rejimlerinde gerçekleştirirken yanal kaldırma kuvveti alan altında soğutma (FC) rejiminde gerçekleştirilmiştir. Şekil 6 katkısız ve Ti eklenmiş külçe MgB_2 örneklerin 25 K sıcaklığında FC rejimlerinde ölçülmüş yanal mesafeye karşı kılavuzlayıcı kuvvet grafiklerini vermektedir. Şekil 6'dan kılavuzlayıcı kuvvet değerleri en iyi olan örneğin yine dikey kaldırma kuvveti değerlerinde olduğu gibi ağırlıkça %5 Ti eklenmiş MgB_2 örnekte olduğu görülmektedir. %15 Ti eklemesine kadar kılavuzlayıcı kuvvet değerlerinin katkısız MgB_2 örneğe göre daha yüksek olduğu görülmektedir. %15 Ti eklemesi ile beraber kılavuzlayıcı kuvvetin saf örneğe göre düştüğü bulundu.

Tablo 1: Saf (% 0), % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin 25K ve 20 K sıcaklıklarda ölçülmüş ZFC ve FC rejimlerinde dikey kaldırma kuvveti değerleri.

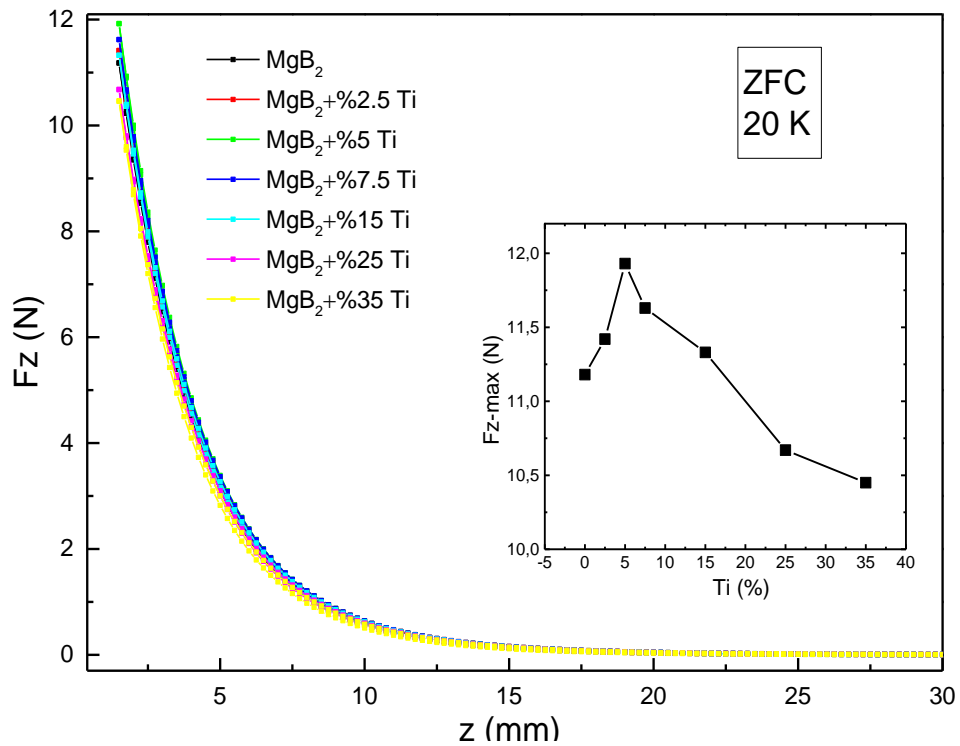
Ti Miktarı (%)	25K		20K	
	ZFC	FC	ZFC	FC
0	10.80 N	-3.25 N	11.19 N	-3.31 N
2.5	10.82 N	-3.26 N	11.41 N	-3.42 N
5	11.65 N	-3.36 N	11.92 N	-3.52 N
7.5	11.18 N	-3.32 N	11.63 N	-3.38 N
15	10.67 N	-3,24 N	11.32 N	-3.26 N
25	10.38 N	-3,06 N	10.67 N	-3.14 N
35	9.84 N	-2.98 N	10.47 N	-3.10 N



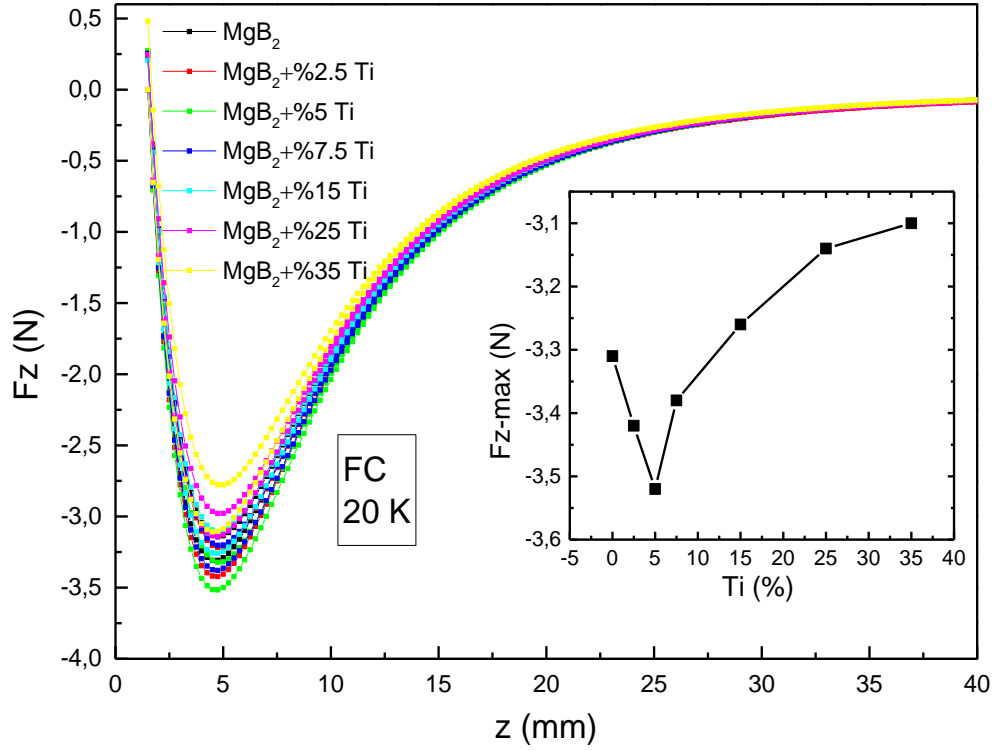
Şekil 2. Saf, % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin ZFC rejiminde 25 K sıcaklıkta ölçülmüş, kalıcı mıknatıs ve örnekler arasında dikey mesafeye (z) karşı dikey kaldırma kuvveti (F_z) grafikleri.



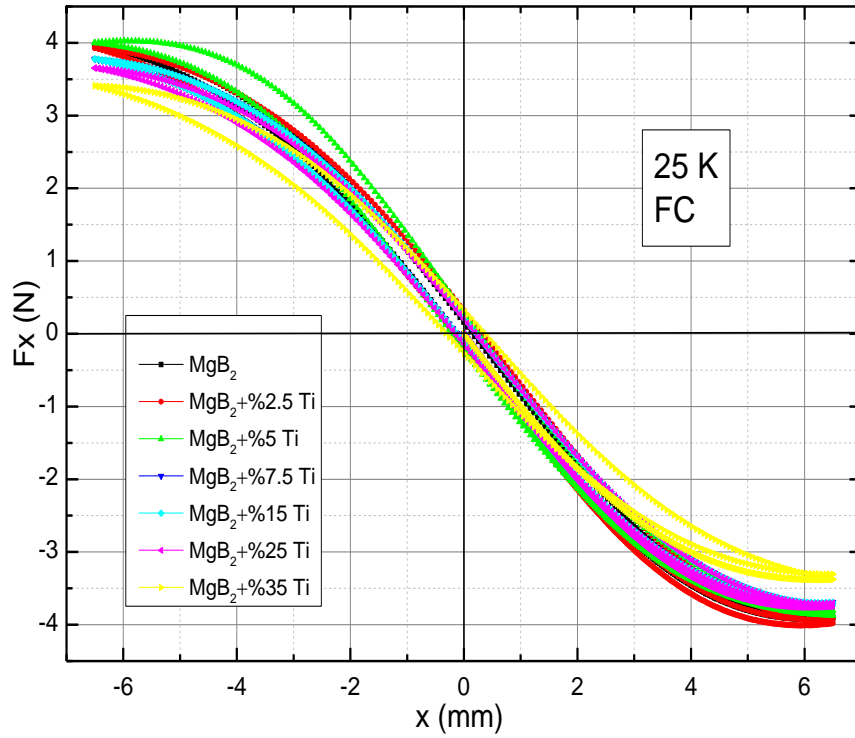
Şekil 3. Saf, % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin FC rejiminde 25 K sıcaklıkta ölçülmüş, kalıcı mıknatıs ve örnekler arasında dikey mesafeye (z) karşı dikey kaldırma kuvveti (F_z) grafikleri.



Şekil 4. Saf, % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin ZFC rejiminde 20 K sıcaklıkta ölçülmüş, kalıcı mıknatıs ve örnekler arasında dikey mesafeye (z) karşı dikey kaldırma kuvveti (F_z) grafikleri.



Şekil 5. Saf, % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin FC rejiminde 20 K sıcaklıkta ölçülmüş, kalıcı mıknatıs ve örnekler arasında dikey mesafeye (z) karşı dikey kaldırma kuvveti (F_z) grafikleri.



Şekil 6. Saf, % 2,5; % 5; % 7,5; % 15; %25 ve %35 Ti eklenmiş külçe MgB_2 örneklerinin FC rejiminde 25 K sıcaklıkta ölçülmüş, kalıcı mıknatıs ve örnekler arasında yanıl mesafeye (x) karşı kılavuzlayıcı kuvvet (F_x) grafikleri.

Conclusion

Bu arařtırmada manyetik olarak havalanmıř uľařım araları (Maglev) iin gerekli olan, yksek deęerde dikey ve yanal manyetik kaldırma kuvvet deęerlerine sahip speriletken rnekler retilmeye alıřıldı. Bunun iin MgB_2 rneęin ierisine aęırlıka belli oranlarda (%0 (saf MgB_2), %2,5; %5, %7,5; %15; %25; %35) Ti eklendi ve 20K ve 25K lm sıcaklıklarında ZFC ve FC rejimleri altında dikey kaldırma kuvveti deęerleri ve 25K sıcaklıkta FC rejiminde klavuzlayıcı kuvvetleri arařtırıldı. Dikey kaldırma kuvveti sonularından 20K ve 25K lm sıcaklıkları ve ZFC ve FC rejimleri altında alınan lmlerin her ikisinde de aęırlıka en iyi Ti ekleme oranının %5 olduęu bulundu. %15 Ti ekleme seviyesine kadar dikey kaldırma kuvveti deęerleri katkısız olan MgB_2 rneęin deęerine gre daha fazlaydı ve %15 Ti ekleme seviyesinden sonra kaldırma kuvveti deęerleri katkısız rneęe gre dřř sergiledi. Klavuzlayıcı kuvvet deęerleri en iyi olan rneęin yine dikey kaldırma kuvveti deęerlerinde olduęu gibi aęırlıka %5 Ti eklenmiř MgB_2 rnekte olduęu grlmektedir. %15 Ti eklemesi ile beraber klavuzlayıcı kuvvetin saf rneęe gre dřř bulundu. Sonu olarak aęırlıka %5 Ti eklenmiř MgB_2 rneęin, hem dikey kaldırma kuvveti deęeri hem de yanal kaldırma (klavuzlayıcı) kuvveti deęerinin en yksek olan rnek olduęu tespit edildi.

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MIL-A 46100 ZIRH ÇELİĞİNİN KAYNAKLAMA İŞLEMİNDE ETKİLİ PARAMETRELERİN BELİRLENMESİ

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Özet: Zırhlı araçlarda kullanılan ana yapı malzemelerinden biri Mil-A 46100 Zırh Çeliğidir. Bu çelik türünün önemi, sertlik ve patlayıcıya karşı koruma özelliği gibi mekanik özelliklerinden kaynaklanmaktadır. Ayrıca, zırh çelikleri diğer herhangi bir metalle karşılaştırıldığında kaynak yapmaya daha meyillidir. Bunun yanı sıra, bu iyi mekanik özellikler sayesinde zırhlı araç yapımında tercih edilirler. MIG (Metal Inert Gas) kaynak tekniği prensip olarak, elektrik arkının metaller ve kaynak teli arasında sürekli olduğu ortamda metallerin kaynatılmasına dayanmaktadır. Kaynaklı alan, Helyum ve Argon gibi soy gazlar kullanılarak, beklenmedik atmosferik etkilere korunur. Kaynaklı metallerin çelik esaslı malzemeler olması durumunda, daha iyi kaynak sonuçları elde etmek için O₂ ve CO₂ ortam gazlarına eklenir. Dikkatlice belirlenen oranlarda CO₂ miktarı, kaynak bölgesine daha fazla ısı transferini sağlayarak yüksek kaynak nüfuziyeti sağlar. Bunun yanı sıra, MIG kaynak uygulamalarında, zırh çeliğinin kimyasal yapısındaki ferrit miktarı, süneklik ve tokluk üzerindeki azaltıcı özelliği nedeniyle bazı beklenmedik etkilere yol açabilir. Zırh çeliklerinin kaynaklarında östenitik tel kullanılarak bu tür bir arızadan kaçınmak yararlıdır. Bu şekilde, kaynaklı parçanın gücü ve mekanik performansı geliştirilebilir. Charpy Darbe Deneyi metallerin darbe tokluğunu tespit etmek için en etkili testlerden biridir. Ayrıca ferritik kaynak teli kullanmak parçaların ön ısıtılması ihtiyacının doğmasına neden olabilir. Kaynak işlemlerinde, kaynaklı parçaların ısıdan etkilenen bölgesi boyunca mikro yapısal değişiklikler meydana gelir. Sonuç olarak, kaynak bölgesi normal olarak ana metallere kıyasla daha düşük mukavemet ve balistik performansa sahiptir. Bu çalışmada, MIG kaynak uygulamalarında MIL-A 46100 zırh çeliği kullanılarak kaynaklı bölgenin mekanik özellikleri üzerinde etkili parametrelerin etki seviyelerinin tespit edilmesi amaçlanmıştır. Etkili parametreleri tespit edebilmek için kaynak gerilimi, tel sürme hızı, kaynak ağzı ve tel malzemesi bağımsız değişkenler olarak tespit edilmiştir. Deneylerin tasarımında 2k faktöriyel (2 seviyeli tam faktöriyel tasarım) deney tasarımı metodolojisi kullanılmıştır.

Anahtar Kelimeler: MIG, Kaynak, Zırh çeliği, 2k Faktöriyel, Charpy

DETERMINATION OF THE EFFECTIVE PARAMETERS IN WELDING PROCESS OF MIL-A 46100 ARMOR

Abstract: One of the main construction materials used in armor vehicles is Mil-A 46100 Armor Steel. The importance of the material arises from its mechanical properties such as hardness and explosive protection capability. Also, armor steels are more keen to be welded compared to any other type of metals. Besides this, thanks to those good mechanical properties, they are preferred in armor vehicle construction. MIG (Metal Inert Gas) welding technique is principally based on welding metals via electric arc where the arc is continuous between metals and welding wire. The welded area is protected from unexpected affects of the atmosphere by using inert gases such as Helium and Argon. In case welded metals are steel based materials, O₂ and CO₂ are added in protective gases in order to get better welding results. The amount of CO₂, with carefully designated proportions, ensures high welding penetration by enabling more heat transfer into the welding zone. Besides this, in MIG welding applications, the amount of ferrit in the chemical structure of the armor steel may result in some unexpected affects due to its decreasing characteristic on ductility and toughness. It is helpful to refrain from that kind of failure using austenitic wire in welding armor steels. By this way, the strength and mechanical performance of the welded part can be improved. Charpy Impact Test is one of the effective tests to determine the impact toughness of metals. Using ferritic welding wire may also cause the need to preheating the parts. In welding operations, there happens micro-structural changes along the heat affected zone of the welded parts. As a consequence, the weld-zone has normally lower strength and ballistical performance compared to the base metals. This emerges plenty of research topics for the scientists concerning with the heat affected zone of the armor weldings. In this study, it was aimed to determine the effect levels of the effective parameters on the mechanical properties of welded zone using MIL-A 46100 armor steel in MIG welding applications. In order to

determine the effective parameters, the welding voltage, wire feed rate, welding hole and wire material are determined as independent variables. In the design of the experiments, 2k factorial (2 level full factorial design) experiment design methodology is used.

Key words: MIG, Welding, Armor Steel, 2k Factorial, Charpy.

Giriş

Zırh çelikleri günümüz talaşlı imalat teknolojisinde kolayca üretilmekte ve işlenebilmektedir. Ancak bu çelik türlerinin kullanılma alanlarının yüksek balistik dayanım gereksinimi nedeniyle birleştirilmesi de bir problem sahası olarak karşımıza çıkmaktadır. Zırh çelikleri genel olarak zırhlı araçlarda ve kara platformlarında (tanklar, taktik tekerlekli ve paletli araçlar, zırhlı personel taşıyıcılar, çok namlulu roketatarlar, obüsler vb.) kullanılmaktadırlar. Bu araçların ortak ihtiyacı çalıştıkları sahada sürekli deformasyon riski taşımaları ve anti silahlarına karşı koruma zorunluluklarıdır. Böylece can ve mal kaybının önüne geçilmesi hedeflenmektedir.

Zırh teknolojisinde kaynağı mümkün olan çelik ve alüminyum esaslı zırh malzemelerini ön plana çıkarmaktadır. Ancak kaynaklı birleştirme işleminde ısı tesiri altında kalan bölgeler ve kaynak bölgelerinden ileri gelen mikroyapısal değişimlerin bir sonucu olarak esas metale nazaran daha düşük mukavemet ve balistik performans söz konusudur. Bu da zırh malzemelerinde kaynak bölgelerinin mekanik, metalurjik ve balistik açıdan araştırılması gerektiğini göstermektedir (Kara ve Korkut, 2012). MIL-A 46100 çelik levha, askeri amaçlı bir zırh çeliğidir. Ülkelerin silahlı kuvvetlerinde kullanılmak üzere onaylanmış yüksek sertlik sergiler. Zırh 46100 çelik levha uygulamalara bağlı olarak değişmesine karşın genellikle yüksek hızda mermileri (high-velocity projectiles (HVPs)) durdurmak için kullanılır. Bu özel sınıf askeri amaçlı zırh çelik levha, askeri platformları keskin nişancı ateşi veya HVP'lerden korumak için yararlıdır. Tehdit seviyesine bağlı olarak, çeşitli kalınlıklarda zırh çelikleri üretilmektedir. Tehdit seviyesinin belirlenmesinde merminin çapı, uzaklığı ve hızı belirleyici parametrelerdir. En iyi koruma seviyesinin sağlanması amacıyla sert bir yüzey elde etmek amaçlı yüksek sıcaklıklarda temperlenir ve soğutulur. Bu malzemenin yüzey sertliği 477 ila 534 BHN arasındadır (<https://www.leecosteel.com>, 2018).

Kaynak teknolojisi, günümüz üretim yöntemlerinin her dalına nüfuz etmiş bir teknolojidir. Uygulama alanlarından bazı örnekler saymak gerekirse, gemiler, demiryolu yolları, bina inşaatları, kazanlar, füze ve roketler, boru hatları, nükleer santraller, uçaklar, otomobiller öncelikle akla gelenlerdir. Yaygın kaynak uygulamaları kaynak teknolojisine iyileştirilmesine ve sürekli geliştirilmesine neden olmaktadır (Khanna, 2006). Kaynak işlem parametreleri ve elde edilen kaynak geometrisi arasındaki ilişkinin araştırmaları 1900'lü yılların ortalarında başlamış ve regresyon analizi ilk olarak Lee ve Raveendra tarafından uygulanmıştır (Lee ve Um, 2000, Raveendra ve Parmar, 1987). Tewari vd. kaynak akımı, voltaj, kaynak hızı ve ısı giriş oranı parametrelerine bağlı olarak penetrasyon derinliği üzerine çalışma yapmışlardır. Kaynak hızındaki artış ve sabit ark voltajı ve akım muhafaza edildiğinde penetrasyon derinliği optimum hıza ulaşana kadar maksimum olmakta sonrasında negatif etki yapmaktadır (Tewari vd., 2010). Gaz altı kaynağında kaynak parametreleri ve kaynak kalitesi arasında matematiksel bir model kurulabilmektedir (Doherty vd., 1978). Chandel (1988), kurulan matematiksel modeli deneysel olarak uygulamış ve başarılı sonuçlar almıştır. Günümüze kadar kaynak parametrelerinin etkisi birçok çalışmaya konu olmuş ve kaynak uygulamalarında yaygın olarak faydalanılmıştır.

Endüstride süreç gelişimi araştırmalarında yapılan deneyleri tasarlamak için, en çok bilgiyi en kısa sürede, en az maliyet ve işgücüyle elde eden çeşitli yöntemler geliştirilmiştir. Deney tasarımı için klasik sayılabilecek bazı yöntemlerin zorlukları, bu konuda yeni çalışmaların yapılmasına neden olmuştur (Şirvancı, 1997).

Kaynak işlemleri esnasında uygulanan parametreler kaynak boncuk geometrisini ve mekanik özellikleri önemli ölçüde etkilemektedir. Kaynak akımı, kaynak gerilimi, kaynak hızı, koruyucu gaz cinsi, gaz akış miktarı, ark uzunluğu, kaynak kutbu ve birleştirme dizaynı gibi gaz altı kaynağında kullanılan kaynak parametreleri kaynak boncuk geometrisini önemli şekilde etkilediği bilinmektedir (Kim vd., 2003). Mühendislik deneylerinde tasarımın amacı yalnızca ele alınan değişkenlerin üretim üzerine etkisini incelemek değil, aynı zamanda kendi aralarında etkileşimlerinin de etkisini incelemektir. Özellikle istatistiksel temelli deney tasarım teknikleri mühendislik dünyasında üretim süreç performansını iyileştirmek için oldukça yararlıdır. Deney tasarımı kullanılarak süreç değişkenlerinin sürecin performansına en fazla etkisi olan alt kümesine karar verilebilir. Deney tasarımının kullanılması daha kolay üretim, daha iyi performans, daha güvenilir ve daha kısa sürede tasarlama, geliştirme ve üretme avantajlarını sunar. İki ya da daha fazla faktörün ele alındığı problemlerde faktöriyel deney tasarımı güçlü bir teknik olarak karşımıza çıkar. Bir faktöriyel deneyde her tekrar tamamlandığında tüm faktörlerin tüm seviyelerine ilişkin olası kombinasyonların tamamı incelenir. Bir faktörün etkisi, faktör seviyesindeki değişimin yanıtta ürettiği değişim olarak tanımlanır. Buna ana etki denir. Faktöriyel deneyler değişkenler arasındaki etkileşimi tespit etmenin tek yoludur (Montgomery vd., 2012).

Bu araştırmanın amacı, farklı mekanik özelliklere sahip malzemelerin kaynağında etkili parametrelerin değişim gösterebileceğinden hareketle MIL-A 46100 zırh çeliklerinde yaygın olarak kullanılan MIG (Metal Inert Gas) kaynağına etkili parametrelerin tespit edilmesi ve yorumlanmasıdır. Bu amaçla yapılan kaynaklama işlemi

sonucunda MIL-A 46100 çeliklerinin darbe dayanımı ele alınmıştır. Bu çalışmada, darbe dayanımı değerinin en büyüklenmesinde etkili olabilecek değişkenler belirlenmiş, ardından yapılan tam faktöriyel deney tasarımı planına uygun olarak dört faktör ve ikişer düzey kullanılarak üç denemeli olarak 16*3 deney olacak şekilde deneyler gerçekleştirilmiştir. Sonuçlar Minitab 18.0 programında analiz edilmiş ve elde edilen sonuçlar literatürle karşılaştırılmıştır.

Deneyel Çalışma

Kullanılan malzeme ve Özellikleri

Deneylerde kimyasal bileşimi tedarikçisi tarafından tespit edilmiş Tablo 1'de verilen, MIL-A 46100 zırh çeliği esas metal (iş parçası) olarak deney numunesi olarak hazırlanmıştır.

Tablo 1: MIL-A 46100 zırh çeliğine ait kimyasal bileşim

Kalite	Standart	Kimyasal Bileşim (% Ağırlık)						
		C	Mn	P	Si	Ni	Al	Cu
MIL-A 46100	MIL-STD-46100D	0.32	0.7	0.006	0.27	0.35	0.09	0.03

Deneylerde kaynak teli değişken olarak kullanılmıştır. Magmaweld marka paslanmaz çelik 307SI ve sert dolgu uygulamalarında kullanılan FCH330 kodlu iki farklı bileşime sahip kaynak teli seçilmiştir. Seçim yapılırken endüstriyel uygulamalarda zırh çeliklerinin kaynağında kullanılan teller tercih edilmiştir.

SI307 Kaynak teli farklı çeliklerin, kaynak kabiliyeti düşük çeliklerin, zırh çeliklerin, yüksek Mn' li çelik döküm parçaların, ray ve makasların kaynaklarında kullanılan östenitik paslanmaz çelik gazaltı (MIG/MAG) kaynak telidir. FCH330 Kaynak teli Özellikle orta derecede darbe ve metal metale aşınmaya maruz parçaların sert dolgu kaynaklarında kullanım için geliştirilmiş gaz korumalı sert dolgu özlü teldir. Kaynak metalinin tokluğu ve çatlak direnci yüksek olduğu için tampon paso uygulamalarında da kullanılabilir. Tellerin kimyasal bileşimi Tablo 2'de verilmiştir (<http://www.oerlikon.com.tr/fch330>, <http://www.oerlikon.com.tr/mi 307>, 2108).

Tablo 2: Kullanılan tel cinsi ve kimyasal Analizi (<http://www.oerlikon.com.tr/fch330>, <http://www.oerlikon.com.tr/mi 307>, 2108)

SI307 Kaynak Telinin Tipik Kimyasal Analizi (%)				
C	Si	Mn	Cr	Ni
< 0.20	0.65 - 1.00	4.50 - 7.50	17.00 - 20.00	7.00 - 10.00
FCH330 Kaynak Telinin Tipik Kimyasal Analizi (%)				
0.14	0.40	1.10	1.25	-

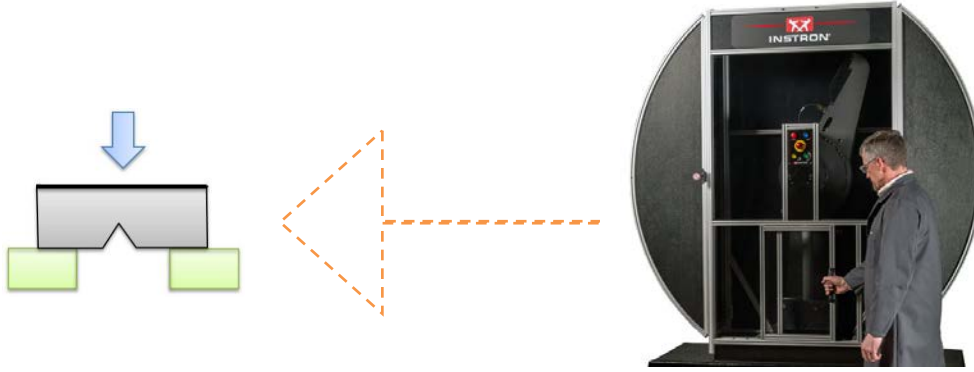
Kaynak işlemleri öncesi MIL A 46100 malzemesinden hazırlanan plakalar, çarpılma olmaması ve kaynak dikişinin daha sağlıklı olması amacıyla Şekil 1'deki gibi sabitlenerek kaynağa hazır hale getirilmiştir.



Şekil 1. Kaynak işlemi öncesi sabitlenmiş MIL A 46100 plakaları

Çentik Darbe Testi

Kaynağa hazır hale getirilen MIL A 46100 zırh çeliği plakaları; 1,20 mm çapında 307Si ve 1,60 mm çaplı FCH330 elektrot kullanılarak, %97 Argon + %3 CO₂ karışımli koruyucu gaz altında, V ve X kaynak ağız geometrisinde, 2 farklı kaynak voltajı (25 ve 30 V) ve iki farklı tel sürme hızında (6,5 ve 10 m/dak) 2 pasolu olarak birleştirilmiştir. Kaynaklama işlemi Miller marka XMS 44 modeli MİG kaynak cihazı ile gerçekleştirilmiştir. Elde edilen kaynaklı plakalardan, ASTM E23 ve A370 standardına uygun 10x10 mm boyutlarında Charpy numuneleri hazırlanmıştır. Deney cihazı ve numunelerin sembolik gösterimi Şekil 2’de gösterilmiştir.



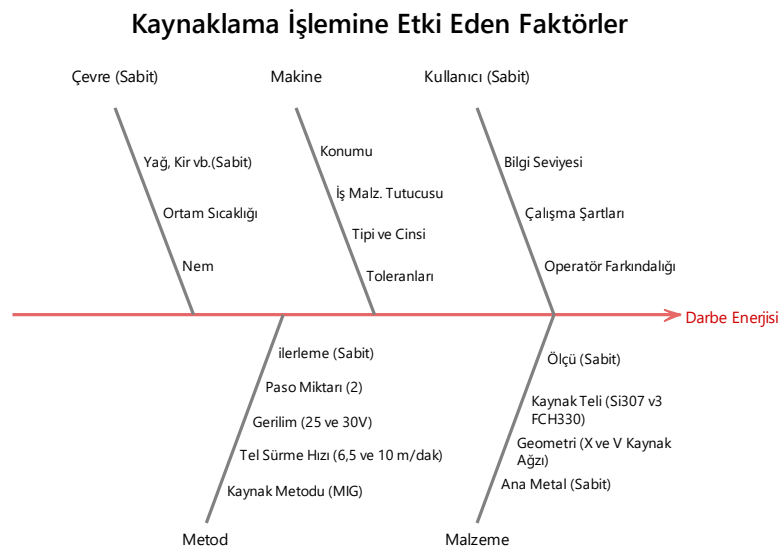
Şekil 2. Charpy deney cihazı ve numunelerin yerleşim gösterimi

Kaynak parametrelerinin seçimi ve seviyeleri

Kaynaklama işleminde kullanılan faktörler ve seviyeleri kullanıcı tecrübesi ile belirlenmiş ve Tablo 3’te belirtilmiştir.

Balık kılçığı diyagramı deneylerin tasarımında hazırlanan ilk çıktılarından biridir. Belirlenen faktörlerin birbirleriyle olan ilişkilerinin net olarak görülebilmesi ve sınıflandırılabilmesi için bir balık kılçığı çizelgesi oluşturulabilir (Şirvancı, 1997). Bu diyagram ürün veya işlem kalitesini temsil eden ve ölçülecek değere etki edecek olan tüm faktörleri belirtir (Savaşkan vd., 2004). Balık kılçığı diyagramı yardımıyla deneyler sırasında değişken ve sabit olarak alınacak faktörlere karar verilmiştir. Şekil 3’te gösterildiği gibi kaynaklama işleminde darbe tokluğuna etki eden faktörler dört ana başlıkta (Malzeme, Çevre, Metod, Makina) toplanmıştır.

Kontrol edilemeyen ve zaruri olarak sabit alınması gereken faktörler haricinde değişken parametrelerin değerleri tam faktöriyel deney tasarımının uygulama mantığına uygun olarak alt ve üst seviyeler şeklinde belirlenmiştir.



Şekil 3. Kaynaklama işleminde darbe enerjisine etki eden faktörlerin balık kılçığı diyagramı ile değerlendirilmesi

Tablo 3: Faktörler ve Alt-Üst Seviyeleri

Faktör	Birim	Değişken	Alt Seviye	Üst Seviye
Gerilim	V	A	25	30
Tel Sürme Hızı	m/dak	B	6,5	10
Tel Cinsi	Text	C	Si307	FCH330
Kaynak Ağzı	Text	D	X	V

Deney Tasarımı

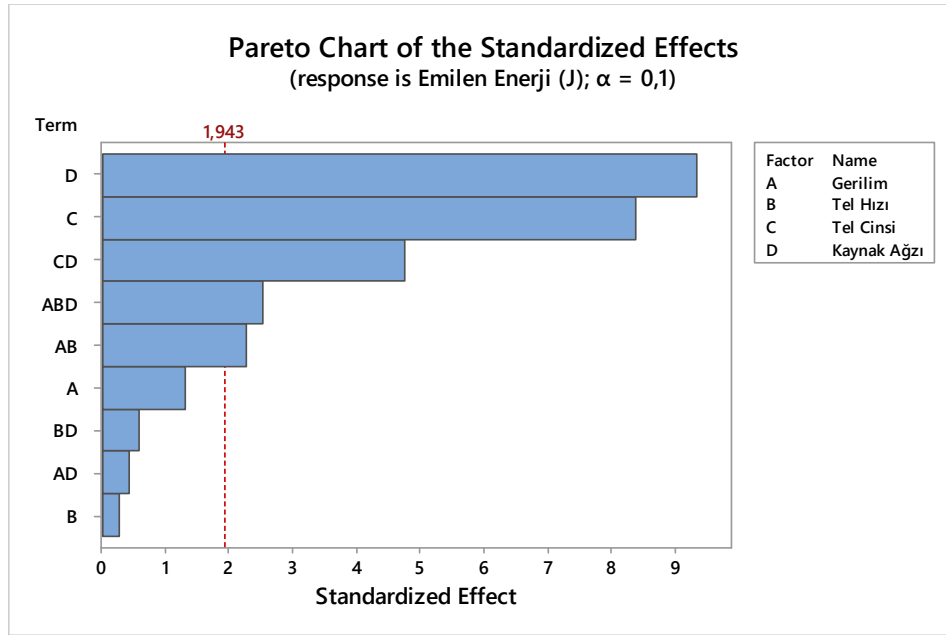
Kaynaklı parçaların çalışacakları ortama uygun olarak kaynaklanması amacıyla darbe tokluğunun optimize edilmesine, etkili parametrelerin tespit edilmesine ve süreç tasarımına ihtiyaç vardır. Kaynak işleminde etkili olan 4 adet faktör (Tablo 4) seçilerek oluşturulan 3 tekrarlı deney tasarım kombinasyonu MINITAB 18.0 paket programı yardımıyla ve ekranda gerekli parametre sayısı ve alt-üst sınır değerleri, tekrar sayısı belirtildikten sonra otomatik olarak elde edilmiştir. Elde edilen deney planı (tekrarsız temsili olarak) Tablo 4'te sunulmuştur. Bu deney kombinasyonuna göre toplamda 48 adet ($2^k=2^4=16$ adet deney kombinasyonu ve 3 tekrarlı) deney gerçekleştirilmiştir. Bu amaçla bu çalışmada; kaynak gerilimi, tel sürme hızı, kaynak teli cinsi ve kaynak ağız geometrisi kullanılacak parametreler olarak belirlenmiştir.

Tablo 4: 2^k tam faktöriyel deney tasarımı

Deney Sayısı	Faktörler ve Seviyeleri			
	A	B	C	D
1	25 V	6,5	307Si	X
2	30 V	6,5	307Si	X
3	25 V	10	307Si	X
4	30 V	10	307Si	X
5	25 V	6,5	FCH 330	X
6	30 V	6,5	FCH 330	X
7	25 V	10	FCH 330	X
8	30 V	10	FCH 330	X
9	25 V	6,5	307Si	V
10	30 V	6,5	307Si	V
11	25 V	10	307Si	V
12	30 V	10	307Si	V
13	25 V	6,5	FCH 330	V
14	30 V	6,5	FCH 330	V
15	25 V	10	FCH 330	V
16	30 V	10	FCH 330	V

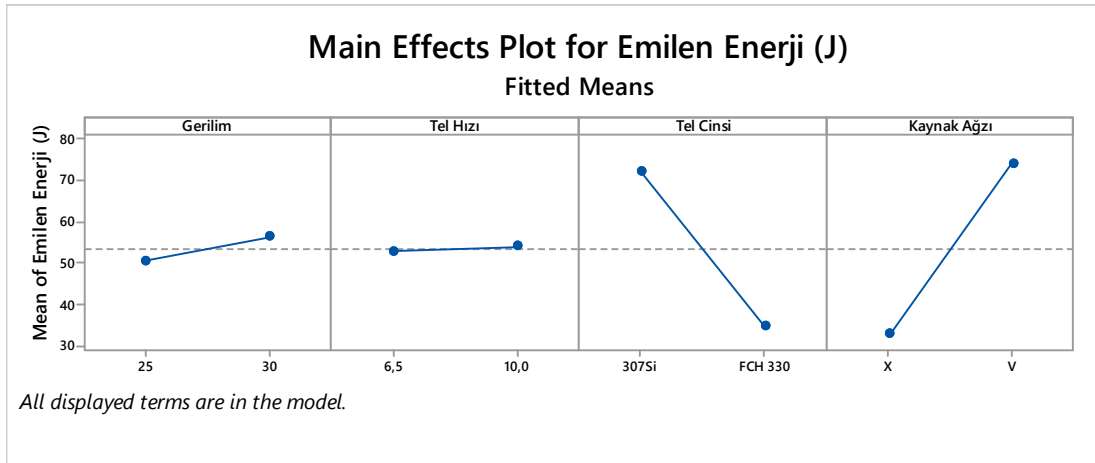
Deney Sonuçlarının Analizi

Deneyler sonucunda tespit edilen emilen enerji (J) değerlerine göre Minitab-18 programı kullanılarak gerçekleştirilen analiz sonucunda; $\alpha=0,10$ anlamlılık (güven) düzeyinde pareto grafiği oluşturulmuştur. Ana faktörler ve ikili/üçlü etkileşimler için oluşturulan pareto grafiği (Şekil 4) analizinde 0,10 anlamlılık düzeyindeki eşik değer olan 1,943 çizgisini geçen faktörler emilen enerji değerini en çok etkileyen faktörlerdir. Grafikten de görüleceği gibi kaynak ağzı ana faktörü en etkili faktör iken ikinci öneme sahip faktör tel cinsi ana faktörüdür. Daha sonra etki seviyesine göre; tel cinsi-kaynak ağzı ikili etkileşimi, gerilim-tel hızı-kaynak ağzı üçlü etkileşimi, gerilim-tel hızı ikili etkileşimi sıralanmaktadır. Gerilim değerinin tek başına anlamlı bir etkisi bulunmamasına rağmen, tel hızı ve kaynak ağzı ile birlikte oluşturduğu üçlü etkileşimin, ayrıca tel hızı ile oluşturduğu ikili etkileşimin emilen enerji üzerinde etkisi bulunmaktadır. Kaynak ağzı ve tel cinsi ikili etkileşiminin tel hızı ve gerilim faktörlerinden daha etkili olması tel cinsine göre kaynak ağzı doğru seçildiğinde kaynaklı bölgenin alan veriminin artmasına bağlanabilir. Kaynak hızı ve ark gerilimi penetrasyon derinliğinde etkili olmakta ve daha verimli bir kaynak alanının oluşturulmasında diğer parametrelere zemin oluşturmaktadır (Tewari vd., 2010, ve Yıldız vd., 2003).



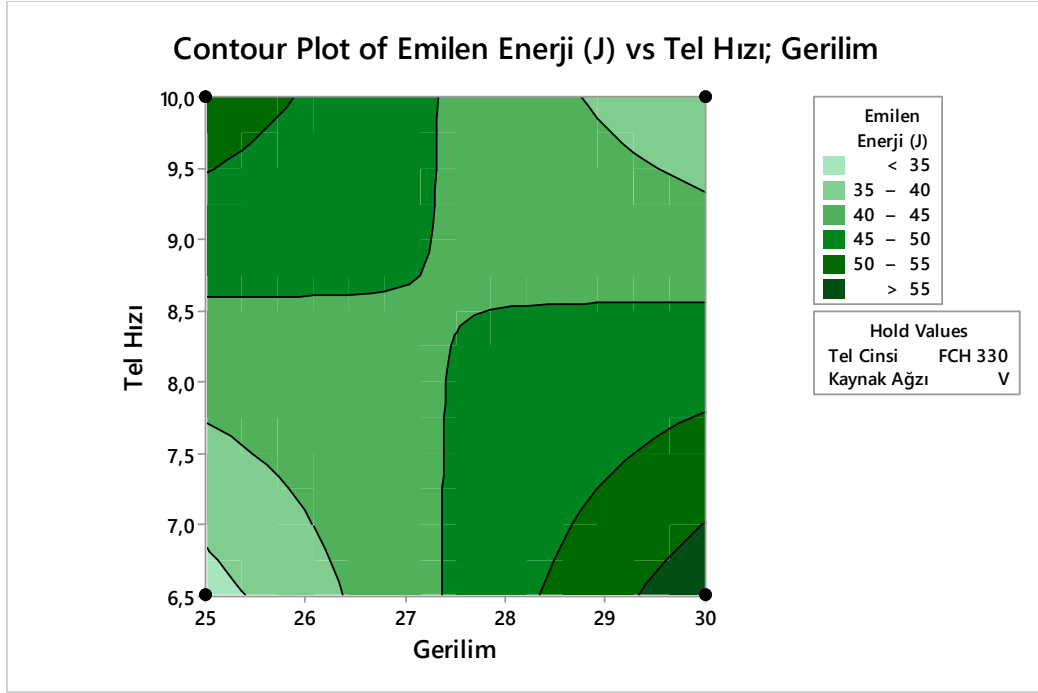
Şekil 4. Faktör etkilerini gösteren pareto grafiği

Ana faktörlerin yanıt (emilen enerji) üzerindeki etkilerinin grafikleri aşağıda verilmiştir. Gerilim ve tel hızı faktörlerinin etkisi (çizgiğinin eğimi sıfıra çok yakın) oldukça düşüktür. Özellikle tel hızının artırılması ile emilen enerji neredeyse hiç değişmemektedir. Diğer iki ana faktördeki değişim emilen enerji üzerinde etkilidir. Tel cinsinin 307Si çeşidinden FCH 330 modeline değiştirilmesiyle emilen enerji miktarında düşüş, kaynak ağzının X tipinden V tipine değiştirilmesiyle ise emilen enerji miktarında artış elde edilmektedir (Şekil 5). Tel cinsinin etkili olması ana metal ile uyumlu ve östenitik olması ile açıklanabilir (Tusek vd., 2001 ve Kılınçer vd., 2013). Kaynak hızı penetrasyonu azaltmakta ancak ark geriliminin artışı penetrasyonu artırarak darbe tokluğuna olumlu katkı yapmaktadır (Tewari vd., 2010, ve Yıldız vd., 2003).

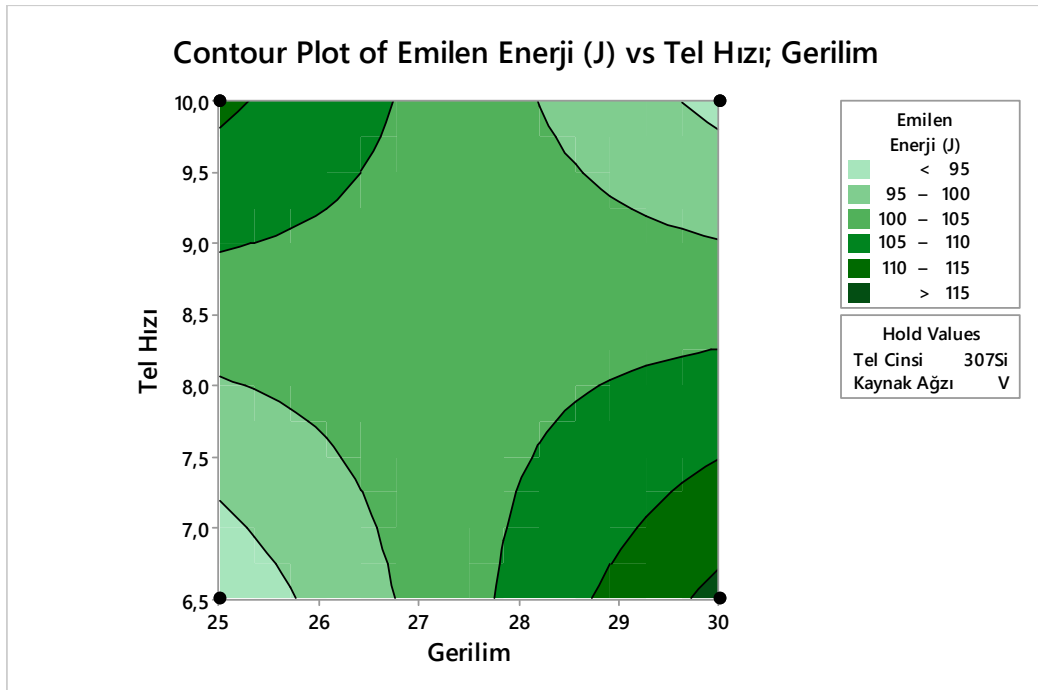


Şekil 5. Ana faktörler etki grafikleri

Tel hızı-gerilim etkileşiminin aynı kaynak ağzı (V), farklı tel cinsleri kullanılması durumunda emilen enerji üzerindeki etkilerinin eş yükselti eğrileri aşağıda verilmiştir. Yüksek gerilim değerinde tel hızının en düşük seviyede tutulması ile emilen enerji değeri en yüksek değerine ulaşmaktadır. Eğer yüksek tel hızı isteniyorsa emilen enerjinin yüksek olması için bu sefer de gerilim değeri en düşük seviyede tutulmalıdır. Yani tel hızı ile gerilim arasında ters orantı olduğu söylenebilir. Ancak her iki kontur grafiğinin birlikte yorumlanması sonucunda; en yüksek emilen enerji değerinin yüksek gerilim, düşük tel hızı, V kaynak ağzı şeklinde ve 307Si kaynak teli ile elde edilebileceği görülmektedir. Gerçekleştirilecek optimizasyon (en iyileme) ile de en iyi faktör değerlerinin araştırılması yapılarak kontur grafiklerinden elde edilen sonucun sağlanması yapılacaktır (Şekil 6,7).



Şekil 6. Tel hızı-gerilim ikili etkileşiminin eş yükselti eğrileri (V kaynak ağzı ve FCH 330 teli)



Şekil 7. Tel hızı-gerilim ikili etkileşiminin eş yükselti eğrileri (V kaynak ağzı ve 307Si teli)

Optimizasyon

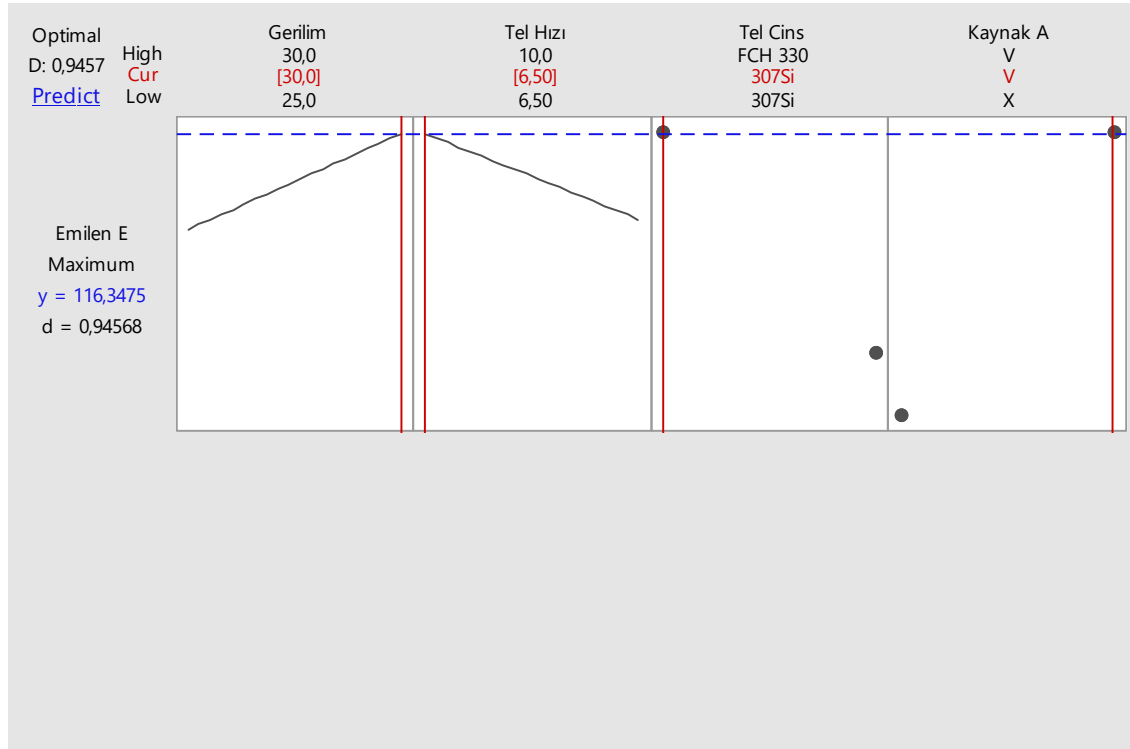
Faktörlerin alt ve üst seviyeleri arasındaki hareketler yanıt üzerinde farklı sonuçlar ortaya çıkarabilmektedir. Çalışma kapsamında yanıtın (emilen enerji) arzu edilen değeri en iyileyecek faktör değerlerini belirlemek amacıyla en iyileme (optimizasyon) gerçekleştirilmiştir. Minitab programındaki response optimizer (yanıt en iyileyici) aracı memnuniyet fonksiyonu yaklaşımı kullanılmıştır.

Çok amaçlı en iyileme yönteminde; en iyilenecek her bir yanıt için tekil memnuniyet fonksiyonu (d) ve tüm yanıtları kapsayacak şekilde birleşik memnuniyet fonksiyonu (D) seviyesinin, faktörlerin hangi kombinasyonunda en iyi değerlere ulaşabileceği araştırılmaktadır. Tekil memnuniyet fonksiyonu (d) faktörlerin tekil olarak ulaşabileceği optimum noktayı değerlendirirken, tüm sistemin memnuniyet fonksiyonu (D) elde edilen faktör değerleri ile sonuca ne kadar yaklaşılabildiğini göstermektedir. Memnuniyet seviyesi 0 ile 1

arasında değer almaktadır. 1 değeri ideal durumu gösterirken, 0 değeri bir veya daha çok değer kabul edilebilir limitler dışına çıktığını gösterir. Yapılan analizde birleşik memnuniyet fonksiyonu $D=0,94568$ olarak elde edildiği için, belirlenen en iyi faktör değerleri ile (gerilim 28 V, tel hızı 8,5 m/dk., tel cinsi 307Si ve kaynak ağzı şekli V) ideal duruma $1-0,94568=0,05432$ birimlik bir sapma ile ulaşılabildiği tespit edilmiştir. Burada tek bir yanıt olduğu için sistemin birleşik memnuniyet fonksiyonu (D) ile yanıtın tekil memnuniyet fonksiyonunun (d) aynı değeri aldığı görülmektedir. En iyi faktör değerleri uygulanarak ulaşılabilecek yanıt (y) değeri (emilen enerji) ise 116,35 J olarak bulunmuştur. Faktör seviyelerini gösteren optimizasyon sonuçları aşağıda verilmiştir (Tablo 5 ve Şekil 8).

Tablo 5: Optimizasyon sonucunda elde edilen faktör seviyeleri

Variable	Setting			
Gerilim	30			
Tel Hızı	6,5			
Tel Cinsi	307Si			
Kaynak Ağzı	V			
Response	Fit	SE Fit	95% CI	95% PI
Emilen Enerji (J)	116,35	6,99	(99,25; 133,44)	(88,78; 143,91)



Şekil 8. Optimizasyon Sonuçları

Regresyon ve Varyans Analizi Sonuçları:

Çoklu regresyon analizinde; deneyler sonucunda her bir parametrenin iki düzeyi için elde edilen 16 değer (2^4 tam faktöriyel) kullanılarak geriye doğru çıkarma metodu kullanılmıştır. Regresyon analizinde değişkenler arasındaki ilişkiyi fonksiyonel olarak açıklamak ve bu ilişkiyi bir modelle tanımlayabilmek amaçlanmaktadır.

İlk aşamada bütün ana parametreler, parametrelerin ikili etkileşimleri ve dördünün beraber neden olduğu etkileşim modele katılmış, $\alpha=0,10$ anlamlılık (güven) düzeyinde adım adım gerçekleştirilen analizde her bir faktör için belirlenen p olasılık değerlerine göre; emilen enerji üzerinde en etkili iki parametrenin aynı olasılık değerine sahip ($p=0,000<0,1$) tel cinsi ve kaynak ağzı faktörleri olduğu tespit edilmiştir. Bu faktörlerden sonra en önemli faktör tel cinsi-kaynak ağzı ($p=0,003<0,1$) ikili etkileşimidir. Analizde en düşük öneme sahip faktör tel hızı ($p=0,788>0,1$) faktörü oldu görülmektedir. Başlangıçta yeterli seviyede serbestlik derecesi elde edebilmek için analiz tarafından; gerilim-tel hızı-tel cinsi üçlü etkileşimi, gerilim-tel cinsi-kaynak ağzı üçlü

etkileşimi, tel hızı-tel cinsi-kaynak ağzı üçlü etkileşimi ve gerilim-tel hızı-tel cinsi-kaynak ağzı dörtlü etkileşimi modele dahil edilmemiştir. Faktörlerin ve etkileşimlerinin etki dereceleri varyans analizi ile incelenecektir. Kurulan modelin emilen enerjideki değişimi açıklama oranı (regresyon belirleme katsayısı) $R^2 = 97\%$ (R^2 (düzeltilmiş) = $92,50\%$) olarak gerçekleşmiştir. Regresyon analizi sonuçları Tablo 6'da sunulmuştur.

Tablo 6: Regresyon analizi sonuçları

	----Step 1----		----Step 2----		----Step 3----	
	Coef	P	Coef	P	Coef	P
Constant	53,43		53,43		53,43	
Gerilim	2,91	0,313	2,91	0,268	2,91	0,235
Tel Hızı	0,62	0,818	0,62	0,801	0,62	0,788
Tel Cinsi	-18,53	0,002	-18,53	0,001	-18,53	0,000
Kaynak Ağzı	20,62	0,001	20,62	0,000	20,62	0,000
Gerilim*Tel Hızı	-5,03	0,117	-5,03	0,084	-5,03	0,063
Gerilim*Tel Cinsi	-1,36	0,618				
Gerilim*Kaynak Ağzı	-0,92	0,735	-0,92	0,711	-0,92	0,692
Tel Hızı*Tel Cinsi	1,37	0,615	1,37	0,582		
Tel Hızı*Kaynak Ağzı	-1,28	0,639	-1,28	0,608	-1,28	0,583
Tel Cinsi*Kaynak Ağzı	-10,48	0,014	-10,48	0,007	-10,48	0,003
Gerilim*Tel Hızı*Kaynak Ağzı	-5,61	0,091	-5,61	0,062	-5,61	0,044
S		10,1051		9,36230		8,83660
R-sq		97,38%		97,19%		97,00%
R-sq(adj)		90,19%		91,58%		92,50%
R-sq(pred)		58,13%		71,25%		78,66%

Varyans analizinde $\alpha=0,10$ anlamlılık düzeyinde sonuç değişkeni üzerine etkisi araştırılan faktörlerin modele katkılarının anlamlılığı araştırılır. Regresyon analizi ile modelde yer aldığı tespit edilen faktörlerin katkı oranları incelendiğinde en yüksek katkı değerinin $43,57\%$ ile kaynak ağzı faktörüne ait olduğu, aynı olasılık değerine sahip tel cinsi faktörünün katkı değerinin ise $35,2\%$ olduğu görülmektedir. Buradan yapılan diğer analiz sonuçlarını da destekleyici şekilde emilen enerji üzerinde en etkili faktörün kaynak ağzı faktörü olduğu sonucuna ulaşılabilir. Tel cinsi faktörü ikinci en önemli faktör olarak görülmektedir. Tel cinsi-kaynak ağzı ikili etkileşiminin katkı düzeyi $11,25\%$ olarak belirlenmiştir. Olasılık değeri yüksek olmasına rağmen ($p=0,365>0,1$) modele dahil edilen tel hızı faktörünün katkı değeri ise $0,04\%$ olarak tespit edilmiştir. Varyans analizi sonuçları Tablo 7' de sunulmuştur.

Tablo 7: Varyans analizi sonuçları

Source	DF	Seq SS	Contribution	Adj SS	Adj MS	F-Value
Model	9	15140,8	97,00%	15140,8	1682,31	21,54
Linear	4	12436,3	79,67%	12436,3	3109,07	39,82
Gerilim	1	135,8	0,87%	135,8	135,84	1,74
Tel Hızı	1	6,2	0,04%	6,2	6,18	0,08
Tel Cinsi	1	5493,8	35,20%	5493,8	5493,77	70,36
Kaynak Ağzı	1	6800,5	43,57%	6800,5	6800,48	87,09
2-Way Interactions	4	2201,6	14,10%	2201,6	550,41	7,05
Gerilim*Tel Hızı	1	405,4	2,60%	405,4	405,42	5,19

Gerilim*Kaynak Ağızı	1	13,5	0,09%	13,5	13,51	0,17
Tel Hızı*Kaynak Ağızı	1	26,3	0,17%	26,3	26,27	0,34
Tel Cinsi*Kaynak Ağızı	1	1756,4	11,25%	1756,4	1756,45	22,49
3-Way Interactions	1	502,9	3,22%	502,9	502,88	6,44
Gerilim*Tel Hızı*Kaynak Ağızı	1	502,9	3,22%	502,9	502,88	6,44
Error	6	468,5	3,00%	468,5	78,09	
Total	15	15609,3	100,00%			

Regresyon eşitliğinin katsayılarının belirlenmesi amacıyla t-testi uygulanmıştır. Modelde yer alan faktörlere ait etkiler burada görülmektedir. Deney tasarımı matrisinde kodlama yöntemi kullanılmadığından regresyon eşitliği katsayıları kodlanmamış olarak elde edilmiştir (Tablo 8).

Tablo 8: T-testi sonuçları ve regresyon eşitliği katsayıları

Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		53,43	2,21	24,19	0,000	
Gerilim	5,83	2,91	2,21	1,32	0,235	1,00
Tel Hızı	1,24	0,62	2,21	0,28	0,788	1,00
Tel Cinsi	-37,06	-18,53	2,21	-8,39	0,000	1,00
Kaynak Ağızı	41,23	20,62	2,21	9,33	0,000	1,00
Gerilim*Tel Hızı	-10,07	-5,03	2,21	-2,28	0,063	1,00
Gerilim*Kaynak Ağızı	-1,84	-0,92	2,21	-0,42	0,692	1,00
Tel Hızı*Kaynak Ağızı	-2,56	-1,28	2,21	-0,58	0,583	1,00
Tel Cinsi*Kaynak Ağızı	-20,96	-10,48	2,21	-4,74	0,003	1,00
Gerilim*Tel Hızı*Kaynak Ağızı	-11,21	-5,61	2,21	-2,54	0,044	1,00

Regresyon eşitliği:

$$\begin{aligned} \text{Emilen Enerji (J)} = & -243 + 10,66 \text{ Gerilim} + 32,0 \text{ Tel Hızı} - 18,53 \text{ Tel Cinsi} - 254 \text{ Kaynak Ağızı} \\ & - 1,151 \text{ Gerilim*Tel Hızı} + 10,20 \text{ Gerilim*Kaynak Ağızı} \\ & + 34,5 \text{ Tel Hızı*Kaynak Ağızı} - 10,48 \text{ Tel Cinsi*Kaynak Ağızı} \\ & - 1,281 \text{ Gerilim*Tel Hızı*Kaynak Ağızı} \end{aligned}$$

Sonuçlar

Bu çalışmada, darbe dayanımı değerinin en büyüklüktesinde etkili olabilecek değişkenler belirlenmiş, ardından yapılan tam faktöriyel deney tasarımı planına uygun olarak dört faktör ve ikişer düzey kullanılarak üç denemeli olarak 16*3 deney olacak şekilde deneyler gerçekleştirilmiştir. Sonuçlar Minitab 18.0 programında analiz edilmiş ve elde edilen sonuçlar literatürle karşılaştırılmıştır. İş parçası olarak kara silah platformlarında yaygın olarak kullanılan MİL-A 46100 zırh çeliği kullanılmıştır.

1. $\alpha=0,10$ güven düzeyinde oluşturulan regresyon modelinin emilen enerji değişikliği açıklama oranı %92,50 olarak bulunmuştur.
2. Emilen enerji üzerinde en etkili parametre **kaynak ağızı** ana faktörüdür. **Tel cinsi** emilen enerji üzerinde ikinci öneme sahip ana faktördür.
3. Emilen enerji üzerinde üçüncü öneme sahip faktör ise **tel cinsi-kaynak ağızı** ikili faktör etkileşimidir.
4. Tel hızı ana faktörünün tek başına emilen enerji üzerinde anlamlı bir etkisi bulunmamasına rağmen gerilim, kaynak ağızı faktörleri ile oluşturduğu üçlü etkileşim ve gerilim ile oluşturduğu ikili etkileşimi emilen enerji üzerinde anlamlı bir etkiye sahiptir. Bu nedenle telin ilerleme hızı bu faktörler ile birlikte değerlendirildiğinde etkin olmaktadır.
5. Diğer faktörlerin; gerilim, tel hızı-kaynak ağızı ikili etkileşimi, gerilim-kaynak ağızı ikili etkileşiminin sonuç değişkeni üzerinde anlamlı etkileri yoktur.

6. Emilen enerji deęerinin en iyi deęerinin elde edilebileceęi řartların tespiti iin optimizasyon gerekleřtirilmiřtir. Tespit edilen faktr seviyeleri ile (gerilim 28 V, tel hızı 8,5 m/dk., tel cinsi 307Si ve kaynak aęzı řekli V) emilen enerji deęeri 116,35 J olarak tespit edilmiřtir.

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MULTIPLE THINKING ACTION, THE PROCESSABLE COLLECTIVE RAW INTELLIGENCE, DIGITAL HUMANIZATION OR COMMAND BY MEANS OF QUANTUM SEMIOTICS APPLE-NETFLIX, AS AN EXAMPLE

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Abstract

Beginning from 2000's the mechanism of quantum was spread out on modern human life. In other words, 'quantum' as a word began to be 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." (<https://www.newscientist.com/article/mg-21128285-900-quantum-minds-why-we-think-like-quarks/>)

The purpose of this article is not to examine these mechanisms of quantum. It is about multiple thinking action and its reflection on processable collective raw mind, just to be an Internet user or a follower, Apple(Netflix)... All of those are related with semiotics.

Key Words: Quantum Thinking, Humanization, Collective Raw Mind, Netflix, Processable, Digital Royalty, Digifl.

Introduction

"... As a matter of fact, this is really amazing phenomenon, the Internet is the way of true universal communication, and the largest democratic environment ever." CLOSER: Julia Roberts

"Yes, certainly, it is the very future." Closer, Clive Owen (<http://www.indirmedenfilmi-zle1.com/daha-yaklas-closer-izle.html>)

The movie "Closer", adapted from the theater play with the same title, which ensured Natalie Portman and Clive Owen Golden Globe best supporting actress and actor awards respectively, shot in 2005, were filmed only five years after the Millennium year and the first signals were given in this movie that the cinema will have deeper meaning than its conventional influence and accelerate in this direction.

NARCOS 1. Season 1. Episode: Each episode starts with this opening crawl: "This television series is inspired by true events. Some of the characters names, businesses, incidents, certain locations and events have been fictionalized for dramatization purposes. Any similarity to the name, character or history of any person is entirely coincidental and unintentional... Magical Realism

is defined as what happens when a highly defined, realistic setting is involved by something too strange to believe. There is a reason magical realism was born in Colombia. ... "In this day and age, American government can wiretap anything. They know where we are, who we talk to, and believe me they do even know with whom we sleep. If you use any cell phone or computer, then you are already in deep waters. However, it wasn't that easy in Colombia in 1989. Above all, internet or cell phones were not introduced at that time. In order to locate satellite telephones, it was necessary to go right over them. Only the richest people had satellite telephones. Large landowners, politicians and drug dealers, heaven knows why, were the richest ones. On the other hand, even if you catch a signal, it was not possible to know who you were wiretapping. That was the reason why the US government developed software that could recognize the voices of the subjects.

As you might have guessed, GPS wasn't available yet. It was necessary to locate the targets after identifying them. So we had to triangulate the signals according to some fixed points on the land. <http://www.diziyo4.net/bolum/narcos-1-sezon-1-bolum-turkce-dub-laj-izle/>)

Gradually, we came to these days of 21st century. In the 21st century, the profile deemed fit for human was consumer. It was necessary that human beings did not think too much so that they would be constant consumers. And not to read, to prevent thinking. If you pay close attention, you will notice that the long sentences that are quite common in the works of the former writers are not encountered in the works of contemporary writers since the

contemporary writers are also perfectly designed for a consumer society. Measure large masses, identify best-sellers, listen to the expectations of the society; and the next morning, and introduce the author and the book on the market. It is now much easier to measure the tendencies of the masses, to get their cultural codes, motifs, borders and thanks to all intelligent systems. Including the refrigerator in the kitchen.

It is about how the data obtained by the use of all digital instruments can be used to hunt large masses by means of the cinema or the Internet in a similar vein. The multiple thinking ability is human-specific. Scientists say that they try to create a quantum computer that can perform multiple thinking action just like humans but without any error. If they still fail to design it ... Following our self-talks; the best way to do this is to jot down everything we think without using auto-censorship, namely to keep a journal; then we can see how variable, fast and diverse it can be. Another interesting aspect of it is that: all these thoughts are diversified through interaction. In other words, the human being must be a 'social animal'. If we were to diversify the definition of communication, then to put it differently, we can say that the communication system that activates the mechanics of thinking is also interaction. Human beings can focus on development only through interaction; If such a sentence is used as a definite judgement, this cannot be considered to be faulty. Here, imagine that this error-prone multiple thinking capability is analyzed along with cultural codes, motifs, features contributed by characters, and similarly think that all these analysis results are abused to reach, hunt, shape, motivate and direct them.

Everyone is measured in the 21st century.

Since the dawn of the humanity, human beings have longed for good human being with qualities such as honor, virtue, morality for the sake of social order. Interestingly, in this biological spacecraft referred to as the World, we might have faced the fact that there might be human species having such foundation to preserve the conditions in which people live, or the people, who would want to base human on values such as honor, virtue, morality after recovery from numerous chaos or anarchy, might have such philosophical foundation. All past philosophers tell us that the order in society can be achieved through honor, virtue and morality. Up until now, all generally accepted religions and belief systems have survived through discourses that convey this. After all, there were so many ... ism or religious views in commensurate with the number of people. What modern science teaches is that man is not born as tabula rasa. A number of physical and psychological features are due to genetic features, however linguistic features are within the scope of this article because of the tendencies that attributable to language-thought relation and passed down, not being even aware of; such as intelligence, faculty, ability...The dictionary with unlimited capacity, which is fundamentally shaped in the family, the first social environment of a person, between the age interval of 0-6.; namely, brain. The brain works through interaction but is autonomous. Therefore, there were so many views as the number of people. The communication language of the brain is interaction. Is it possible to form a brain? Is it possible to take such opinions that are as many as the number of people and also that are open to multiple interpretations, multiple thinking, and to amalgamate them? Into a humanely format that it is supposed to be? So what is the format intended? Maybe in a format that should be after every kind of chaos? What might be the thoughts that need to be reformulated? Is it possible to create an ideal world? Unfortunately, there are no answers to these questions in this article.

Although it is possible to format the brains through interaction, this article covers the researches on how people, measured in digital environment, are hunted by the cinema industry processing raw information sneakily collected from them.

Hollywood, Apple-Netflix, Big Brother, Big (The Biggest) Data

Hollywood movies would generally serve to introduce the new products of the brands, along with American culture, to the market. To exemplify; It was possible to see Ford's newly released car in the movie Rear Window, where Grace Kelly and James Stewart costarred. New technological products were admired in underdeveloped or developing societies, particularly wherein these products were not produced or were not allowed to be produced due to the imposition of the dominant imperialist economy, and would remain really innocent when compared to the current cinema industry.

As of the beginning of the new Millennium, ordinary people were introduced to space intelligence. In 2000-2005, we seem to have faced a new system that is gradually accelerating, sometimes stagnating, but in any case with a purpose. Internet, New Media, Digital Media, Cyber Media... Digital environment, all these names can now be grouped under a single name: Digital ruling or command. In addition to the developments in this digital environment, nowadays a rapid development is experienced in artificial intelligence. It can be observed that it can be static at some times, whereas it can be very rapid at some other times, but in any case in parallel with developments in electronics.

All cultural motifs, codes are measured and analyzed respectively. The view that supports the democracy and the all freedoms on the whole planet seems to be a part this issue. The planet is a huge market and all the data collected through internet users and the data for the cultural codes are analyzed and transferred to the areas of interest after being synthesized. Cinema seems to be more persuasive, influential, and transformative than ever before because

everyone is hunted with cultural codes to set them in motion. These cultural codes are used to recreate the truth if desired. In which sector is the raw information the most intensively used right now? We can say that 'advertising industry' is the answer to this question. The collection and processing of information throughout the world is the most beneficial to the advertising industry. In other words, the idea that is created to change and transform politics in principle is: all technological developments and think tanks are created for world politics and act with the sectors that will serve them. What is evident by now is that capitalist system can take an immediate action to capture the world in commercial sense just to achieve their exact goals. While taking an action, at the same time, it will also achieve its goals with respect to local attitudes and behaviors, and effectively break them into pieces. For example: Just as there are movies where sexuality is banalized and male sexuality is totally disregarded...

Films reviewed: Three Days of the Condor: If there are those who watch this movie and say such things never happen, then they are mistaken. It's an approach, and it embraces the whole world gradually. Each Own Own, Okja: Just before the final scene of the film, (the neck pillow is Burberry, the trench coat with Burberry... It is emphasized that the capitalism will always prevail. Use of such visual Trust is like a soul; it never comes back to the body it leaves. Critique of commercial minds: How everything is evaluated in terms of money... Blue Jay: A new fire extinguishes someone else's fire. New pain relieves old pain. Trap to the bosses The week of Gerald's Game: In such movies, the surrealist scenes that have been impregnated into a mass of women's psychological states can make the movie fail.

What are the benefits of inclusion of measurement information in the film industry: Even the success rate of the fictions in the scripts written according to these measurement results can be distinguished. If too much of aggregate information is included therein, the effect is reduced even if they are true. They can establish an interactive relation with the audience. The next article will mention American movies before and after Measurement. After watching the films, it is possible to see in which films the measurement information is used, what kind of script is written therefor and what is the purpose of the film.

A Look At The Bright Side Of Things, Netflix Design Of The Ideal World Or Required Features Of The Man In Artificial Intelligence Era

What kind of characteristics should 'ideal man' have in the future as of this century? Psychologists / psychiatrists have identified the ways to develop terminal attitudes and behaviors to in a man and this is a tedious way. The early orientation is done in the family. Is it possible to take a short cut through digital environment? Is it possible to format a person -who is alienated or become an individual and tries to be noticed in the digital media; starts to exist therein- in the majority psychology? Movies are always prospective. Therefore, a selection of the new human characteristics already existing or intended to exist in the new order.

1. The human race formerly categorized into different races is now introduced as a part of whole. Yellow, White, Black races are not differentiated. Examples of such films and series. Lost in Space series, the most distinguishable feature of the adopted African girl in the family is to remain calm even in the most exciting environment. The white girl in the house is quite excited. Responsibility is given according to the capabilities.
2. In general, the families are composed of a single dominant race. Either by adoption or marriage between different races (?), Crossbreed children are born (?) and no discriminatory language is used in the family (including body language, of course). In some movies, we see that a never-seen type of human and black/African is compared, which makes us question our current perspective, and the discrimination against them experienced in the past centuries are exercised on them. But this time, it is white people to do it, and black people to give a chance to them. Even in the same film, the father says his daughter that "we cannot humiliate people for being stupid.", but the daughter reminds her father of his own advice when he runs out of patience against a stupid act.

3. In the coming centuries, crossbreed, race, yellow, black, white race, afro, negro, adopted child, or more vulgarly bastard, prostitute, etc. may fall into disuse. 'Natural Selection', 'Survival the Fittest' can be no more valid for people. In some way hopes are instilled for a new world order where weak people are also accepted and they are not humiliated (due to anomaly, sexual preference, living against social rules, religion, language, race etc.)
4. Neither Cinderella is so beautiful, nor are her stepmother and sisters very ugly. Everyone has their own reasons. "They're as good as they can be, says Cinderella. But in any case, it is not so far away from reality to live together with the bad.

Conclusion

Since the dawn of the humanity, man steals information/material from others. In 15th century, Leonardo da Vinci took all his notes, his observations, and his works on science, life and art on (<https://www.cnet.com/news-steve-jobs-writer-aaron-sorkin-says-my-coinscience-is-clear-on-films-accuracy/> "It's a one-off that you get scripts like this.". thanks to a mirror writing style invented by him. In these notes, you can even find recipes about healthy living. (Gelb, Michael, 2004: 355). It was written in a way to be read when looked from a certain angle with a mirror. But stealing someone else's information / idea has never been easier. Steal someone else's information/idea, furnish it data to elevate your own level of living and end increase your life energy. In the meantime, if the exploited person becomes aware of being made a desperate victim, he feels to have one foot in the grave day by day.

The story of the Apple/Mac tributes to a course dating back to Adam and Eve. From semiotic perspective, it is not a mere coincidence that a half-eaten apple is chosen as a logo. The man wondered and learned by biting. It can be deemed as a reference to the view that the first access to information was initiated by biting the forbidden apple. The word refers to the story of a religious existence story that has been made universally known semiotically. From this point of view, while reshaping the world, Apple's involvement with Netflix can be seen as a natural development process.

The main problem is its implementation developing countries like us (which does not produce technology). An environment where people, who has run riot, and has no ethical or legal concerns, run wild seems very frightening. It is also possible that Youtubers collaborate with these companies. Let's make a fictitious assumption: Let's say that you create a new youtuber, it starts with if you this and that, and then you don't fail. Furthermore, since there is a legal gap three, the invented "digiperson" who laid golden legs for their direct benefit and it is easier to reach target audience through his/her words; apart from the notes saved on "victim" user's computer, we see that it is possible for them to go too far with homeworkers. The topics selected from in-house talks... We have already mentioned that they send messages from TV channels even if television is not turned on. Not only being exploited like a dairy cow providing topic and content to TV channels for years, but also we should mention about how these stolen book content and titles are told as good news under the guise of autograph session. Let's assume that he/she cannot file a complaint. Moreover, he/she gives up due to cheaper tricks than the ones in "Three days of the Condor" Fortunately, this is just a fiction... It should not be a distant and unreasonable prediction that commercial concerns or personality problems would be excessively reflected in digital media brokers if the task of an unlimited and unlawful measurement is left to human.

What can be done: In Law, 'Interaction Law' space can be created and the borders of the digital environment can be drawn, and the exploitation of 'digiperson' equipped with smart systems may not be allowed. Difficulty of drawing the boundaries of the digital environment necessitate a solution therefor. An independent R&D can be established for our speeches, our remarks, for preventing to bother a digiperson which is assumed to provide commercial contribution. Because we are exposed to thousands of visual material, behavior, namely actions, in the 21st century. A correct analysis, interpretation and synthesis of all this is essential. This comment will be used to 'convince' and 'recreate the truth'. In other words, to get the audience in the palm of the hand, to motivate the audience, to get desired reactions or to suppress motions will depend on it so that they can achieve their exact goals. We live such an important century. If it is a mechanism that steals the energy of life / the energy reserved for individual, and individual is aware of this, it may be necessary to cope with the problem of helplessness.

Well, is there any other option than wishing for not be exploited by not making good analysis so that one could not be measured in a disproportionate, unlimited, boundless manner. Most people in the 21st century are not even aware of it, and they are not aware that they are measured in all digital environments, or in daily radio programs into which they participate just like in a game. These are innocent participations: For example: every day a topic is chosen for a country-related event, and everyone presents either visual material or information about it. Naturally, it is possible that this information can be used by different sectors in identifying them later. In a digital environment, in this context, it should not be seen as a distant and unreasonable prediction that the life of this "digiperson", who is falsely assumed to lay golden eggs, empoisoned with measurement and his/her family is also bothered. Money is the greatest power in a capitalist system. The discourse of 'Information Age' and 'Knowledge is Power', put in the limelight as of the Millennium, is as follows; We will receive information from you and we will not furnish you with elements to convince you. All these return to us as money. They will be able to abuse all of these procedures to hunt people who long for an ideal world, - where religion, language, race discrimination is not present and gender inequality is solved, and it is succeeded in becoming human- (according to the data they measure) in line with their political goals and objectives.

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MYCORRHIZAL EFFECTS ON NUTRIENT LEACHING IN SEMI-ARID LAND AFFORESTATION OF CENTRAL ANATOLIA

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Abstract: Using mycorrhizae inoculated seedling in semi-arid land afforestation may affect nutrient leaching. Therefore, the objective of this study is to assess the mycorrhizal inoculation on nutrient leaching in experimental afforestation sites established in semi-arid lands of Central Anatolia.

Mycorrhizae inoculated and non-inoculated seedlings of Taurus Cedar (*Cedrus libani* A. Rich), Black Pine (*Pinus nigra* J.F Arnold) and Turkish Oak (*Quercus cerris* L.) seedlings were planted in three sites located in semi-arid regions of Central Anatolia. All three sites were ripped down to about 80 cm depth then plowed for site preparation. Each site then was divided into 9 experimental unites. For each species, one of the experimental units is used to plant 40 seedlings inoculated with arbuscular mycorrhizae + ectomycorrhizae, one of the experimental unit is used to plant 40 seedlings inoculated with arbuscular mycorrhizae and one of the experimental unit is used to plant 40 seedlings without any mycorrhizae inoculation (Control). Ions in soil solutions were collected with resin bags located in periphery of the seedling roots for 3 months (April-June) for the second and third years of the plantation.

In the second growing season, neither in black pine nor in cedar sites the leaching nutrients were not significantly different. However, in oak sites amount of leaching NO_3^- differed significantly ($P\text{-value} = 0.0260$). In the third growing season, amount of leaching Ca^{+2} were significantly different ($P\text{-value} = 0.0453$) among cedar sites.

In conclusion, the data suggested that using mycorrhizae inoculated seedlings in afforestation of these nutrients poor sites may help to increase available nutrient in upper part of soil profile.

NANOTECHNOLOGY APPLIED TO RENEWABLE

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ABSTRACT

Lately, an important application for Nanotechnology is renewable energy. Scientists and engineers have discovered that by using this technology efficiency, cost, size, and weight are improved directly, and the environment and green energy are improved indirectly.

Benefits such as these make the investment of capital in the research and development of nanotechnology a top priority element, such as in the strategic European plan. An important subfield of nanotechnology related to energy is nanofabrication. Nanofabrication is the process of designing and creating devices on the nanoscale. Creating devices smaller than 100 nanometers opens many doors for the development of new ways to capture, store, and transfer energy. The inherent level of control that nanofabrication could give scientists and engineers would be critical in solving many of the problems the world is facing today with the current generation of energy technologies. Another current problem is the cost of nanofabrication.

Keywords: Nanotechnology; renewable energy; photovoltaic; wind power; thermal solar

1. Nanotechnology And Renewable Energy

Nanotechnology operates at such a fundamental level that there is very little of a technological nature that it will not impact. Thus its effects on energy generation, transmission, storage and consumption are numerous and diverse. Some will be incremental and some quite possibly revolutionary.

Nanotechnology helps increase the efficiency of existing forms of energy while opening up completely new ways of exploiting renewable energies. Given its role as a key and cross-sectional technology, nanotechnology has the potential to achieve decisive technological breakthroughs in the energy sector, thus making important contributions to sustainable energy supplies. The relevant innovations apply across the entire value-added chain. Innovative methods will boost efficiency in all subareas: These include tapping energy sources such as crude oil, natural gas and coal as well as renewable energy sources such as geothermal heat, the sun, wind, water, the tides and biomass. There are also solutions for generating (energy transformation), transmitting and storing electricity all the way to electricity consumption. The number of patents issued for renewable-energy technologies has risen sharply over the last decade, according to new research from MIT and the Santa Fe Institute (SFI). The study shows that investments in research and development, as well as in the growth of markets for these products, have helped to spur this dramatic growth in innovation.[1].

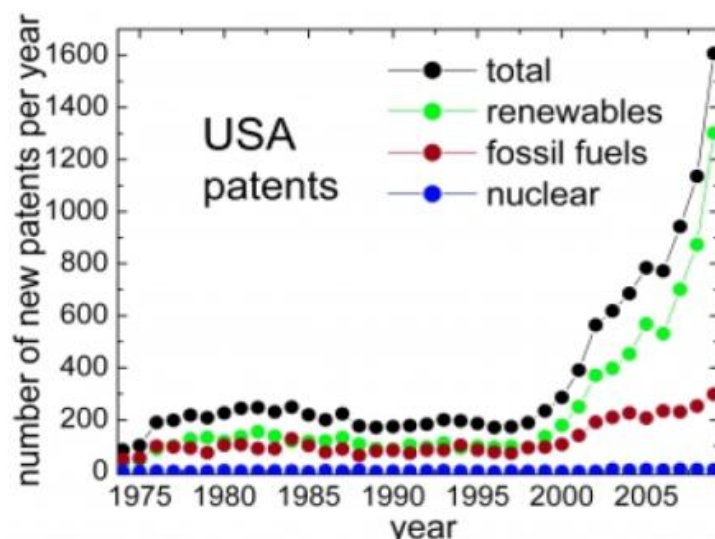


Figure 1. Study found a dramatic increase in the overall number of energy-related patents issued in the U.S., with increase in renewable energy patents far outpacing those in other energy sectors. A similar trend was seen globally.

The inventory is an essential resource for consumers, citizens, policymakers, and others who are interested in learning about how nanotechnology is entering the marketplace. It is meant to be international and expanding.

As of March 10, 2011, the nanotechnology consumer products inventory contained 1317 products or product lines.

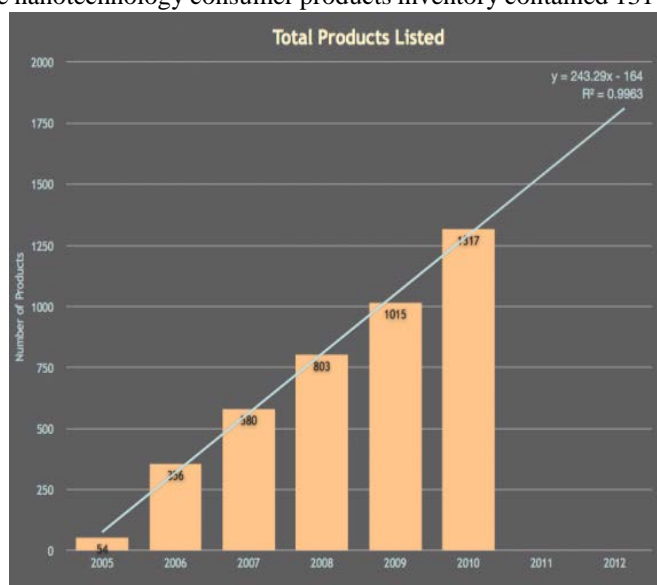


Figure 2. Number of total products listed, by date of inventory update, with regression analysis.[2]

2. Custom Photovoltaic

The fundamental objectives of nanotechnology applied to solar cells are:

- Increase the light absorption rate.
- Increase the efficiency of the photovoltaic effect.
- Decrease the cost of manufacturing.
- Make PV cells adaptable to different scales and localities.

Nanotechnology is already used to provide improved performance coatings for photovoltaic (PV) and solar thermal panels. Hydrophobic and self-cleaning properties combine to create more efficient solar panels, especially during inclement weather. PV covered with nanotechnology coatings are said to stay cleaner for longer to ensure maximum energy efficiency is maintained.

Using nanoparticles in the manufacture of solar cells has the following benefits:

- Reduced manufacturing costs because of using a low temperature process similar to printing instead of the high temperature vacuum deposition process typically used to produce conventional cells made with crystalline semiconductor material.
- Reduced installation costs achieved by producing flexible rolls instead of rigid crystalline panels. Cells made from semiconductor thin films will also have this characteristic.
- Currently available nanotechnology solar cells are not as efficient as traditional ones, however their lower cost offsets this. In the long term, nanotechnology versions should both be lower cost and, using quantum dots, should be able to reach higher efficiency levels than conventional ones.

2.1 Increasing the efficiency of energy production

Nanotechnology could potentially have a great impact on clean energy production. Research is underway to use nanomaterials for purposes including solar cells that are more efficient, practical fuel cells, and environmentally friendly batteries. The most advanced nanotechnology projects related to energy are storage, conversion, manufacturing improvements by reducing materials and process rates, energy saving (by better thermal insulation for example), and enhanced renewable energy sources.

Today's best solar cells have layers of several different semiconductors stacked together to absorb light at different energies but they still only manage to use 40 percent of the Sun's energy. Commercially available solar cells have much lower efficiencies (15-20%). Nanotechnology could help increase the efficiency of light conversion by using nanostructures. Figure 3.

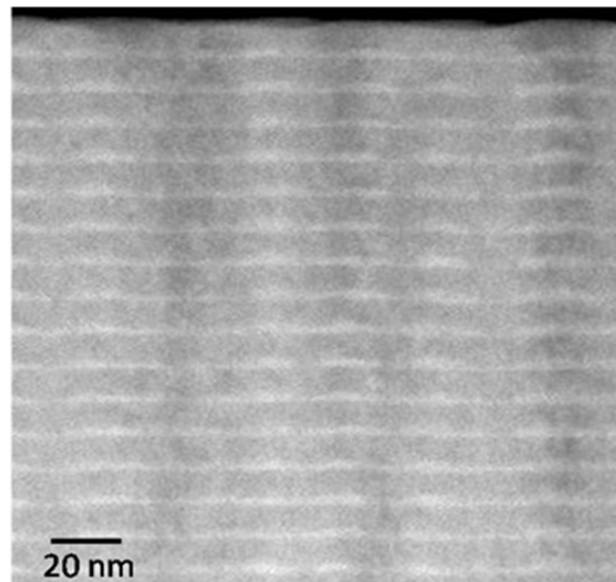


Figure 3. TEM image of self-organized quantum dot superlattice

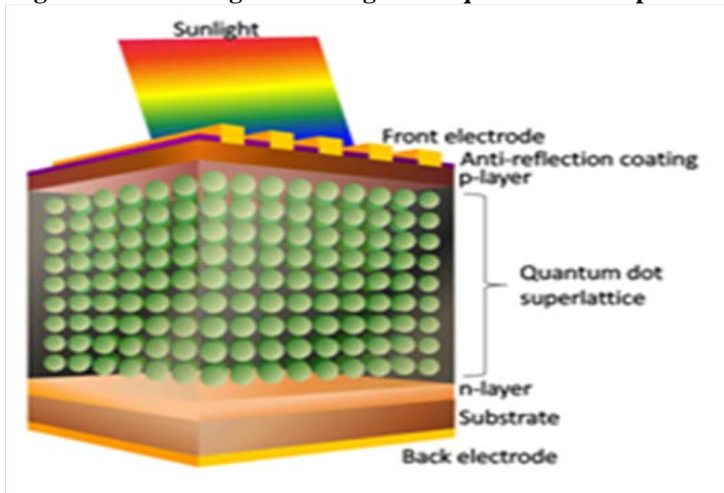


Figure 4. Schematic structure of quantum dot intermediate band solar cell

New semiconductor materials and new quantum nanostructures are produced by crystal growth using molecular beam epitaxy to fabricate high-efficiency next-generation solar cells, such as multi-junction tandem solar cells and intermediate band solar cells, Figure 4 A3-dimensional quantum dot superlattice which consists of multi-stacked layers of self-organized InAs quantum dots is a promising absorber for intermediate band solar cells. This increases the efficiency to 35% compared to 16% of silicon.

2.2 Advances in Solar Panel Nanotechnology

2.2.1 Self-Cleaning Solar Panels

In July 2012, ecoSolyar launched a range of solar panels which use self-cleaning glass - this keeps the panels free of dirt and debris, to ensure that the PV cells receive as much of the incident solar energy as possible. This technique is very effective in helping the conventional cells to perform at peak efficiency.

We will probably see much more of this sort of indirect application of nanotechnology to solar panels in the coming years, before nanotechnology is able to gain a significant market share in the actual PV materials used.

2.2.2 Dye-Enhanced Solar Cells - Mimicking Photosynthesis

In May 2012, Northwestern University researchers developed a new sort of "dye-sensitized" solar cell (part of the second generation of photovoltaic technologies), which uses an organic dye monolayer to help absorb sunlight, much as plants do for photosynthesis.

Dye-sensitized PV cells have been explored before - however, the organic dye used is usually a liquid, which can leak out, drastically shortening the lifetime of the cell. The advance made by the team at Northeastern University is to use a dye which is just as effective at capturing solar energy, but solidifies, preventing it from leaking and giving the cell a viable lifetime.

Their novel solar cell also uses a number of other nanomaterials, like titanium dioxide nanoparticles and cesium tin iodide thin films, as high-performance p-type and n-type semiconductors.

2.3 Connection between Stacked Solar Cells[3]

North Carolina State University researchers have come up with a new technique for improving the connections between stacked solar cells, which should improve the overall efficiency of solar energy devices and reduce the cost of solar energy production.

Stacked solar cells consist of several solar cells that are stacked on top of one another. Stacked cells are currently the most efficient cells on the market, converting up to 45 percent of the solar energy they absorb into electricity. However, to be effective, solar cell designers need to ensure the connecting junctions between these stacked cells do not absorb any of the solar energy and do not siphon off the voltage the cells produce -- effectively wasting that energy as heat.

2.4 Nanowire Solar Cells Raise Efficiency Limit [4]

Scientists from the Nano-Science Center at the Niels Bohr Institut, Denmark and the Ecole Polytechnique Fédérale de Lausanne, Switzerland, have shown that a single nanowire can concentrate the sunlight up to 15 times of the normal sun light intensity. The results are surprising and the potential for developing a new type of highly efficient solar cells is great.

Due to some unique physical light absorption properties of nanowires, the limit of how much energy we can utilize from the sun's rays is higher than previous believed. These results demonstrate the great potential of development of nanowire-based solar cells. During recent years, research groups have studied how to develop and improve the quality of nanowire crystals, which are a cylindrical structure 10,000 times smaller than a human hair. The nanowires are predicted to have great potential in the development not only of solar cells, but also of future quantum computers and other electronic products.

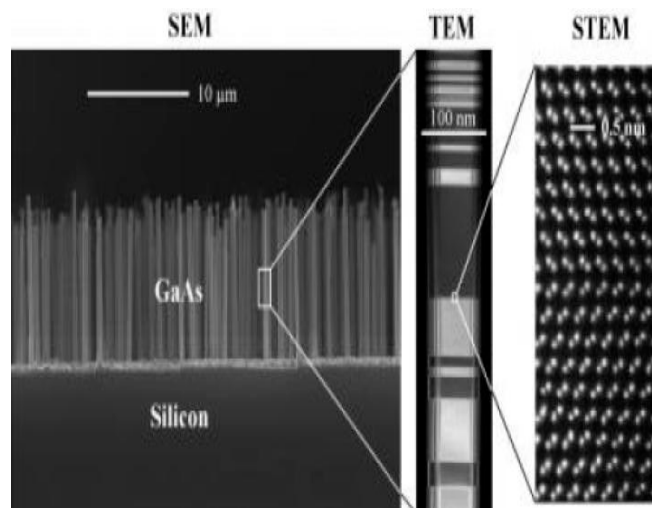


Figure 5. Schematic structure of the nanowires naturally concentrate the sun's rays into a very small area

It turns out that the nanowires naturally concentrate the sun's rays into a very small area. Because the diameter of a nanowire crystal is smaller than the wavelength of the light coming from the sun it can cause resonances in the intensity of light in and around nanowires Figure 5. Thus, the resonances can create concentrated sunlight, where the energy is converted, which can be used to give a higher conversion efficiency of the sun's energy.

2.5 Quantum dots or nanowires

Putting the amorphous quantum dots in an array or merging them into a nanowire are the best assemblies for maximizing the efficiency of silicon nanomaterials to absorb light and transport charge throughout a photovoltaic system according to a study from researchers at North Dakota State University and the University of South Dakota [5].

Amorphous Silicon nanowire facilitates harvesting of solar energy in the form of a photon. In the process of light absorption a pair of mobile charge carriers is created. The energy of their directed motion is then transformed into electricity. Electron and hole charge distributions are often located in different regions of space due to multiple structural defects in amorphous silicon nanowires.

2.6 The crown jewel of nanotechnology [6]

Graphene has extreme conductivity and is completely transparent while being inexpensive and nontoxic. This makes it a perfect candidate material for transparent contact layers for use in solar cells to conduct electricity without reducing the amount of incoming light -- at least in theory. Whether or not this holds true in a real world setting is questionable as there is no such thing as "ideal" graphene -- a free floating, flat honeycomb structure consisting of a single layer of carbon atoms: interactions with adjacent layers can change graphene's properties dramatically. Now the HZB Institute for Silicon Photovoltaics has shown that graphene retains its impressive set of properties when it is coated with a thin silicon film. These findings have paved the way for entirely new possibilities to use in thin-film photovoltaics.

Graphene was deposited onto a glass substrate. The ultrathin layer is but one atomic layer thick (0.3 Angström, or 0.03 nanometers), although charge carriers are able to move about freely within this layer. This property is retained even if the graphene layer is covered with amorphous or polycrystalline silicon.

Their measurements of carrier mobility using the Hall-effect showed that the mobility of charge carriers within the embedded graphene layer is roughly 30 times greater than that of conventional zinc oxide based contact layers. [7] Also graphene can be applied as a substitute for platinum when Dye-sensitized solar cells are thin, flexible, easy to make and very good at turning sunshine into electricity. However, a key ingredient is one of the most expensive metals on the planet: platinum. While only small amounts are needed, at \$1,500 an ounce, the cost of the silvery metal is still significant.

2.7 All-Carbon Solar Cell [8]

The solar cell consists of a photoactive layer, which absorbs sunlight, sandwiched between two electrodes. In a typical thin film solar cell, the electrodes are made of conductive metals and indium tin oxide (ITO). And this is replaced with conventional electrodes with graphene -- sheets of carbon that are one atom thick -and single-walled

carbon nanotubes that are 10,000 times narrower than a human hair.

The active layer made of carbon nanotubes and "buckyballs" -- soccer ball-shaped carbon molecules just one nanometer in diameter. Currently the efficiency is less than 1%.

3. Solar Thermal

We can apply almost the same nanotechnology from the second chapter to this kind of generation energy.

As is well known, for example one of the most important problems is that this type of energy is the heliostats need to clean almost every day because they get dirty. Therefore, it's important to have a self-cleaning system. This isn't an easy thing to do, because you need specific machines, water and other chemical products.

To resolve this problem we can use the lotus-leaf effect using nanotechnology to reproduce what nature does. Self-cleaning surfaces are based on the superhydrophobic effect, which causes water droplets to roll off with ease, carrying away dirt and debris. Figure 6



Figure 6. Schematic structure of the nanowires naturally concentrate the sun's rays into a very small area

Every material has an energy associated with its surface, and when a fluid droplet is in contact with this surface, the energies of the three-phase contact line balance to a minimum, forming a distinct angle of contact with the other surface.

A specific research project for this type of energy is the Thermalcond project, which is a European collaborative project aimed at developing a novel collector containing plastic components with high efficiency, low cost and less weight structures compared to metallic collectors.

These collectors will have an improved design due to the use of plastic materials, high thermal conductive nanoparticles modified with SAM technology, and a flexible absorber coating based on nanometallic oxides. Figure 7.

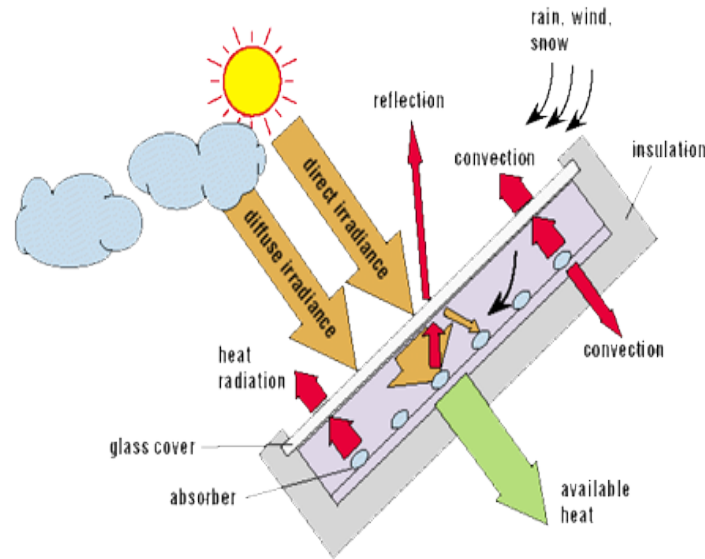


Figure7 collectors will have an improved design due to the use of plastic materials, high thermal conductive nanoparticles

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4 Wind Power

Various nanotechnologies are utilized to improve the efficiency of power-generating wind turbines, including nanoparticle-containing lubricants that reduce the friction generated from the rotation of the turbines, nanocoatings for de-icing and self-cleaning technologies, and advanced nanocomposites that provide lighter and stronger wind blades.

For example the following:

-De-icing coatings

Surface treatment to repel water could prevent ice forming on the blades

- Lotus Plant non-wettable self-cleaning leaves due to nanostructured rough surface with wax crystals.
- Reduced porosity and moisture absorbance.
- Self-cleaning coatings like Pilkington's self-cleaning glass

-Weight saving

- Strength/ weight improvements
- Tensile strength up 40%
- Tensile modulus (elasticity) up 68%
- Flexural strength up 60 %
- Flexural modulus (bending) up 126%
- Distortion temperature up from 65% to 152%
- Improved flame retardant properties
- 20% weight saving over conventional materials

-Lubricants

- Nanolubricant for improved wear resistance at all temperatures and pressures

-New Sealants

- Novel sealants based on nanocomposite elastomers

-Hydraulic systems

- Brake systems, pitch & yaw controls
- On-board cranes, locking systems.

- Pumps, drives, oil tanks, filters, pressure valves and control systems

-Power pack improvements

- Carbon nanotubes as fuel storage
- Control systems are increasingly important
- SCADA for systems required by grid operators

-Condition monitor

- Remote control and full monitoring
- Mini generators and energy storage for start-up and nil wind.
-

5 Conclusions

- Clean power generation from renewable energy is seen as the solution to the climate impacts of the energy sector. However, there are barriers yet to be overcome to scale up energy production through renewables.
- In the United States, only 9 percent of total energy consumed came from renewable sources in 2011 according to the Institute for Energy Research. In Germany, renewables only account for 12 percent.
- The main challenges now for the application of nanomaterials in the energy sector are the improvement of efficiency, reliability, safety and lifetime, as well as the reduction of costs.
- To date, universities, research institutes and even governments are paying attention to the synergy that could be established between nanotechnology and renewable energy.
- Thanks to better nanomaterials, PV solar cells are increasing their efficiency while reducing their manufacturing and electricity production costs at an unprecedented rate. Hydrogen production, storage and transformation into electricity in fuel cells are being benefited from more efficient catalysts for water splitting, better nanostructured materials for higher hydrogen adsorption capacity and cheaper, simpler fuel cells.

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NITROREDUCTASES FROM THERMOPHILIC *BACILLUS* SPECIES

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Abstract: Nitroreductases (NTR) are members of the NAD(P)H/FMN oxidoreductase that exists widely in bacteria. NTRs have raised a great interest due to their potential in biomedicine, especially in prodrug activation for chemotherapeutic cancer treatments, in bioremediation and enzyme-based biosensors for nitro-sensitive compounds. Thermophilic *Bacillus* species isolated from hot water springs in Turkey were identified by 16S rRNA gene sequence analysis. The previously identified species, *Bacillus paralicheniformis* (5NK) and *Bacillus paralicheniformis* (FMB2) with sequence similarity of 97% and 99.65, respectively, were used. They were all found to possess the putative NADPH nitroreductase genes. Genomic DNAs for isolation of nitroreductase genes were isolated by conventional phenol-chloroform extraction method. The nitroreductase genes from thermophilic *Bacillus* species were amplified by PCR, using the designed three primer pairs. The corresponding DNA fragments were fractionated by agarose gel electrophoresis and PCR products were purified and concentrated for cloning and DNA sequencing.

Keywords: Nitroreductases, Thermophilic *Bacillus*, PCR

Introduction

Most nitroaromatic compounds are toxic for living organisms, which are released to the environment during manufacturing and handling, through filtration and losses of the storage tanks and during transport and intensive military activities, especially TNT and other explosives. There have been human health risk with regard to nitrosubstituted compounds due to the metabolites causing genotoxic and mutagenic effects and the generation of reactive nitrogen oxide species, which readily react with biological macromolecules (Cortial et al. 2010).

It has been found that various microorganisms have developed reductive pathways to degrade or transform these compounds. Bacterial nitroreductases including *Bacillus* species are flavoenzymes that catalyze the NAD(P)H-dependent reduction of the nitro groups on nitroaromatic and nitroheterocyclic compounds. Therefore, the nitroreductases are used for several biotechnological applications for bioremediation, as biosensors and for clinical uses (Gwenin et al. 2015, Roldán et al. 2008, Chaignon et al. 2006).

Particularly, prodrug activation gene therapy is a promising approach to cancer treatment, whereby prodrug-activating enzymes are expressed in tumour cells. Following administration of a non-toxic prodrug, the nitroreductase enzyme expressed in tumour cells converts it to cytotoxic metabolites which directly kill the cancer cells. The enzyme nitroreductase, isolated from *Escherichia coli* B, converts CB1954 ((5-aziridin-1-yl)-2,4-dinitro-benzamide) into a potent DNA-crosslinking cytotoxic agent that kills tumor cells (Drabek et al. 1997).

The use of any prodrug activating enzyme is, however, limited by factors such as its stability of which is needed when for example conjugated to an antibody. From this point of view, enzymes from thermophilic organisms have considerable potential because they are resistant and remain fully active under denatured conditions compared to most enzymes from mesophilics. On the other hand, thermophilic stable enzymes still need to have sufficient catalytic activity at 37 °C if they are utilised in prodrug therapy (Emptage 2009).

Turkey has lots of different ecological areas, which possesses a broad microbial diversity. Turkey is well known for its geothermal activity and there are so many thermal springs all over the country. Therefore, there should be a great deal of opportunities for newly isolated microorganisms from extreme environments, including thermophilic ones with numerous biotechnological applications. For many decades, the *Bacillaceae* family members have been good sources in biotechnological processes concerning whole cells or enzymes. In Turkey, the isolated and identified thermophilic members of the *Bacillaceae* family include *Anoxybacillus*, *Geobacillus*, *Bacillus*, *Brevibacillus*, *Aeribacillus*. Members of *Bacillus* genus are well known to be widespread all over the world in various extreme and geographical areas including hot springs of Turkey (Güven et al 2018).

In the present study, we report on the identification and characterization of nitroreductase genes from the Gram-positive thermophilic *Bacillus* species isolated from hot springs in Turkey.

Material And Methods

Bacteria, Plasmids and Media

Bacillus paralicheniformis 5NK, *Bacillus paralicheniformis* FMB2 and *E. coli* DH5 α strains used for transferring the nitroreductase gene in to pET28a + vector.

Bacterial strains and *E. coli* DH5 α maintained at -20 ° C in medium containing 30% v / v glycerol. Bacterial strains were produced in Luria Bertani Broth (LB) medium (Bacto Trypton 10 g / L, Bacto-Maya Extract 5 g / L, NaCl 10 g / L, pH 7.0), 40-55 ° C and aerobic conditions. *E. coli* DH5 α strains were produced at 37 ° and aerobic conditions in LB broth. 1.5% w / v agar was added to breeding media for solid medium.

Isolation of chromosomal DNA from *Bacillus* strains

Bacteria were produced in aerobic conditions in LB medium and chromosomal DNA was isolated from the produced bacteria using the Thermo Fischer Scientific DNA isolation kit. The amount and purity of DNA in the spectrophotometer was measured and prepared for the PCR reaction.

Agarose Gel Electrophoresis

For the volume required, SeaKem® GTG® pure agarose was weighed and added to the volume of 1X TAE buffer in a mulled beer and kept on the flame until dissolved. After cooling to the tangible temperature (45-50 ° C), the EtBr solution was added to give a final concentration of 0.5 μ g / mL. The gel was poured carefully into the container and gel tray was placed and waited for about 40 minutes to freeze. 1X TAE buffer was added to the gel electrophoresis tank until it was covered. DNA samples (3 μ L BFB and 10 μ L DNA) were inserted into the wells formed by removing the comb. One DNA standard (4 μ L) was loaded from the wells to calculate the DNA size. After the progress of the molecules in the electric field, the gel was kept in the pure water for 10 minutes and the gel was observed by translucinator.

PCR

A nucleotide BLAST search of the *Bacillus* genome was performed using the *nfnB* gene sequence of *E. coli*. *nfnB* gene was identified as BC_1619a: putative oxygen-insensitive NADPH nitroreductase, Primers were obtained from Sentegen (Ankara/Turkey). Primers for amplification of the *nfnB* gene were ATAGGATCCATGACTAACTCAGTAAAGAC (5' primer) and ATCAAGCTTTTATTTCATTCAGCAAC (3' primer), *Bam*HI and *Hind*III sites are underlined. PCR products were purified using the QIAquick PCR Purification Kit (QIAGEN Ltd., UK) according to the manufacturer's instructions. The purity and approximate size of the PCR products were confirmed using agarose gel electrophoresis.

Cloning

The purified PCR products obtained from the bacteria and the vector DNA to be used for cloning were partially cleaved by *Bam*HI and *Hind*III restriction enzymes. 500 ng of chromosomal DNA and 50 ng of plasmid DNA digested with *Bam*HI and *Hind*III were ligated. Prior to transformation, the ligation mixture was subjected to ethanol precipitation and ligase samples were inactivated by incubation at 65°C for 15 min prior to transformation. The inactivated self ligation and ligation samples were transformed with the prepared competent bacteria. All of the liquids in the transformation tube were first separately produced at 37 ° C for 1 hour, poured into S.O.C liquid media. With this application, the bacteria that have become sensitized by the competing processes are returned to their normal state, and the adaptation of the bacteria to the antibiotic fattening, which will be inoculated after one hour, is provided. At the end of one hour, the bacterium was removed and plated on a LB/Kanamycin petri dishes, and the plates were dried for 5-10 min, then inverted and left at 37 ° C for 1 night. The next day, transformants were transformed with recombinant (expanded) and non-recombinant (widely closed) plasmid DNAs. Recombinant colonies were selected by means of a sterile toothpick and transferred to tubes containing 10 mL of LB/Amp100 nutrient and produced at 37 ° C with shaking for 1 night and plasmid isolation was performed as described below with the aid of QIAGEN mini-prep kit. The amount of plasmid DNA was measured and then the purity was tested by agarose gel. Sequence analysis was carried out by Sentegen (Ankara/Turkey). Nitroreductase gene sequences were examined in the Blast program at the National Center for Biotechnology Information (NCBI) website (<http://www.ncbi.nlm.nih.gov/BLAST/>), CLC Workbench v 4.0 Software (CLC bio, Aarhus, and other *Bacillus* species, and their homology affinities were determined.

Results And Discussion

Thermophilic *Bacillus* species isolated from hot water springs in Turkey were identified by 16S rRNA gene sequence analysis. The previously identified species, *Bacillus paralicheniformis* (5NK), *Bacillus paralicheniformis* (FMB2), with sequence similarity of 97% and 99.65% respectively, were used. Genomic DNAs of *Bacillus* species were isolated and shown in Figure 1.



Figure 1: Genomic DNAs of *Bacillus* species, **B2:** Genomic DNA of *Bacillus paralicheniformis* (FMB2), **5NK:** Genomic DNA of *Bacillus paralicheniformis* (5NK), **L:** DNA marker (New England Biolabs)

One gene from *Bacillus* species were successfully amplified during PCR using the primer BC_1619a (putative oxygen-insensitive NADPH nitroreductase) among three primers designed (Figure 2). The primers were designed on the basis of *Bacillus cereus* nitroreductase genes which have been found to metabolise prodrug CB1954 and its metabolites as superior cell killing ability, which were a promising candidate for enzyme prodrug therapy (Gwenin et al. 2015).

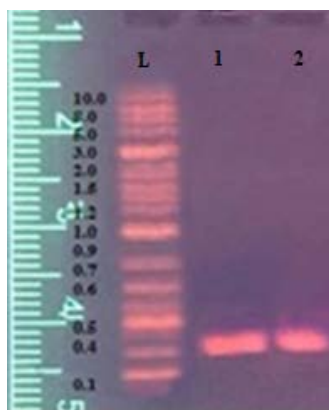


Figure 2: PCR products, **L:** DNA marker (New England Biolabs), **1:** PCR products of *Bacillus paralicheniformis* (FMB2), **2:** PCR products of *Bacillus paralicheniformis* (5NK)

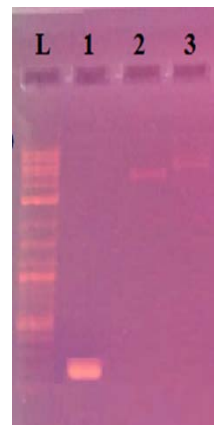


Figure 3: **L:** DNA marker (New England Biolabs), **1:** PCR products of *Bacillus paralicheniformis* (5NK) after ligation, **2:** pET28a+, **3:** Ligation (double digested DNA of strain 5NK and double digested pET28a+)

These PCR products were successfully inserted into pET28a+ expression vector, which consists N-terminal His-tag for ease of protein purification (Figure 3).

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NOVEL PHTHALOCYANINES BEARING *N,N*-BIS(PROPYLENEOXY)ANILINE MOIETIES: SYNTHESIS AND CHARACTERIZATION

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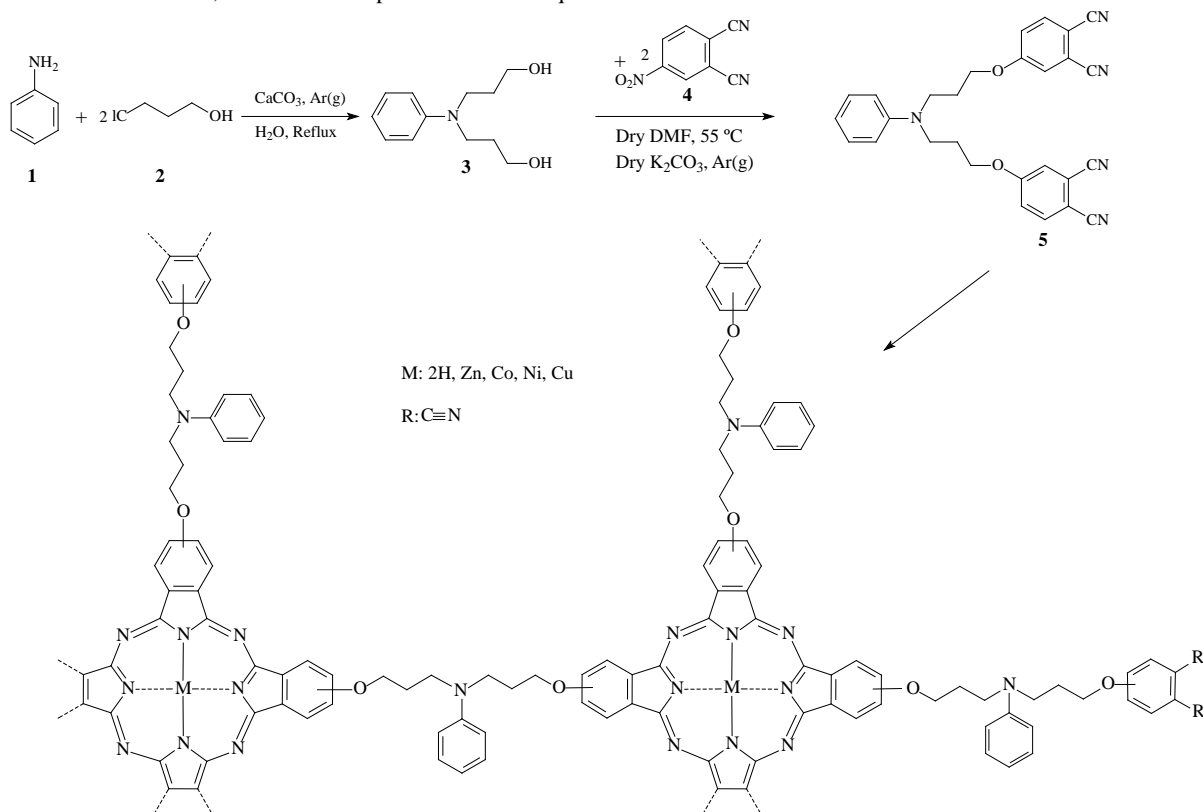
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Abstract

Two-dimensional 18 π -electron conjugated polymeric phthalocyanines have been investigated in detail for many years, especially with regard to their optical, electronic, catalytic and structural properties as dyestuffs, chemical sensors, photosensitive materials for nonlinear optics (NLO) and optical storage devices [1,2].

In this work the synthesis and characterization of a novel diphthalonitrile and its polymeric metal-free and metallophthalocyanines bearing *N,N*-bis(propyleneoxy)aniline moieties. For this purpose *N,N*-bis(3-hydroxypropyl)aniline **3** was synthesized by the reaction of 3-chloro-1-propanol and aniline in calcium carbonate medium according to slightly changed literature procedure [3]. 4-[*N,N*-bis[(3,4-dicyanophenoxy)propyl]amino]benzene **5** was synthesized via a base-catalyzed nucleophilic aromatic nitro displacement of 4-nitrophthalonitrile with compound **3**. Afterwards the metal-free and metallophthalocyanine polymers (M=2H, Zn, Cu, Co and Ni) were prepared via polycyclotetramerization reactions of **5** with under suitable conditions. All the novel compounds have been characterized by elemental analysis, UV-Vis, FT-IR, NMR and MS spectral data techniques.



Scheme 1. Synthesis of novel phthalocyanines bearing *N,N*-bis(propyleneoxy)aniline moieties

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On A Web CSS Framework

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Abstract: The aim of this work is to explain how to use the W3.CSS library, one of the Css (Cascade Style Sheet) style libraries used in preparing web pages. Web Css libraries are largely lacking in the HTML language, which is based on web pages. Css libraries such as Bootstrap are widely used in the web design world. The World Wide Web Consortium (W3C), an international organization that sets Web standards, has developed a fast and smooth Css library called W3.CSS. Some of the key features of the W3.CSS library; It is space-saving, fast, compatible with all web browsers, does not require JavaScript codes, responsive to the screens of the hardware. In this study, the basic benefits of Css libraries will be explained. Examples of usage patterns will be given. It will be explained examples of how to use. The basic characteristics of the W3.CSS library will be explained, and the results will be discussed using sample codes. It will be explained how some designs needed on a web page can be done with W3.CSS.

Keywords: Html, Css (Cascade Style Sheet), W3.CSS, Bootstrap CSS Library, Web Browsers, W3C (World Wide Web Consortium)

Introduction

With the development of web technologies, there have been developments in the Html field which are the basis of web pages. Developed to address the formal deficiencies of HTML (Hyper Text Markup Language), Css has been mandatory for use on web pages.

CSS is a markup language that describes the style of an HTML document. CSS defines how HTML elements should be displayed. CSS is abbreviation for Cascading Style Sheets. Css simplifies the formal editing of HTML tags. Css file extension is external stylesheets. Example style1.css. On the screen of the desktop computer and on the screen of mobile computers the web pages can be displayed correctly with the help of Css codes. The developer of web pages is Css3 and the developer of Html5 is W3C (World Wide Web Consortium)

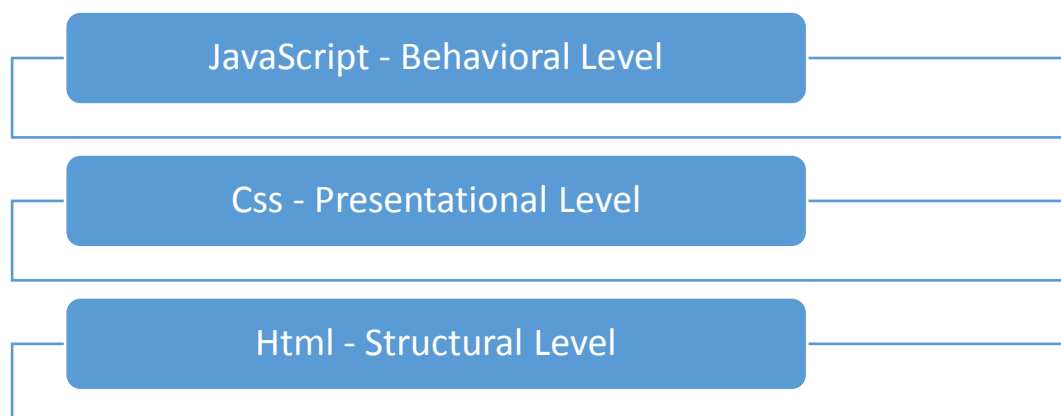


Figure 1: Web page elements

In the software world, library structures are used too much to make things easier. The library structure for Css, the markup language, was developed. BootStrap has pioneered this issue. Such libraries are called the Css framework. With the widespread use of mobile devices, the Css framework is being used too much. Because the web

programmer needs to design the web page to a responsible screen width. It has become very simple to develop a responsible page with prepared Css classes.

1. Css Framework

A CSS framework is a prepared software framework that is meant to allow for easier, more standards web design using the Cascading Style Sheets language. The CSS framework is designed to overcome recurring problems across web pages. This greatly reduces the time it takes to start creating applications and websites. In this way developers, large applications do not always have to start from scratch. Re-use the basis of previous applications. A framework is a standardized and set of concepts, practices and criteria for dealing with a common type of problem, which can be used as a reference to help us approach and resolve new problems of a similar nature.

Below is a list of the best css framework.

- Bootstrap (<http://getbootstrap.com/>)
- W3.Css (<https://www.w3schools.com/w3css/4/w3.css>)
- Semantic-UI (<http://semantic-ui.com/>)
- Foundation (<http://foundation.zurb.com/>)
- Materialize (<http://materializecss.com/>)
- Material UI (<http://www.material-ui.com/#/>)
- Pure (<https://purecss.io/>)
- Skeleton (<http://getskeleton.com/>)
- Uikit (<http://getuikit.com/>)
- Milligram (<https://milligram.github.io/>)
- Bulma (<https://bulma.io/>)
- Susy (<http://susy.oddbird.net/>)
- Mini.css (<https://minicss.org/>)

BootStrap is the most commonly used Css framework.



Figure 2: Top 5 Css framework

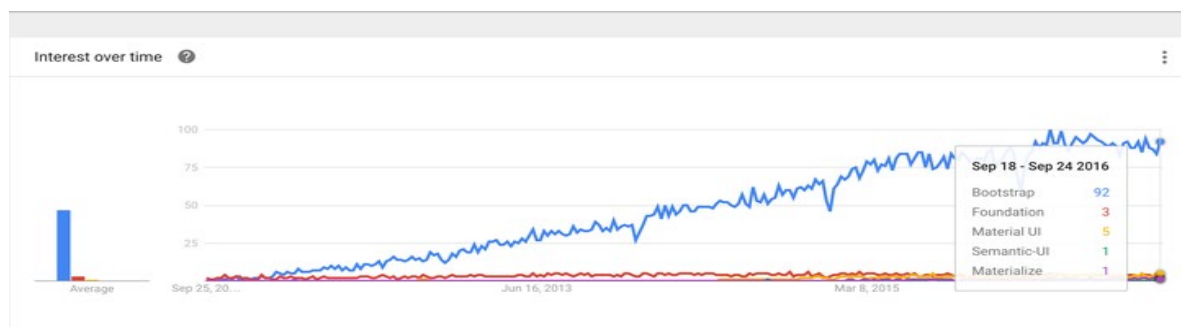


Figure 3: Top 6 Css Framework using on September, 2016 (<https://www.keycdn.com/blog/front-end-frameworks>)

1.2. W3.CSS

W3.CSS is a modern CSS framework with built-in responsiveness. It supports responsive mobile first design by default, and it is smaller and faster than similar CSS frameworks. W3.CSS can also speed up and simplify web development because it is easier to learn, and easier to use than other CSS frameworks. W3C developed this CSS framework. W3.CSS is free.

If you want to use W3.CSS in your web site, just add a link to "w3.css" from your web pages:

```
<link rel="stylesheet" href="https://www.w3schools.com/w3css/4/w3.css">
```

You can download w3.css to your web folder.

```
<link rel="stylesheet" href="w3.css">
```

First, create a web page (index.html) with Notepad++ or any Html editor.

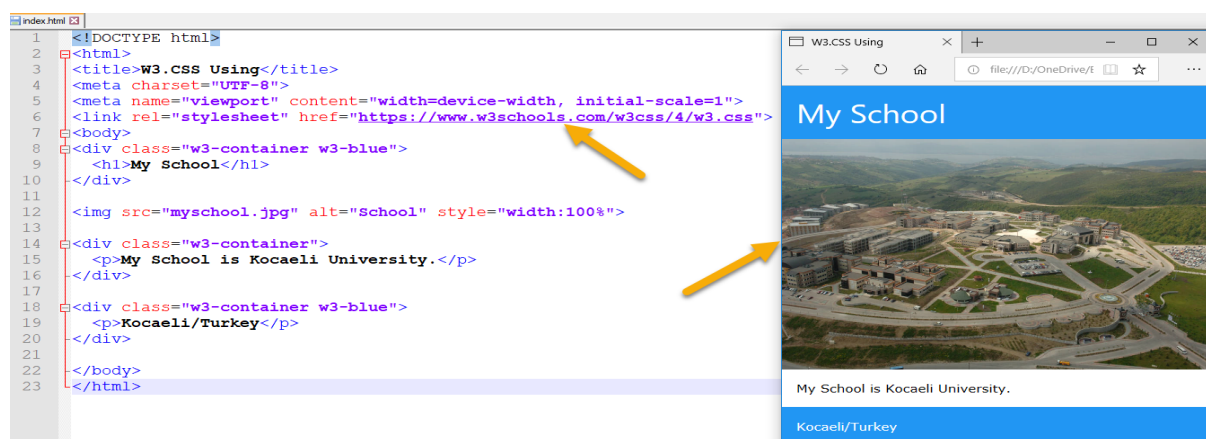


Figure 4: Web page is used W3.Css

W3.CSS Containers;

The w3-container class is the most important of the W3.CSS classes.

The w3-container class is used with HTML container elements, like:

<div>, <header>, <footer>, <article>, <section>, <blockquote>, <form>, and more elements.

Create container1.html and use a W3.Css container.

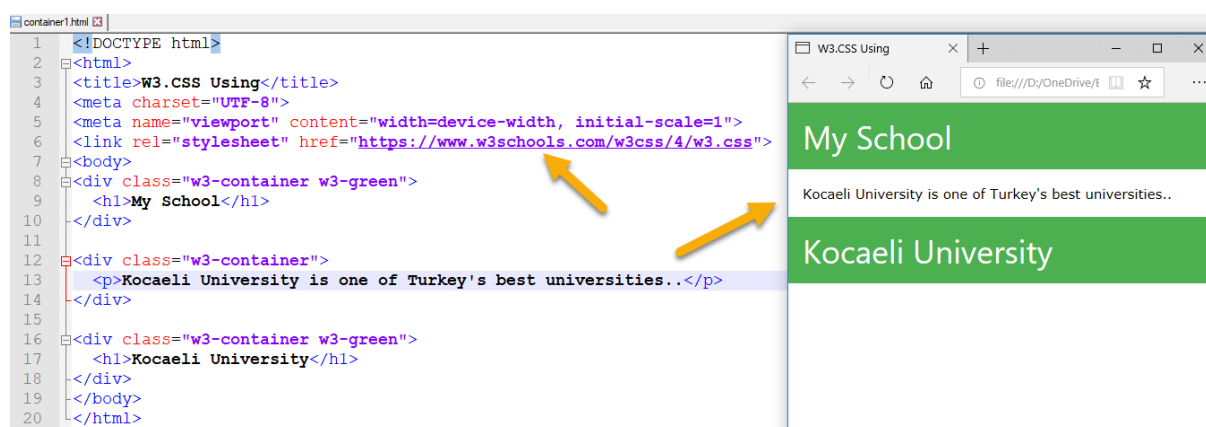


Figure 5: W3.Css Container

W3.CSS Panels, Notes, and Quotes;

You may need to use many text and content in panels on your web page. W3.CSS panels have a stylish and beautiful appearance. The w3-panel class can display all kinds of notes and quotes.

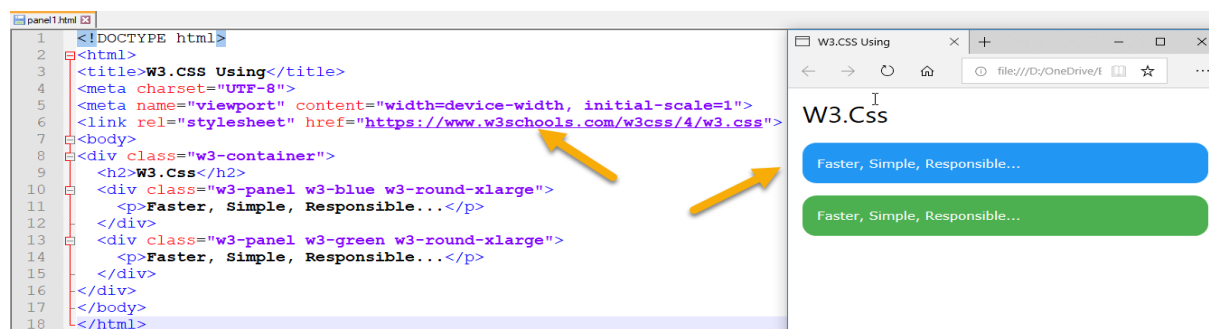


Figure 6: W3.CSS panel

W3.CSS Cards;

The w3-card classes are suitable for your images and contents.



Figure 7: W3.CSS cards

W3.CSS Tables;

Conclusions

It is easy to design a web page with W3.CSS. Both fast, simple and straightforward, as well as fit all devices. All responsible. Unlike other Css, W3.CSS mostly consists of Css codes. Does not use any other language codes unless required. This will load web pages faster. It also uses less memory than the web browser.

A few simple steps are needed to use W3.CSS, which comes from the group that develops the Html and Css languages. As the projects grow, the codes used increase. As a result, the web page begins to load slowly. Here W3.CSS makes you feel the difference. Less work with less code.

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ON DECIPHERMENT OF THE INSCRIPTIONS OF LINEAR A IN THE COMMON KARTVELIAN LANGUAGE: QA-PA₃ – A VESSEL FOR LIQUID

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Abstract: The object of this paper is deciphering of Cretan Linear A inscriptions spread mainly across the Aegean area.

1. The paper presents a brief background of the ancient population of the Peloponnese, Asia Minor and the Aegean islands before the Indo-European migrations.

It is supposed that the indigenous inhabitants of this area were of non-Indo-European and non-Semitic origin.

2. The study of the linguistic material and graphical qualities of Linear A, and the phonetic reading of Linear B script by M. Ventris, granted the correctness of my decipherment of Linear A inscriptions in the Common Kartvelian.

Some of the deciphered Linear A words are the following:

- a. Words for numeral operations: (addition) ku-ro – “to bind, gather, collect, add”, and (subtraction) ki-ro – “fault, defect; to subtract, lessen, diminish, cut off”;
- b. Names of vessels for liquid – qa-pa₃, ka-ti, and ka-di;
- c. The toponyms and anthroponyms: pa-i-to – “Phaistos”; a-ja – “Aea”; ku-ta- – “Cytalea”; ku-ku-da-ra – “a Colchian person”; ma-ka-ri-te – “the island of Macris/Euboea (Macrean or Macrones tribe)”.

Keywords: Linear A script, the Common Kartvelian language, comparative and inner reconstructions.

Introduction

The object of this paper is deciphering of Cretan Linear A (LA) inscriptions spread all over the Aegean area, also found on the territory of Palestine, Bulgaria, Georgia.

1. The paper presents an overview of the data on the ancient population of the Peloponnese, Asia Minor, Aegean islands before the migrations of Indo-European tribes into Europe began (Kvashilava, 2011, p. 228-233; 2017a, p. 66).

It is supposed that indigenous inhabitants of this area were of non-Indo-European and non-Semitic origin but were South Caucasian / Kartvelian – Colchian tribes – *Macrians* or *Macrones* among others¹ (see Apollonius of Rhodes, I.1023-1024; The Scholiast, I.1024-1025, 1037; II.392; Kvashilava, 2011, p. 233-236; 2017a, p. 66, 66₂).

2. The Common Kartvelian (CK) language formed an influential substratum for the language of Proto-Greek tribes after their invasion of the Peloponnese. The toponyms of “*unknown etymology*” (J.Chadwick, R.Beekes, and others) are now proved to be CK.
3. The correctness of my decipherment of LA inscriptions in the CK is verified by the analysis of linguistic material (of special importance are toponyms, ethnonyms, anthroponyms and theonyms), the study of graphical qualities of LA and of the signs of related scripts (Linear B = LB, Cypriot Syllabic = CS), the previous phonetic reading of LB script by M.Ventris and J.Chadwick (1973, p. 23, Fig. 4; p. 388, Fig. 28; Chadwick, 1970, p. 165, Fig. 17; p. 24, Fig. 7).

¹. The following notations are used in this paper: C – any simple consonant or harmonic group of decressive order; /j/ stands for a frontal sonant phoneme; k= k'; p= p'; S denotes any non-syllabic sonant; V denotes any vowel phoneme; /w/ denotes a labial non-nasal sonant phoneme; Ø – a null phoneme; * denotes the reconstructed phoneme; / denotes a parallel phoneme or form; a>b means that a changes to b (comp. Hockett, 1958, p. 284-285; Gamkrelidze and Machavariani, 1965, p. 304, 306).

The texts of LA inscriptions are mostly agricultural accounts with anthroponyms, agricultural produce (e.g., cereals, etc.), domestic animals, and signs denoting natural numbers and fractions, etc (Kvashilava, 2011, p. 242-244, 253-259; 2014a; 2017b, p. 857-858, 863).

Below I present the name of a vessel for liquid – qa-pa₃.

The words read by me earlier in LA inscriptions and presented in my papers (Kvashilava, 2010, p. 317₁ ff., 320; 2011, p. 259-278; 2014b; 2015a; 2015b; 2016a; 2016b; 2016c; 2017a, p. 67-71; 2017b, p. 858) were:

- a. The words for the operations on numerals: (addition) ku-ro – “to bind, gather, collect, add”, and (subtraction) ki-ro – “fault, defect; to subtract, lessen, diminish, cut off”;
- b. The names of vessels for liquid – ka-ti (also attested in LB) and ka-di;
- c. The toponyms and anthroponyms: pa-i-to – “Phaistos” (mentioned in LB); a-ja – “Aea” (also attested in LB); ku-ta- – “Cyta[ea]” (attested in LB too); ku-ku-da-ra – “a Colchian person”; ma-ka-ri-te – “the island of Macris/Euboea (Macrean or Macrones tribe) attested in later Greek texts”.

All words attested in LB are given by M.Ventris and J.Chadwick (1973, p. 338, 372, 500, 551, 555, 557, 558).

The above stems also display regular phonological and semantic relations to Kartvelian material.

The analysis of the data shows that LA inscriptions record the CK language. The following should be emphasized (Kvashilava, 2017a, p. 65-66):

- a. The LA syllabic signs are graphically simplified versions of the Cretan hieroglyphic script and the Phaistos Disk script signs (Kvashilava, 2011, p. 239).
- b. The vast bulk of LA syllabic signs are graphically and phonetically identical to the graphic and phonetic properties of the syllabic signs of Mycenaean Greek LB (Ventris and Chadwick, 1973, p. 23, Fig. 4) and the Greek CS scripts (Ventris and Chadwick, 1973, p. 388, Fig. 28). The problem of the language of LA inscriptions has long remained unsolved, and it was declared to be impossible to read because the language and its culture no longer existed.

The phonetic values of LA graphical syllabic signs are presented in Table 1:

























































001  da	017  za	039  pi	057  ja	077  ka
002  ro	020  zo	040  wi	058  su	078  qe
003  pa	021  qi	041  si	059  ta	079  zu
004  te	023  mu		060  ra	080  ma
005  to	024  ne	045  de	061  o	081  ku
006  na	026  ru	046  je	065  ju	085  au
007  di	027  re	050  pu	066  ta ₂	087  tve
008  a	028  i	051  du	067  ki	
009  se	029  pu ₂		069  tu	
010  u	030  ni	053  ri	070  ko	
011  po	031  sa	054  wa	073  mi	
013  me	037  ti	055  nu	074  ze	
016  qa	038  e		076  ra ₂	

Table 1. Syllabograms of LA script

The meanings of all LA inscriptions remained unidentified, and the LA tablets were declared to be written in an unknown dead language.

- c. The method of comparative and inner reconstruction made it possible to identify the forms and meanings of LA syllabic sequences as belonging to the CK Language.

Some authors (Kretschmer, 1896, p. 290, 292; 1953, p. 162 ff., 200 ff.; Schachermeyr, 1954, cols. 1531-1533; Schachermeyr, 1955, p. 227-263; Schwyzer, 1939, I, p. 60; Meillet, 2009, p. 55-56; Thomson, 1949, p. 176, and others) connected the ancient Pre-Greek languages to South Caucasian (Kartvelian) tribes.

Traces of these earlier languages of the indigenous population of the Aegean, Asia Minor and Caucasian regions appear in the form of a substratum to the structure and lexicon of the dialects brought by the new settlers (comp. Gamkrelidze and Ivanov, 1995, I, p. 782).

LA is the substratum language of clay tablets and other inscriptions found in many parts of Crete and Aegean islands (Chadwick, 1976, p. 4). The substratum is obviously linked to early Minoan culture and to the inscriptions in LA.

1. About Kartvelian Languages and CK Ancestor Language

Linguistic research made by G. Deeters (Deeters, Solta and Inglisian, 1963, p. 4-7), Th. Gamkrelidze and G. Machavariani (1965, p. 3 ff.; Gamkrelidze, 1966, p. 69; see also: Gildenstädt, 1787, I, p. 342, 413; Klaproth, 1823, p. 111; Bopp, 1848, p. 259, and others) showed that the languages spoken in Georgia – and now also on the territory of Turkey – are affiliated languages: Georgian, Svan, Mingrelian and Laz are of the common origin; they are called the South Caucasian / Kartvelian languages. The term was introduced by H. Schuchardt (1897, p. 54 ff.).

The pioneers of Kartvelology G. Rosen (1844, p. 2), M. Brosset (1849, p. 72-78), A. Tsagareli (1880, II, p. 1-92), N. Marr (1912, p. 1093-1098; 1913, p. 1-36), and others studied separate Kartvelian languages with the comparative method and showed regular phonemic correspondences between them. Basing on these phonemic correspondences it is declared that Kartvelian languages developed from the common language – the CK (Gamkrelidze and Machavariani, 1965, p. 4; Gamkrelidze, 2008, p. 30).

Nominal and verbal archetypes of CK can be reconstructed only if regular phonemic correspondences are attested between root and affixal morphemes² (Gamkrelidze, 2008, p. 26).

The detailed research was carried out and its results were published by Th. Gamkrelidze and G. Machavariani (1965; also see Gamkrelidze, 2008, p. 24-57, 85-88). The comparative method and internal reconstruction applied to the material of Svan, Georgian, Mingrelian and Laz resulted in the presentation of the typology of the morphophonemic system of the CK language, and diachronic transformations of its patterns in the affiliated Kartvelian languages. Regular phonemic correspondences in the phonological and morphophonological patterns of these languages were presented in detail by the authors.

The alternative variant of the scheme of the diachronic development of Kartvelian languages earlier suggested by G. Deeters (1930, p. 2; Deeters, Solta and Inglisian, 1963, p. 5; comp.: Fähnrich, 2007, p. 5) was presented by Th. Gamkrelidze and G. Machavariani (1965, p. 16; Gamkrelidze, 2008, p. 87). In consequence of linguistic changes the CK ancestor language developed into two branches (see Fig. 1): Svan and Common Colchian-Georgian unity which was later divided into two independent language systems that were presented by Colchian and Georgian dialects; still later Mingrelian and Laz were generated from the Colchian branch.

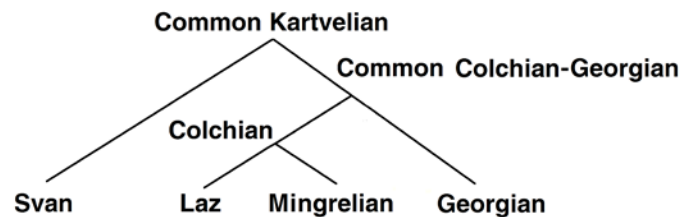


Fig.1. The Scheme of the Origin of Kartvelian Languages

Old Cretan syllabic inscriptions of LA are deciphered by me as the patterns of the CK language.

2. Deciphering LA inscription in the CK Language: qa-pa₃ – a Vessel for Liquid

The tablet HT 31 (HM 19) with the inscription in LA script is studied in the paper (see Fig. 2). The tablet was found in Crete, in Hagia Triada and was dated back to LM IB period (Godart and Olivier, 1976, I, p. XXI; 1985, V, p. 84; Raison and Pope, 1994, p. 64), i.e. to 1500-1450 BC.

². Comp. “The sole means of reconstructing is by comparing, and the only aim of comparison is a reconstruction. Our procedure is sterile unless we view the relations of several forms from the perspective of time and succeed in re-establishing a single form” (Saussure, 1959, 218).

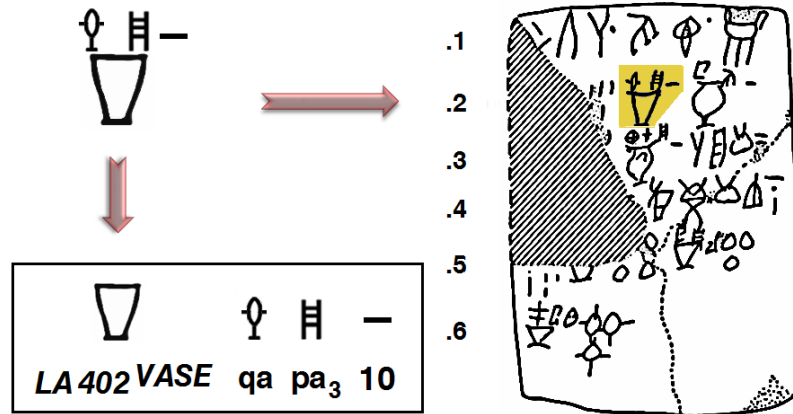


Fig. 2. The inscription of HT 31 (HM 19) clay tablet
(Godart and Olivier, 1976, I, p. 58)

The word for *vessel* is inscribed on the tablet which is presented with the sequence $\text{LA016 LA056 LA10110}$ qa-pa_3 . Below the graphical contours, phonetic notations and the decipherment with typological parallels and commentary are also given.

The paper presents the analysis of the South Caucasian / CK material and the process of the development of the affiliated languages, also of the material on the regular phonemic correspondences of root as well as affix morphemes; comparative linguistic study of the data is also presented.

The interpretation of the sequence $\text{LA016 LA056 LA10110}$ is proved to be a CK archetype – the word for a wine-vessel; this is the pattern displaying the regular phonological and semantic correspondence with the Kartvelian material.

The stem qap- with the meaning of “*vessel*” reconstructed for the languages of different families are given.

The following sequence of signs LA016 , LA056 and LA10110 is written above the vessel ideogram $\text{LA402}^{\text{VASE}}$ in the second line of the LA inscription on clay tablet HT 31 (HM 19) (see Fig. 2). The last sign of the inscription denotes the natural number 10 (Kvashilava, 2017b, p. 857, Table 1).

In this inscription the sequence LA016+LA056 is deciphered as qa and pa_3 syllables, which coincides with the phonemic reading of LB016 and LB056 syllables of Mycenaean Greek LB inscription (comp. Ventris and Chadwick, 1973, p. 385, Fig. 27). These signs and their phonetic meanings are presented in Table 2.








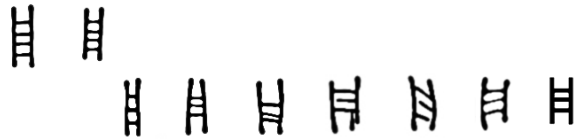






LA		qa / *kwa
LB		qa
Comp. Old Greek script sign		 q / k
Comp. the letters of old Georgian alphabet:		 q  q̇  k  k̇
LA		pa ₃ / *paj
LB		pa ₃

Table 2. The variants of LA016 and LA056 signs
(Godart and Olivier, 1985, V, p. XXX, XXXVII; Bennett, 1966, p. 298, 299, 304, 305)

According to M.Ventris and J.Chadwick (1973, p. 81, 77, 527), the following phonetic units are attested in LB texts: the labiovelar q=[*kw] and the diphthong a₃=[*aj]. The corresponding signs of LA script  qa and  pa₃ are consequently reproduced as [*kwa] and [*paj] syllables, and the sequence of the signs  qa-pa₃ is read as [*kwa-paj] archetype.

It has been stated in linguistic researches (Ventris and Chadwick, 1973, p. 323; Gordon, 1958, p. 247; Pope, 1958, p. 21; Packard, 1974, p. 27; Best and Woudhuizen, 1989, p. 1-2, 5-6; and others) that  qa-pa₃ sequence is the name of the “vessel” (“pot” or “cup”).

 sequence of LA402^{VASE} qa-pa₃/[*kwa-paj] is shown by me as corresponding to the CK archetype [*k̇ waṗ -aj] / [*k̇ wap^h-aj] that is the word for the wine-vessel. Considering the linguistic material given by Th.Gamkrelidze and G.Machavariani (1965; Gamkrelidze, 1966), the reconstruction of the given sequence as an archetype of the CK parent language is given below.

3. Reconstruction of the CK Phoneme Sequence *k̇ waṗ -aj / *k̇ wap^h-aj and Its Allomorphs

As already mentioned the above linguistic material supports the postulation of the transformations undergone by the CK root patterns in linguistically attested Svan, Georgian and its dialects, Mingrelian and Laz language forms. As the sample of the linguistic-comparative analysis, the Kartvelian stem k̇ oṗ - / k̇ op^h- (see Table 3) has been reconstructed resulting in the sequence *k̇ waṗ -aj / *k̇ wap^h-aj and its allophones on the CK level³.

³. About hierarchical levels of language system see Palmer (1957-1958, p. 225 ff.).

Georgian <p> $\kappa \text{ op} -$, $\kappa \text{ op}^h -$ </p>	<p> $\kappa \text{ op} -e$ – <i>a small wine vessel</i> (comp. Orbeliani, 1991, I, p. 383 ff.); <i>a scoop for wine</i> (Klimov, 1998, p. 99); “<i>Weinschöpfkelle</i>” (Fähnrich, 2007, p. 251). $\kappa \text{ op}^h -a$ (Imeretian and Rachan dialects) – <i>measuring jug</i> (comp. DGL, 1955, IV, p. 1352); (Khevsurian dialect) – <i>a wooden vessel</i> (comp. Ghlonti, 1984, 306, 292). </p>
Mingrelian <p> $\kappa \text{ op} -$ </p>	<p> $\kappa \text{ op} -a$ – <i>a scoop for wine; a wine vessel</i> (comp. Kajaia, 2002, II, p. 157); “<i>Weinschöpfkelle</i>” (Fähnrich, 2007, p. 251). $\kappa \text{ op} -i$ – <i>a wine vessel with a wooden handle</i> (comp.: Kajaia, 2002, II, 157; Kobalia 2010, 372). </p>
Laz <p> $\kappa \text{ op} -$ </p>	<p> $\kappa \text{ op} -a$ (Vits’e and Khopan dialects) – <i>a skimming spoon</i> (Marr, 1910, p. 157); “<i>a big spoon</i>” (Klimov, 1998, p. 99); “<i>großer Schöpflöffel</i>” (Fähnrich, 2007, p. 251). </p>
Svan <p> $\kappa \text{ op} , \kappa \text{ op} -$ ₄ </p>	<p> $\kappa \text{ op}$ (Lentekhan dialect), $\kappa \text{ op}$ (Lashkhan dialect) – <i>a bowl with a wooden handle, a big wooden spoon, a ladle</i> (Topuria and Kaldani, 2000, p. 763); “<i>große Holzschale mit Henkel, großer Löffel</i>” (Fähnrich, 2007, p. 251). </p>

Table 3. Regular patterns of the nominal stem $\kappa \text{ op} -$ / $\kappa \text{ op}^h -$ / $\kappa \text{ op} -$

The comparative study of the nominal stem $\kappa \text{ op} -$ / $\kappa \text{ op}^h -$ of Kartvelian languages supports the reconstruction of the nominal archetype denoting “*vessel for wine and other fluids*” in CK (comp. Klimov, 1998, p. 99; Fähnrich, 2007, p. 251; Chukhua, 2017, p. 241).

According to the method of comparative and internal reconstruction applied to the analysis of the Kartvelian stem $[\kappa \text{ op} -]$ / $[\kappa \text{ op}^h -]$ / $[\kappa \text{ op} -]$ by Th. Gamkrelidze and G. Machavariani’s (1965, p. 366-367) CK theory, the Kartvelian stem morpheme was received:

$$\{[*\kappa \text{ wep} -] / [*\kappa \text{ wap} -] / [*\kappa \text{ wep}^h -] / [*\kappa \text{ wap}^h -] / [*\kappa \text{ wēp} -] / [*\kappa \text{ wāp} -]\}.$$

The syllabic element of this morpheme is $*e$ / $*a$ / $*ē$ / $*ā$. The non-syllabic variant of the labial sonant $/*w/$ that is attested in C-V position is closely attached to the simple consonant $*\kappa$ and creates the most natural complex $*\kappa +w$ (comp. Gamkrelidze and Machavariani, 1965, p. 198, 306, 368; Gamkrelidze, 1966, p. 80, 3.3).

If to the CK root allomorphs $\{*\kappa \text{ wep} - / *\kappa \text{ wap} - / *\kappa \text{ wep}^h - / *\kappa \text{ wap}^h - / *\kappa \text{ wēp} - / *\kappa \text{ wāp} -\}$ the CK suffixal morpheme $\{*-ej / *-aj\}$ is attached, then the following variants of the archetype $*\kappa \text{ wep} -ej / *\kappa \text{ wap} -ej / *\kappa \text{ wep}^h -aj / *\kappa \text{ wap}^h -aj / *\kappa \text{ wēp} -ej / *\kappa \text{ wāp} -ej$ ⁵ develop. Linguistic changes (see Table 4) of the archetype resulted in the Kartvelian forms seen above in Table 3.

4. The consonantal alterations of p / b are attested in Svan dialects, as, e.g., $\kappa \text{ op}$ (Lentekhan dialect) $> \kappa \text{ ob}$ (Lentekhan and Lower Bal dialects) – *a wooden vessel, “large cup”* (comp. Wardrop, 1911, p. 600); $\kappa \text{ op}$ (Lashkhan dialect) $> \kappa \text{ ob}$ (Upper Bal dialect) – *a wooden bowl* (comp. Topuria and Kaldani, 2000, p. 763).

5. CK archetype $*\kappa \text{ wap} -aj$ could be compared to Sino-Caucasian $*qwa\text{p} -ā$ – “*vessel*” (comp. Starostin, 2004-2005, p. 167); Proto-North-Caucasian $*qwa\text{p} -ā$ – “*pot, vessel*” (comp. Nikolayev and Starostin, 1994, p. 899). According to Th. Gamkrelidze and G. Machavariani (1965, p. 367-372), the Kartvelian words given below allow the reconstruction of Early CK archetype $*\kappa \text{ wēp} -ā$ / $*\kappa \text{ wāp} -ā$ – “*vessel*”. $*e / *a$ occurred after the $*e$ and $*a$ allophones of the CK vocalic $/*ə /$ phoneme acquired phonological values. Comp. Early CK $*\kappa \text{ wēp} -ā$ to Common Abkhaz-Adyghean $*\kappa \text{ wēp} -i$ – “*bowl*” (comp. Chukhua, 2017, p. 241).

CK	Common Colchian-Georgian	Colchian	Georgian	Mingrelian	Laz	Svan
*-wa- / *-we-	*-o-	*-o-	-o-	-o-	-o-	-o-
*-wā- / *-wē-	*-ō-					-ō-
*-ej	-ej	*-aj	-ej > -eθ > -e	-aθ > -a	-aθ > -a	
*-ej > *-i	*-i	*-i	-i	-i	-i	*-i > -θ
*-aj			*-aj > -aθ > -a			

Table 4. Kartvelian phonetic changes

CK { **k* wāp - / **k* wēp - / **k* wāp^h- / **k* wēp^h- / **k* wāp - / **k* wēp - } root and { **-ej* / **-aj* } suffixal morphemes are of CVC- and -VS structural types that are the canonical forms of CK morphemes (comp. Gamkrelidze and Machavariani, 1965, p. 304, 318, 368; Gamkrelidze, 1966, p. 77).

Appendix

According to Th. Gamkrelidze and G. Machavariani's theory (1965, p. 198, 306, 368; Gamkrelidze 2008, p. 52; Gamkrelidze, 1966, p. 80, 3.3), CK [**k* w] and [**k*] are functionally equal:

CK **k* wāp - = **k* ap - , **k* wēp - = **k* ep - , **k* wāp^h- = **k* ap^h- , **k* wēp^h- = **k* ep^h- – “vessel”.

The consonantal alterations of *p* / *b* and *k* / *k*^h are attested in Georgian and its dialects, as, e.g., *ka p* -ic□-i, *ka b*-ic□-i, *k^hab*-ic□-i – “measuring jug” (comp. Ghlonti, 1984, p. 272; Orbeliani, 1991, I, p. 345; DGL, 1955, IV, p. 1006; 1962, VII, p. 237); in Mingrelian *ka p* -e□-i; *k ab*-e□-i – “measuring jug” (Kobalia, 2010, p. 354, 351) and other forms.

Also, typological parallels of CK nominal stem for vessel **kap*-/**k^hap*^h-/**kop*-/**kup*-/**ḡ up*- is presented in detail in the languages of different families, such as:

➤ Proto-Nostratic **k^hap^h-a* – “*bowl, cup, jar, container; skull*” (Bomhard, 2018, II, p. 490, №420);

➤ Proto-Afrasian **kap*- – “*bowl, cup, jar, container*” (Bomhard, 2018, II, p. 490); Hamito-Semitic **kab*-/**kib*- – “(*gourd*) vessel” (Orel and Stolbova, 1995, p. 307, №1407); Hamito-Semitic **k ab*- – “*goblet*” (Orel and Stolbova, 1995, p. 332, №1526) > *κ ᾰ β ο ς* – “*measure of grain*” (comp. Beekes, 2010, I, p. 612); Akkadian *kappu* (m) – “(*small*) bowl, of wood, gold, silver”⁶ (Black, George and Postgate, 2000, p. 147); Middle Egyptian *ḳ by* – “*jar for beer*”; comp. Middle Egyptian *ḳ bbt* – “*jar*” (Faulkner, 1991, p. 277, 187);

➤ Proto-Altaic **k^hap^ha* – “*vessel, container*” (Bomhard, 2018, II, p. 491); Proto-Altaic **k^hap^ha* – “*a kind of vessel, box*”; Proto-Japanese **kàp* – “*scoop, ladle, spoon*”: Old Japanese *kapji*;

⁶. Akkadian *kappu* > Hittite *ḳap-pi* [*ḳap-pi*], *ḳap-pi* – “*bowl*” (Puhvel, 1997, IV, p. 63, 2007, VII, p. 42) > Urartian *ka-pi* [*ka-pi*] – “*dry measure*” > Armenian *կապի ճ* [*kapij*] – “*measure de blé, d’orge, etc*” (Sandalgian, 1900, p. 386).

Middle Japanese *kāfi* (Starostin, Dybo and Mudrak, 2003, p. 763); Common Turkic **k'āb* – “bag, sack”: Old Turkic *qāb* – “leather bag, wine-skin”; Turkic *kap* – “earthenware, dishes, vessel” (Dolgopolsky, 2012, p. 1026); comp. Proto-Turkic **Kāp*; Turkic *kap* – “sack” (Starostin, Dybo and Mudrak, 2003, p. 646);

➤ Proto-Indo-European **k^hap^h-* – “bowl, cup, jar, container; head” (Bomhard, 2018, II, p. 491); Proto-Indo-European **kap-* – “vessel, box” (Dolgopolsky, 2012, p. 1026, 1980, 2927); Latin *capis* – “a one-handled vessel (used in sacrifices)” (Bomhard, 2018, II, p. 491); “bowl, cup” (De Vaan, 2008, p. 90); Germanic **kuppaz*; Middle High German *kop* – “cup, bowl”, Old High German *kopf* – “cup, skull, head” (Orel, 2003, p. 224); Hittite *ḫupp ar-* – “bowl, pot, keg, also a liquid or dry measure” (Puhvel, 1991, III, p. 387);

➤ Pre-Greek *κ ύ π ε λ λ ο ν* – “bulbous drinking vessel, beaker, goblet” (Beekes, 2010, I, p. 804) > Mycenaean Greek *𐀓𐀕𐀖𐀗* [k□u□-pe-ra] – *κ ύ π ε λ λ α*, “drinking cups” (Ventris and Chadwick, 1973, p. 331, 558); Pre-Greek *κ ά π ε τ ο ς* – “digging” (Beekes, 2010, I, p. 638; II, p. 1342); Pre-Greek *κ ό β α θ ο ς* – “a vessel” (Beekes, 2010, I, p. 727); Pre-Greek *κ ό φ ι ν ο ς* – “big basket” (Beekes, 2010, I, p. 765); Pre-Greek (?) *γ ά β ε ν α* □ “small vessel; cup, bowl” (Beekes, 2010, I, p. 253); comp. *χ α β ί τ ι α* – “name of unknown vessels” (Beekes, 2010, II, p. 1605);

➤ Basque *kopor* (Gipuzkoan, High Navarrese), *gopor* (Lapuradian, Lower Navarrese), *gophor* (Lower Navarrese), *khopor* (Zuberoan), *opor* (Gipuzkoan, High Navarrese, Lapurdian, Lower Navarrese), *ophor* (?) – “bowl, basin” (sometimes esp. “earthenware bowl”, but “cup” in Zuberoan) (Trask, 2008, p. 254);

➤ Sumerian *𒌦𒂍𒌦* [ḫ ubur] > Akkadian *ḫ ubūru(m)* – “a beer jar” (PSD, 2005, 116; Black, George and Postgate 2000, p. 118); Sumerian *𒌦𒂍𒌦* [ḫ ubḫ ub], *𒌦𒂍𒌦* [ḫ ubḫ ub₂] – “a container or tube” > Akkadian *ḫ upḫ uppu* – “a container” (PSD, 2005, p. 116); comp. Akkadian *ḫ uppu(m)* – “a kind of basket” (Black, George and Postgate, 2000, p. 120, 121).

Conclusions

1. The deciphering of LA inscription HT 31 (HM 19) found in Crete, Hagia Triada and was dated back to LM IB period, i.e. to 1500-1450 BC.
2. The sequence of *𐀓𐀕* LA016+LA056 of this inscription is deciphered as *qa-pa₃* / [**kwa-paj*].
3. The semantic interpretation of *qa-pa₃* / [**kwa-paj*] is presented as the CK archetype [**k waṗ -aj*] / [**k waṗ^h-aj*] meaning “pot, vessel”. The pattern of this archetype displays regular phonological and semantic correspondences to the Kartvelian data.
4. The archetype **k waṗ -aj* / **k waṗ^h-aj* is of the CVC-VS structural type that is the main canonical morphonological pattern of the CK language.
5. According to Th. Gamkrelidze and G.Machavariani’s CK theory, **k w* and **k^h* are functionally equal:

$$CK \text{ } *k \text{ waṗ -} = *k \text{ aṗ -, } *k \text{ waṗ^h-} = *k \text{ aṗ^h-} \text{ – “vessel”}.$$

The root forms **k aṗ -* / **k aṗ^h-* are the variants of the basic CK root pattern **k waṗ -* / **k waṗ^h-*. The pattern is also attested in the data of the languages other than Kartvelian.

6. The study of the data of Kartvelian languages verifies the decipherment of LA script *𐀓𐀕* *qa-pa₃* / [**kwa-paj*] sequence in the CK language.

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ON NEWLY DISCOVERED DEUTONYMPH STAGE OF *STIGMAEUS KUMALARIENSIS* AKYOL & KOÇ (ACARI: STIGMAEIDAE) FROM TURKEY

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Introduction: With consisting of 34 genera including *Stigmaeus* Koch, Stigmaeidae is one of the most abundant mite families in the superfamily Raphignathoidea. *Stigmaeus kumalariensis* Akyol & Koç, 2007 were only given before from Turkey. Until now, female and male of this species were known, but its immature stages were not. With this study, deutonymph of *S. kumalariensis* has been found from Turkey for the first time. In the present work, we aimed to contribute to the knowledge on mite existence in Turkey.

Material and Methods: Mite specimens were collected in litter and soil from Ekşisu marsh, Erzincan. The mite specimens were extracted by using Berlese-Tullgren funnels, cleared in 60% lactic acid and mounted on microscopic slides in Hoyer's medium. The specimens were examined by using a Leica DM 4000B phase-contrast microscope. The photos were taken by an Olympus BX63-CBH DIC microscope. The measurements were taken in micrometers (µm) with the aid of the Leica Application Suite (LAS) Software Version 3.8.

Results: *Stigmaeus kumalariensis* was given from type locality Afyonkarahisar, and later reported from Hakkari and Erzincan in Turkey. During a faunistic study carried out on mites in Erzincan (Turkey), 31 females, 6 males and 4 deutonymph specimens were identified as *S. kumalariensis*. The deutonymph stage of the species was found for the first time. In addition, we noted that variations in the number of aggenital setae and structure of median zonal shields in the adult specimens.

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Keywords: Mite, *Stigmaeus*, immature, variation, Turkey

On the Chemical Engineering

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Abstract. In this paper, it is presented an overviewing of some authors' perspectives. Operational methods, processing systems and substantial equipment give high level improvements. These increases may conclude in the disappear of some traditional types of gear. In this paper, we discuss on process strengthening and its construction, review recent increases in procedure increasing devices and means.

Key words: chemical engineering, technological increase, curricular material, intensifying

Introduction

Engineers at many universities are working on efficient systems that could transform the concept of chemical plants (Stankiewicz, 2002). He stayed that these growths use a shared emphasis on process intensification which is a tactic that has been emerged as a special discipline of chemical engineering at many universities. Georgius Agricola (1556) illustrated the progression of regaining gold from gold ore. He modified the similarity between some of the strategies, for example, the stimulated vessels *O* and the stirrers *S* and the basic gear of today's chemical development productions is arresting. We can say that Agricola's modifying represents that process intensification. This modifying has not had much impact in the ground of inspiring technology over the last years (Science and Technology).

For procedure intensification capacity, Philips at all (1997) explained that it contains of the increase of novel kits and systems that substantially decreasing production capacity rate and energy consumption are developable technologies. So, any chemical engineering increase which turn out to be a considerably cleaner, and energy well-organized technology is procedure strengthening. The research team figureate that the full ground commonly can be separated into two parts as shown below (Science and Technology) (Figure 1).

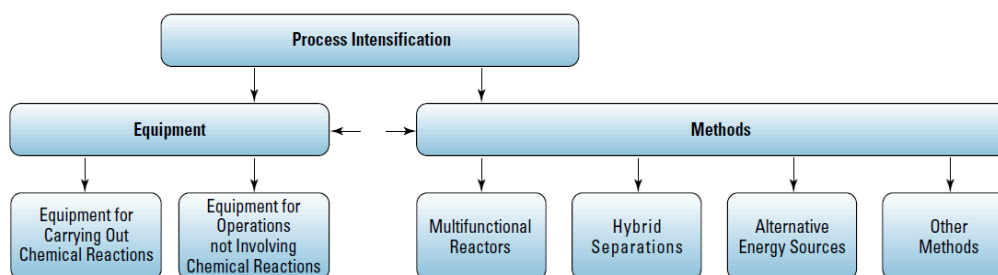


Figure 1. Procedure intensification and its parts.

Procedure Equipment

When we examine the Agricola's woodcut systems, we say that progressing of little stirring technology is not completely real. The technology of stirring has been mainly intensified during the last two decades. Stankiewicz (2002) expressed that this was attained not by refining powered blenders but, by deserting them in errand of static churns. These efficient devices are god models of procedure-increasing gear. This research team proposed energy-efficient method for mixing fluids and, they are using different functions. For example, static-mixer reactor of Winterthur is mixing basics made of warmth-transfer tubes. This reactor can be functional in procedures of mixing as neutralization reactions (Science and Technology) (Figure 2).



Figure 2. Proprietary reactor-mixer is a model of procedure-intensifying equipment.

Microreactors

Even higher values of warmth-transfer constants can be obtained in micro reactors (Stankiewicz, 2002). Microreactors are chemical devices of awfully small sizes that typically have a construction containing of a few layers with micromachined stations. The research team stayed that

the layers perform various operations, from mixing to catalytic reaction and warmth exchange. Integration of the operations within a single unit is one of the more significant advantages of microreactors. According to him, the very high warmth transfer rates reachable in microreactors get for operating highly exothermic procedures: “very low surface-field amounts make microreactors perhaps striking for procedures including short-tempered reactants” (Science and Technology) (Figure 3).

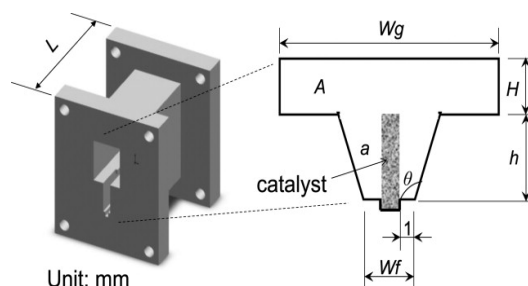


Figure 3. Design of a catalytic reactor

Multifunctional reactors

Centi and Perathoner (2009) stated that it could be defined as reactor to increase the chemical transformation and achieve a high degree of integration. For example, they continued to integrate the response and temperature transfer in a very operational unit, the opposite stream reactor (Science and Technology).

Other reactive reaction and separation types, reactive extraction (Minotti, Doherty and Malone, 1998), reactive crystallization and the integration of reaction and sorption processes. And periodic separation reactors (Vaporciyan and Kadlec, 1989).

Result

In this paper, we have mentioned a diversity of gear and systems that have an important and efficient role in the strengthening of chemical procedures. This is a restricted group of the materials. We hope that new increases will come from researchers worldwide. For an example, mixtures of responses and one or more-unit operations (called hybrid operations) will play an active part in the future of maintainable chemical Procedure Industries (Science and Technology).

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On The Computer Technology

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Abstract. Computer technology uses the computer to gather, process, store and precede information. A long way, it has been reached in the history of wireless. Wireless technologies have undergone massive growth. Computer technologies have followed different evolutionary lines aimed to unify objective that performance and efficiency. In this study, we deal with the basic lines of the computer technologies focusing the future possibilities. We also focus the evolution and development of computer technology. It is related to the information and communication technology. Communication technologies extends around the world faster than most other technologies in current centuries.

Keywords: *communication technology, development of computer, computer industry*

Introduction

We satisfied rapid development in the presentation and ability of processor systems for over last decades. The view of that interesting achievement can be abridged in this word: admiration and parallelism (Furber, 2008; Steane and Rieffel, 2000). They stayed that request has controlled the manufacturing to need an extensive variety of calculating resolutions by growing presentation and volume at this area. Steane and Rieffel pointed out that type of general presentations but lead to the way for the future periods calculating structure. In this point, we add that the request for eternally larger presentation is an accustomed term to the lobes of each processor model way. Replying to the request, computer has changed to achieve various processes as demanding a greater capacity of properties of the chip. We need to investigate the instructions in each of these three features of developing computer technology to understand the future in computer technology. Progress in computer technology has been outstanding level since 1980. Gordon Moore explained his foresight of progress basically in depending on transistors count that could be try to factory-made cheaply on a unit of combined semiconductor circuit (Furber, 2008; Moore, 1965). The semiconductor industry appears to be confident in its ability to continue to shrink transistors, at least for another decade or so, but the game is already changing (Furber and Wilson, 1987).

From Past to Future

When the Manchester S.S.E.M. that nicknamed “Baby” computer first be activated (June 1948) a code stored in its CRT memory to compute the accurate result, this was interpreted the beginning of the new age of calculating (Figure 1). We celebrated the 70th centenary of this particular occasion this year. Over those 70 years we have viewed so several growths in computer hardware that have made computers more elastic and rapidly to software, but these are into irrelevance along with the development in the technology used to manufacture the devices (Furber, 2008).



Figure 1. A very big 'Baby' fills the room
(www.google.com.tr/search?q=Manchester+'Baby'+computer&rlz)

We need to compare some of the important features of devices then and now to see how far information and computer technology has developed in past 70 years. The “Baby” (it's called formal name the S.S.E.M. - Small Scale Experimental Machine) engaged different count post - workplace stands of electronic based on thermal valves – vacuum tubes and processed 700 processes in a second while intense about 3500 Watt electricity power (Furber, 2008; Anderson, 2009).

In 1985, the first A.R.M. processor (ARM-1) processed 6 million processes in a second and consumed 0.1 Watt power. In the present, a classical type power effectual surrounded computer, such as the ARM-968 that we will see many times later, inhabits 0.4 mm² on the exterior of a silicon-based chip by a 130nm process (figure 2). This CPU has as more capability in its registers called Manchester Baby's primary retention. The ARM-968 executes approximately 200 million processes in one second on 20 mW power budget (Furber, 2008; Furber and Wilson, 1987).



Figure 2: The first ARM (Advanced RISC Machines) processor
(www.google.com.tr/search?q=ARM1&rlz)

The basis of the different two energy efficiency that is the computer in same class to the liter per km” metering for a car is a version to compare these computing devices S.S.E.M. (“Baby”) used 5 joules for a command, ARM-1 used 15 Nan joules for a command, and the ARM-968 used to 100 Pico joules for a command. The ratio of the S.S.E.M. and ARM-968 figures points to an amazing high degree in the energy - efficacy of computer machines over 60 years by a factor of 5×10^{10} (Furber, 2008; Furber and Wilson, 1987). We can say that this unbelievable development is to increase in consumer electronics and pervasive computing. The rapid speed development in processor hardware has become closely related with Gordon Moore’s 1965 forecast that the count of transistors on a combined semiconductor cycle will last to rise up increased for an additional 10 years (Furber and Wilson, 1987). According to Borker, “it has developed a self - sustaining prediction; manufacturing asset is set at the equal needed to make it”. As an imagination of how distant this has absented, the 128GB microSD unit includes of the integrate of fifty billion transistors in a very thin field minor than a fingernail and only a millimeter thick (Furber, 2008) (Figure 3).



Figure 3. 128 GB micro SD card
(<http://www.globalsources.com/manufacturers/12GB-Microsd-Card.html>)

There are negative ways of this exponential progress (Roy at all. 2006). They noted that the total price of building producing facility also rises up logarithmically, as does the spending prices of designing a hi-tech chip; the manufacturing of integrated semiconductor circuits has been highly lucrative because of its nearly unlimited using possible as high-technology manufactures develop smaller, lighter, multipurpose and cheaper. There are several important reasons what for progress in information technologies will slow, and every expert has their favorite which physical dimensions, economics, kind of power consumption, process diversity. Stensaker at all. (2007) moot that the following improvement will be hardening to difficult, with project and engineering prices rising up inevitably as the dimensions of very minor devices reduces their features progressively solid to control. All of these reasons have the meaning that the future will not be easy an extrapolating the previous.

Conclusions

The first 70 years of electronic and computer technologies have witness powerful progress, exemplified by the notable improvement in computer energy-efficiency. These developments provide a power base for the increase in consumer electronics products that we have today. Much less dependable technologies will follow, making up to changes in structural condition and design pattern.

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On the Concept of Nature in Chemistry

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Abstract. A mechanical knowledge of chemistry should be actively taken by learners. The modern images of the learning process being the transfer of information from teacher to student are now widely insufficient. The notion of nature in chemistry looks like a contradiction, then normal language advises a clear contradiction between the concepts 'ordinary' and 'chemical'. But, using chemistry as a discipline of nature means that nature is the object of chemistry. So, the etymological perspective, there is not a contradiction between 'biological' and 'natural'.

In this paper, we present a historical investigation of the main concept of character in chemistry. We focus that the contradiction has been founded on motionless and teleological concepts of nature during olden times and that chemists have deserted the dynamic concept of nature.

Keywords: chemistry, concept of nature; synthetic- organic chemistry

Introduction

"Amongst all the arts, the alchemical art copies nature finest" is the famous words of Albert the Great who lived about six centuries ago. The philosopher constituted the opposite view of the imposition of the impeccable imitation of nature by changing the basis of nature. Latin chemistry was not the same as the chemical skills. While the last applied various types of substantial changes, chemical alterations were very specific changes (Schummer, 2003a; Drews, 2000).

According to a new view, alchemists have drawn many derivatives from the expression lama imitating nature, which serves as the interpretation of the framework and the justification of alchemy; Alchemy, taken to dogma, technology is considered as a semi-personified agent, said that the lower than Nature (Newman, 1989). The same point of view is presented in the following terms, frequently and briefly, so that it often appears contradictory (Schummer, 2003a);

- Alchemy simulates nature as long as it improves metals
- Alchemy variations nature as long as it variations the real substantial situation.

Schummer (2003a) emphasized that mixtures can resemble natural compounds and that nature cannot only be imitated with nature in some scientific organizations of man. More precisely, what it is described the chemical clarification of substantial change was a presence method to the chemical query of how human activity could touch nature. In addition, since the concept of nature does not correspond to the teleological concept, a scientific argument had to be given about how nature can variation nature. In this complex situation, an explanatory information was presented that the natural maturation of ores in the mines revealed a kind of astrological explanation that the sun could not provide by technology (Schummer, 2003a; Ramberg, 2000). The normal results of the concepts of nature have influenced the alchemy methods and scope, which some academics have as an alchemy approach as the fundamental science of nature. They made alchemical application to the construction of gold or some other items. Such a remarkable position, effects on widening the alchemy perspectives must shift the idea of nature. These effects have also been added to chemical levels to different levels, such as drug preparation (Schummer, 2002).

Chemistry According to the Public

In Aristotle's view, the teleological concept of nature is not inorganically different from the dynamic concept. Ramberg (2000) was said to be prone to wear as a chemical potential to join oxygen in the atmospheric environment. According to him, if the atmospheric conditions are changed or if they cover the iron part with a defensive sheet, it does not disintegrate but maintains its level of potential. As for the material world, he stressed that the concept of teleological nature would insist that its development be controlled in general by pre-existing expiration in ancient times. In this step, that result can be controlled in scientific descriptions, for example, functional ideas such as revision of species to the theory of evolution, or selection rules, such as sending to such ends (Schummer, 2003a; Schummer, 2003b).

Schummer (2003a) emphasized that the chemists' have clearly analyzed the progress in learning metaphoric terms from controlling and learning from nature. A way of no return and so, produced the own communal vision. He also stated that there are times when nature control is highly predicted in society, and that it can effectively withstand approaches.

Alchemy for Public

Schummer (2003a) stated that at the end of the 18th century, alchemists felt that they should defend material transformations against the theological claims of creation. According to him, like some special acids, the situation was complex when new substances were produced which in no way represented a change of nature. The alchemists admitted that they produced only unknown things in nature, either statically or teleological.

In this century, when alchemy took on a new useful basis in chemistry, theoretical conflicts increased extremely. Although drugs have a long tradition in early Roman medicine, they are made up of artificially minerals. Famous former chemist Paracelsus and his team have expanded the concept of teleological nature to include the utilitarian aims of mankind and the famous alchemy definition get to be used without the fine and sharp great art in things he does not want to want nature. He doesn't bring anything perfect on his own, but he has to complete it. This perfection is called Alchemy. It is the alchemists who have brought the things that arise out of nature, in the interests of humanity, to the state's foresight (Schummer, 2003a).

Schummer (2003b) emphasized that the transformation of resources for the advantage of humankind was written by Nature and by infinite power. Assumption is that humanoid ends are usual ends. However, Paracelsus and his team emphasized the

need for chemical processes to mimic Nature (Schummer (2003b), in the next century, this expression lost its active meaning and provided meaningless support, just as any chemical transformation for medical purposes could now.

The Mechanical Approach to the Concept of Nature

Schummer, 2003a gave a key to thoughtful the theological foundation of powered philosophy. In this vision, Nature is “an intelligent and powerful creation and the special components that make up the environment (Newman 1998). On the one hand, Boyle (1772) structured that idea as the goal of some philosophical reproach of conceptual uncertainties. He modulated a kind of goddess for us (Schummer, 2003a).

Boyle's mechanical and experimental philosophy could not oppose anything on its theological basis (Newman, 1998). If we put the philosophers of school into the concept of nature that intervenes according to emergencies, in the first tissue of evolution, we once assign it to God's science to make a move that makes the motor progress in the way of everything (Schummer, 2003a,b). According to Boyle (1772), since the world is not anything other than matter and movement once governed by the Laws of God, the mission of science is to emulate the science of God by experimentally thoughtful the design of all material and concrete things. Mechanically He then proposed abandoning the accepted idea because it was unpredictable with his mechanical-theological project (Schummer, 2003b).

Organic Chemistry

Vitalism, chemical history, Aristotle's mineral kingdom and natural animal kingdoms according to the distinction between the ancient Aristotle according to organic and inorganic materials had a very important role to cause the main distinctions (Schummer, 2003a; Boyle, 1772). The term 'organic substances' is a famous information coming from 'substances extracted from organized organs' (Newman, 1998).

The term organic 'means the Greek term 'Organon'. In the original sense, the organs of a body are useful prepared materials of the body as a complete system. From a functional or teleological point of view, seeing a part of the body organically is a special classification. The unique difference between live and non-living matter is whether it is arranged according to an herbal character. This is the basis of all kinds of life until the 20th century. It is acceptable to say that vitalism is widespread until the 19th century, because anyone who rejects a life principle has had difficulty in explaining bodily organization (Schummer, 2002; 2003a).

Crystal Points in Chemistry

The teleological concept of nature in the form of plastic is not very useful in the sense that it divides the world to natural and simulated elements (Schummer, 2003a). For example, in chemical discourses we remove both concepts, then some things will disappear. In this statement, many chemists circumvent using the term nature “or” the nature of things. We can say that the two concepts are double-acting in linking expressive values. Schummer says 'to learn from nature', which says it has an item to work and the information obtained has an advanced value than the other information. From this point, he concluded that the abolition of the two concepts should be exchanged about the chemistry term and its values (Ramberg, 2000).

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On the Electrical Power Distribution Schemes

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Abstract. In this paper, we are giving overviews about electronic power distribution schemes by view of the authors. The Spreading services must provide productivity and decrease functioning costs and repairs prices given which customers with a dependable influence resource and services. The active use of data technology is vital to achieve fast success (Chopade, 2005). The structure of a power spreading scheme has been modified to meet some basic requirements. We focus, as the new technologies, the structure of intelligent substations in the power spreading scheme, defense and control-unified equipment.

Keywords: power industry, electrical spreading scheme, new technology

Introduction

Spreading Organization Structure is a basic instrument for extensive administration of an electrical arrangement. The initiatives in spreading administration contain whole spreading scheme spreading management for electrical services (Chopade, 2005; Boyer, 1999). Current spreading schemes have definite intrinsic ineptitudes because of the donation (Alsall, 2001).

The power setting needs renewed approaches to approve its location as a power service. Controlling of energy losses with a visualization to active process of group due to inefficient spreading network load forecasting and scheme planning (Chopade, 2005; Hag and Ygge, 1995). Obtaining a consistent power resource was an significant collective necessity international arena (Kashiwazaki at all., 2013; Chopade, 2005; Iwatani, 2001);

- Numerical technology for the presentation of semiconductor,
- Scheme conformations for fast communication (Kashiwazaki at all., 2013).

Kashiwazaki and his searching team noted which combined in the arguments are difficulties for the control of substations. Also, he claimed which, by applying the improvements, the next investments for the scheme could be possible (Kashiwazaki at all., 2013):

- abridged prices in the observing and process,
- abridged repairs prices based for the organization of tools,

Data technology for energy spreading scheme

The meaning of data technology in this sector is producing, treating, loading and exploring of the data (Hag and Yagge, 1995; Chopade, 2005). In the power sector, it is needs full constructing to control data for all customers since the data required is at customer level. The next data schemes are recommended for an efficient result (Chopade, 2005);

Data using of customers by numerical charting: Chopade (2005) noted which;

- first, planning of networking
- secondly, information registration (Figure 1).

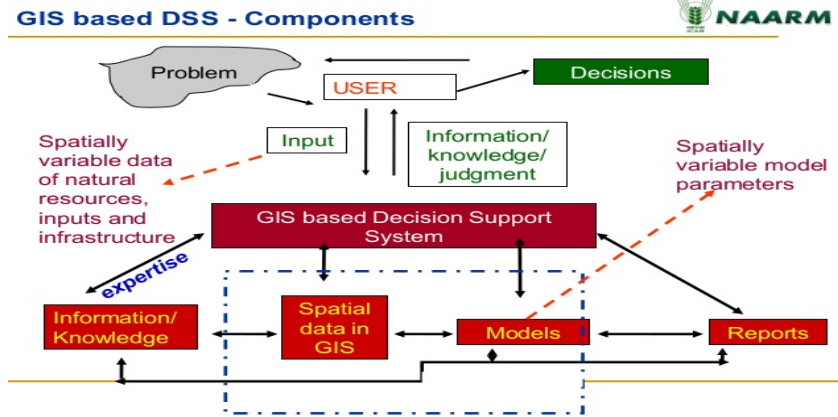


Figure 1: GIS based scheme.
(www.google.com.tr/search?q=GIS+based+scheme&rlz)

Contributing devices to intelligent substation

The power spreading scheme and monitoring equipment are independent of requires reductions in initial investments (Amin, 2001). Also, connection is based on the signal's component price of apparatus and miniaturization and coming through the cable. Amin stayed which an abridged budgets for the all lifecycle, containing the intelligent substation shares all data on process/repairs costs of the substation scheme. Apparatus, control, defense, measurement. He pointed out which the structure of a new power spreading scheme apparatus monitoring equipment through one bus by has been modified to meet these requirements. High efficiency and technology made fast advances in recent miniaturization can be accomplished (figure 2).

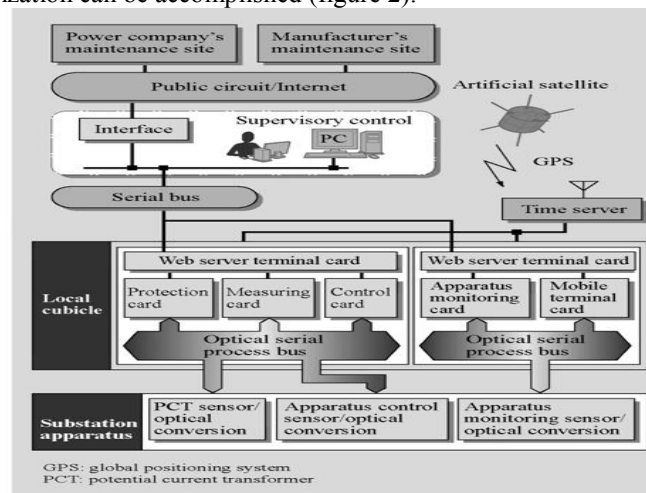


Figure 2. A scheme configuration for concept of intelligent substations.
(www.seminaronly.com/electronics/Artificial-Intelligence-In-Power-Station.php)

Result

In this study, we mentioned the emerging new technology in the electrical resource scheme. Technology investigation has been conducted on the smart scheme on constitution of the scheme because of the development in communication technology (Kashiwazaki at all., 2013). We believe which it needs to be accelerated the development of products in accordance with the demands of costumers.

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On the Energy and Economy Relation

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Abstract. The link between economic growth and power consumption is key to power policies. It is recognised that power consumption and economic growth are directly interested, but the direction and level of this relationship is not always clear. It is a changeable factor when a country's economic growth stimulates power consumption. And, the interested components are not always the same when increased power consumption of a country promote its economic growth. An increasing share of renewable power in the power mix of a country can provide meet the growing future demand for power while influencing economic improvements. Renewable power sources can increase diversity of power sources, contribute to power security and to the long-term availability of power supply. Renewable power sources are the main factor to promote regional improvements. They can be used in less developed areas without conventional power sources. Finally, renewable power could reduce costs associated with climate change. In this study, it is given some authors perspectives by overviewing of their some analyzing.

Keywords: power, economy, finance, renewable power

Introduction

The power system is planned by the demand for power amenities. This mean that it is compelled by people and free conditions, by the level of financial action and by technical and organizational vicissitudes. Power isn't last point and more widely the incomes for supply power facilities (Arthur, 2009). According to Arthur, supply power services involves investment, operating costs and fuel costs. Espey (1998) stayed that the economy is the sponsor of power methods and of their constituents and power movements. Yeager (2008) focused the determination of power level that help to economies necessity to occupation and to support the community improvements.

Grade attention to incorporating power efficient technic has the critical probable to report the main power interested encounters ways (Goldemberg et al., 1985). They pointed out that the evolving power system characterizes technic change and innovation. Technic is the vital subject among the power organization and the economy, specially the 21th century economy. Power and economy are a partner group that technic potential that power transporters could present (Ekholm at all., 2010; UNDESA, 2011). They noted that the industrial rebellion was supported by coal that provided industries with a much more concentrated fuel. So, this turned out to be a upper production according to firewood oils and that improved economic advancement. According to them, abundant admission to coal increased productivity and stimulated economic improvements in the nineteenth century. Admission to contemporary methods of power or usually safe, affordable power exporters essentially potential the contemporary economy in this century (Yeager, K.2008).

Technic and Diffusion

It is pointed out that whole power R&D books for lower that 1% of the annual income of the United States power area. They suggest numerous explanations for this situation (Weiss and Bonvillian, 2009; Yeager, 2008):

- an lengthy period of comparatively small amounts,
- an advanced area,

Research studies assessing technic cycle and dispersion in evolving nations have registered that directness to trade is a required essential to successful cycle (Yeager, 2008; O'Neill at all. 2010; Rogner, 2010). One of basic factor for facilitating technic cycle to relate easily to the incentives for private firms is sophisticated stuff rights. They defined sophisticated stuff rights as that stimulate technic cycle from abroad, licensing new technic, and advancing in domestic enterprises abroad.

The World Bank (2010) assigns a part for high-income nations in provide the following points; (Yeager, 2008):

- extreme industry consolidation in this area doesn't decrease incentives for nations
- general strategies don't stop external companies from licensing operations

The position of the R&D work for increasing "low-emissions technic" proposes that it has a continues model for countries. The part of countries is spreads outside power R&D (Riahi at all., 2007; Yeager, 2008):

- in supporting applied power technic R&D through community R&D expenses and creating and keeping appropriate incentives,
- existing walls for the implementation of cleanser power technic.

Investments in Power

Investments are important for power supply abstraction, power adaptation to serviceable fuels, transmission and circulation methods (Yeager, 2008; Taylor at all., 2008; Tomlinson et al., 2008; IPCC, 2007). According to Yeager. (2008), here are two major categories of investments:

1. investment in the expansion of technic and substructures under inexpensive or controlled market situations,
2. improvements, and commercialization, counting market construction.

Internationalist strategy resolutions focusing on the brief is operating deprived of a total image like this as of power organization alteration or a total international environmental arrangement (Yeager, 2008; Markandya at all., 2010). So, the risk premium on like this investment go to advanced power charges till supplementary speculation is forthcoming. They staved that the portion of money formation assigned to the power sector is appraised at about 4–8% of total savings. This excludes power-interested savings at the end use of the power system like this as structures, heating methods, cars, and refrigerators. The meaning of which are transporting the power facilities which customers request (Yeager, 2008; Wang at all., 2008; Lutz at all., 2010).

Result

We briefly presented some ideas on power and economy by the light of some authors; A powerful economy is necessary to confirm the power stresses are encountered. The reserves and substructure effort are passed and the incomes to encounter the requirements and needs to a maintainable coming. Finally, maximum fresh technic has capital-intensive. But, these minor power request and fuel feasting (Yeager, 2008). Appropriate inducements and economical schemes to endorse the improvements are important.

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On the Energy and Environment

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Abstract. Uncontrollable using of vestige oils has promoted contrary special effects on environment as pollution of underground and superficial waters. Many researchers detected that the investments of unpolished oil are decreasing, and authorized mentions on an important impairment in the oil obtainability for next 30 or sixty years. The renewable energy procedure has completely good results for the atmosphere and gives negative effects on the surrounding in spite of all the desirable characteristics involved (Luis and Bandala, 2014). In this study, we are focusing on the effects of energy sources to environment and give some overviews by the light of the some authors.

Keywords: energy and environment, pollution, renewable energy source

Introduction

“Discussing energy problems without using adequate concepts and proper terminology makes as little sense as disregarding the universal laws of nature. It is virtually impossible to make a sensible contribution to energy development without reference to quantitative issues” (RWEDP Report, 1997). Energy and Environment are two interpenetration words that can hardly be separated. In 2018, general problems of the world are at the dramatic level such as accelerated demographic growing, lack of sufficient food and health for all the inhabitants, environmental disasters including international warming and energetic crisis. From this point of view, we can say that energy and environment problems are quite considerable and are linked in many ways. The use of fossil-derived energetics has become in a serious problem due to the production of greenhouse gases and the subsequent international warming effect (Corzo-Rios, 2012; Cervantes, 2007). He also noted that production of goods for human life has led to the generation of liquid, solid and gaseous residues which contaminate the matrixes of water, air and soil pollution.

Sustainable energy development needs approaches and apparatuses to relate the environmental effects of humanoid actions for numerous crops (Panwar, at all, 2011; Farhad at all., 2008; Fridleifsson, 2001). Vestige fuel has a power hostile effect on the surroundings places, coming from uploaded warm dangers all over the world (Sims, 2003). Everybody know that changes towards environmental improvements are becoming more politically, especially in developed countries.

Overdone consumption of fossil fuels had initiated international warming by waste gasses (Hall, 1991; Youm at all., 2000). Nielsen (2009) stressed that the arrangement was done with the pollution stoppage goals to monitor emission of these greenhouse emissions according to the Kyoto Conventions arrangement.

Connection to the energy consumption

If we focus to the source of maintainable produce project, we can see a good balance between sustainability, functionality and the user context. Also, a designer wants to see this perfect balance, he could be careful for the environment and developments. One of the original technological developments is the request of maintainable energy technologies (Diehl and Mestre, 2009; Haque, 2009).

The nonstop rise of the using of the energy consuming crops is a today's world reality. Therefore, one of the real problems would be to enhance the electric feasting of the crops in the future. At this moment, we can say electric source of power is acquired from the other sources as main and battery (Diehl and Mestre, 2009; Bergman, 2008; Boons at all, 2011).

In last years, there is an increasing mobility trend in the consumer and professional market of the exploding crops. We believe that rechargeable energy storage media have an efficient role in all these crops. Bergman noted that “there is a necessity to recharge these storage media, not to be limited by the availability of a mains socket”. Also, he added “many consumer electronics crops currently function on low voltage DC (8-20V) instead of the 220 (or 110) V AC”. As a result of this change, the number of used batteries and adaptors are increasing rapidly (Diehl and Mestre, 2009).

Renewable energies

Biomass and hydro-power and other renewable energy sources appeal usually by a systematic way (Kumari at all., 2012). “Human power” uses the physical energy of the consumer to maintenance the action of the crop (Mathews at all., 2011). The next words are basic product of electricity via humanoid interface:

- thermal
- physical

“Solar Power” is created by the adaptation of sunshine to electric via cells (Diehl and Mestre, 2009; Reveles, 2010). The cell is modular, and light don't have effect on the atmosphere, and need least keeping of the procedure. They present some benefits linked with conservative power generation systems. Reveles note that “the cells were developed in 1970s, at the time they were expensive and quite inefficient. Since then, technology has been further developed to improve the efficiency and to reduce costs” (Diehl and Mestre, 2009). To develop “fuel cells” that is a giant global power in the last fifteen years (Diehl and Mestre, 2009; Sokka, 2011).



Figure 1. Renewable Hydrogen Fuel Cells
(www.google.com.tr/search?q=fuel+cells&rlz)

Result

We presented some effects of energy sources to environment with the overviews of the some authors. A comprehensive analyse of main renewable energy tools for engineering requests focusing on the energy sources as solar cookers, wind energy, biogas technology and other new energy sources (Panwar, at all, 2011). The necessity of increasing of energy sources and fuels as maintainable way is a compulsory step needed to be taken because of this unhappy situation (Luis and Bandala, 2014).

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On the Modular Construction System

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Abstract. Generally, integrated construction can be stayed as that is a constructional system in which a building is constructed with a special model situations, consuming the similar equipment and model of special and similar constructs http://www.integrated.org/HtmlPage.aspx?name=why_integrated. In this study, we present a brief introduction to architectural construction of system administration by the view of some authors. Some special necessities could lead customers to select an integrated construction. We need to add that, modelling an integrated construction is a multifaceted procedure and could needs a methodical attitude in a long time period (Van Gassel & Martin, 2006).

Keywords: Integrated Construction, System Management

Introduction

Integrated constructions are usually powerful according to conservative building as structurally. The constructions units have unit part in its design as roof or floor, when they combined (Gray and Will, 2001). They noted that construction off site could make guarantee for powerful building administration. Also, the team stressed that industrial plants contain different modules (http://www.integrated.org/HtmlPage.aspx?name=why_integrated). In this step, we can say that integrated building is intrinsically a natural fit view because of the modeler searching of good supportable systems. Van den (2002) expressed that construction with the condition of organized situation decreases unnecessary points.

Integrated Systems

Van Gassel and Martin (2004) were defined the integrated building as “integrated building as a method of building that ‘utilizes pre-engineered, factory-fabricated structures in three-dimensional sections that are transported to be tied together on a site’”. We can say that the definition focuses on the production and method of tool portions. Integrated building has a more widely manning. In this study, we give the integrated building characterised by (Van Gassel and Martin, 2006) as bellow;

- Integrated building includes integrated parts constructed in a fabric
- Integrated parts have established grid dimensions
- The integrated buildings are made by particularly educated persons
- The apparatuses of the integrated materials are stocked in the fabric
- Integrated materials are produced by the view of to client

Integrated building system productions are shown below step by step (Figure 1).

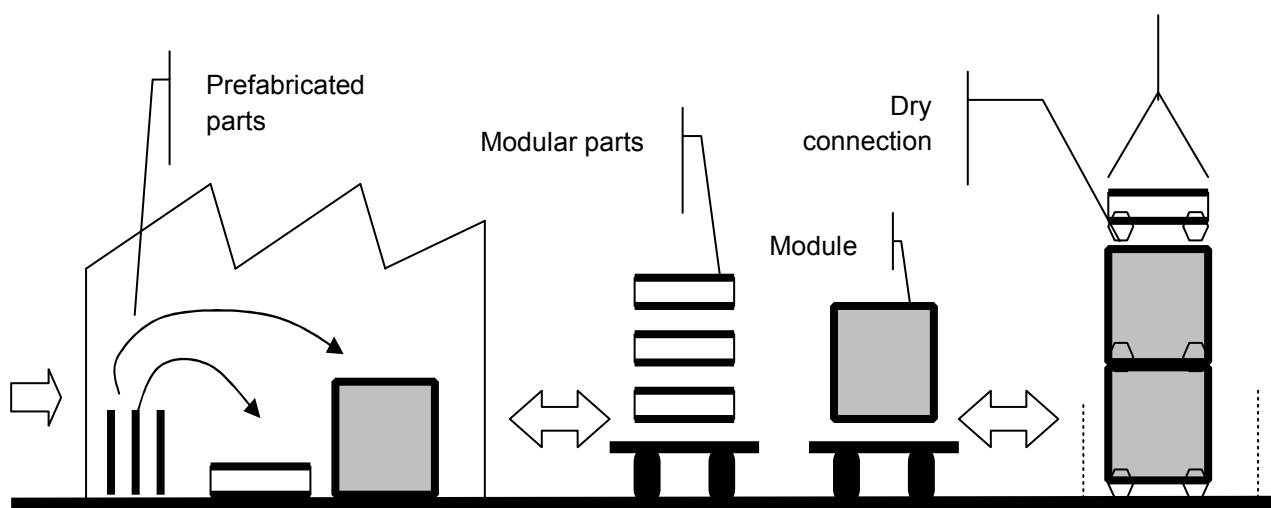


Figure 1. Integrated building structure fabrication system (Van Gassel and Martin, 2006).

We also exhibit some integrated systems from all over the world that they have constructed according to their own systems;



Figure 2. Some models of integrated building systems.

Result

In this study, we focused and presented a method modulated by Van Gassal and Martin (2006) founded on the features of integrated building. Many integrated builders formulate building structures, focusing on the bazaar and crop presentations. This working system give them some advantages as that reducing the risk of failure.

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On the Prefabricated Construction

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Abstract. The concept prefabrication is a development industry word applied to express combinations that are fabricated under processing factory conditions and afterward transported to the buildings site. In this study, we focus on some universal studies to have an overview of buildings methods of prefabrication systems. Prefabrication systems could be divided according to materials, methods, structural configuration etc. There are numerous advantages connected with developing and combining buildings utilizing prefabrication buildings frameworks. The main goal of prefabrication systems is to offer a manner to get a well-designed construction that is simply planned to resident's requirements. It could be stated that prefabrication systems in building buildings have the most effect on time and cost reduction. Prefabrication systems can be applied much to building constructions if the difficulties of prefabrication buildings are resolved.

Keywords: prefabrication, building production, buildings industry

Introduction

In the general context, prefabrication is the concept of collecting segments of a construction in a manufacturing process and assembling site and transferring full elements to the development site where the structure is to be constructed (Limthongtang, 2005). He noted that the item is utilized to recognize the procedure in the big ordinary development routine of moving the essential resources to the buildings site that all get together is confirmed. Designers are using different kinds of materials, they usually prefer to choose light weight ones. Wood and steel are the most practical materials in prefabrication buildings. We also need to add that prefabrication technologies need high level of knowledge and experience and high quality of application on site.

The industrial revolution made a big change in the world economy by effecting all sectors in all individual environment from farming to health. After the incorporation of the last technology, the effort goes to be quicker since it starts connection to machineries and apparatuses. The market demand for products start to increase on the factories because of the increasing number of populations specially in metropolis after the immigration of the people from superb to this place which is one of the reasons of industrial revelation at the end of 19th century (Abulhaem, 2012).

The production marketplace determined a new approach that called "mass customization" (Abulhaem, 2012; Balamuralikrishna, 2005). According to Abulhaem, this is fast adapting as a widespread commercial strategy which focus on individual expressed needs. This strategy was applied to most of the industries from all over the global economy and has a positive reaction from the clients. Finally, we can say that, the old "mass customization strategy", today, is turning out to be "prefabricated building buildings".

In this study, we analyse the different kinds of prefabricated buildings methods applying the principle of mass customization production such as linear production, 2-dimension production and 3-dimension production (Abulhaem, 2012).

Prefabrication Systems

There are 3 kinds of prefabricated building methods every one is special for different type of elements (Abulhaem, 2012):

- linear production
- 2-dimension production
- 3-dimension production

We only deal with 2-dimension and 2-dimension production in this paper.

2-dimension production

A construction contains of several mechanisms presented as products. The word “services” consist of design, buildings and marketing. The two concepts are complexed with home supplies to generate a housing development. (Abulhaem, 2012; Noguchi, 2003). Noguchi also noted that when seen as a ‘system’ for modelling, creating and marketing of a subject, “mass customization” is intolerable if it hasn’t presented in a customizable manner. According to him, at the project phase the client must regulates the conformation of his/her house in selections presented by the place of work that benefiting from a choice system to aid customers to simply select from the several possibilities. Later, buildings engineers and designer be active to choose the number of prefabricated construction mechanisms the system want. Then, in the final step, the study group construct a client association management to make powerful the maintaining dialogue by their client (Abulhaem, 2012) (figure 1).



Figure 1. The customers with the architect in the design stage
(www.framepool.com/en/shot/956832931-architect%27s-plan-customer-interview-architect)

3-dimension production

According to Fujimoto (1999), Toyota performs Heijunka by producing to client direction; typical models lets for Toyota to preserve a rich source of the funds (Abulhaem, 2012; Fujimoto, 2012). The upcoming holder of a house would get to the Toyota Park that the staff could look numerous of the selections and choice particulars. The Toyota internet web line permits customers to practically compose a diversity covering, standards, models in a rinch environment to uniform his/her wants and perceptions. Many of the selections are founded on the similar resources at the store. When the direction is delivered, the stuff could be got the drops (Abulhaem, 2012; Liker, 2004). The all elements are not collected to do the Toyota Home modules and the accomplished construction are personalized” (Abulhaem, 2012) (figure 2).

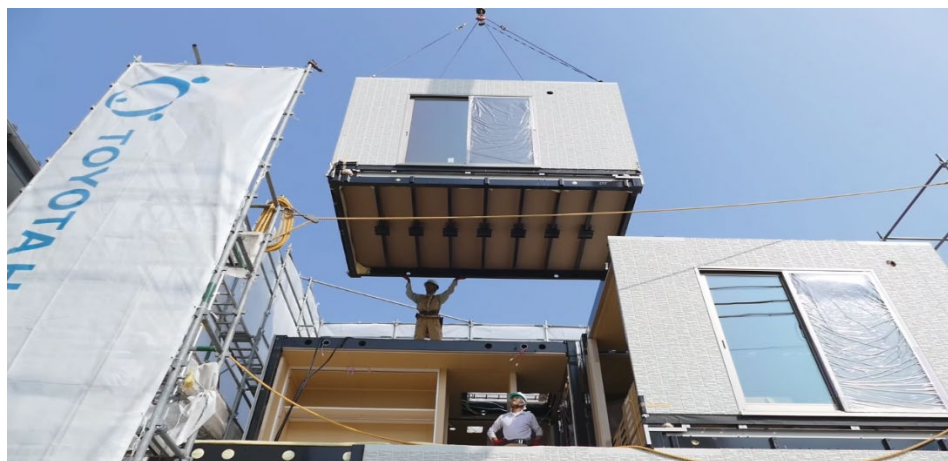


Figure 2. Module fabrication at Toyota
<http://www.prefabmarket.com/ikea-toyota-and-muji-are-actually-prefab-home-manufacturers/>

Result

We believe that some basic strategies for construction model could be approved in construction mass manufacturing sector according to the information and statistics attained in the investigation after studying and analyzing the methods of prefabricated buildings and the connection between the client and the works; The first of them is every prefabricated building model have the special context that key construction, mechanisms and basic design connected to the key structure of the construction. Secondly, the architects should have the main role at the design stage; they should provide two conditions for the clients. The final is the fabric get offer for the client all the subject that they would want to choose their selections (Abulhaem, 2012).

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On the Zero Divisor Graph of a Commutative Ring

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Abstract. In ring theory, a main part of abstract algebra, a (special) commutative ring that the basic operation with multiple function is commutative. The main area of this abstract mathematic of commutative rings is presented commutative algebra. A nonzero element z in a commutative ring is defined as zero divisor element if it has a nonzero element x with $zx = 0$ and $xz = 0$. Let $\Gamma(R)$ be the zero-divisor graph for a commutative ring with identity. In this study, we focused and presented the center of a commutative ring. Also, we noted the connection of this element that the center and the zero-divisor graph in a such a ring.

Keywords: commutative ring, center of a graph

Introduction

The conceptual definition of the zero divisor in a Ring is given as a nonzero element z in a ring is called zero divisor that it has a special element x such that $zx = 0$ and $xz = 0$. Beck (1988) defined the zero-divisor graph of a commutative ring R coloring a graph of a clear set R , and two vertices are adjacent if their product is zero. Later, Anderson and Livingston (1999) modified the vertex set to $Z^*(R)$, the set of nonzero zero divisors of R , this graph is identified by $\Gamma(R)$ (Redmond, S.P. 2006; Nazzal, K 2012).

The set of Gaussian integers, denoted by, $Z[i]$, is given by

$$Z[i] = \{a + bi : a, b \in \mathbb{Z} \text{ and } i = \sqrt{-1}\}.$$

It is obvious that $Z[i]$ is a ring with the very familiar operation that complex operations. A Gaussian prime integer is a unit multiple as that one of them is $1+i$, or a prime integer q in \mathbb{Z} which is congruent to 3 (mod 4), or $a+bi$, $a-bi$, where $a^2+b^2 = p$ and p is a prime integer in \mathbb{Z} which is congruent to 1 (mod 4). In the study, p and p_j with the mean prime integers which are congruent to 1 (mod 4), that the index are define prime integers congruent and modulo relation three and four, respectively (Nazzal and Ghanem, 2012).

Let $\langle n \rangle$ be the principal ideal created by n in $Z[i]$, which n is a positive integer number greater than 1, and let $Z_n = \{0, 1, 2, 3, 4, \dots, n-1\}$ be the ring of integers modulo n . This factor ring $Z[i]/\langle n \rangle$ is congruent to $Z_n[i] = \{a + bi : a, b \in Z_n\}$. Clearly, $Z_n[i]$ with addition and multiplication modulo n is a ring. That special ring is given by the ring of Gaussian integers with n modul. The zero-divisor graph of a commutative ring R , defined by $\Gamma(R)$, is the graph which vertex set is the set of the nonzero zero divisors of R , denoted by $Z^*(R)$, and the element group (Redmond, S.P. 2006; Nazzal, K 2012).

In the article, it is given a full sembolization for the center and the core of $\Gamma(Z_n[i])$ (Osba et al., 2011).

The Center of $\Gamma(Z_n[i])$

The center of group is defined as the set of all vertices of group with minimum eccentricity. For any vertex x of a related graph of the group, the position of x , given by $s(x)$, is the sum of the interval from the element x to the element of the group. The all special set of vertices with lowest level is named the median of the graph (Redmond, S.P. 2006; Nazzal, K 2012). The center of $\Gamma(Z_n[i])$ which n is a power of an element with prime is studied (Nazzal and Ghanem, 2012) where it was shown that the center of $\Gamma(Z_{2^m}[i])$ consists of one vertex, namely $\{(1+i)2^{m-1}\}$ and the center of $\Gamma(Z_{q^m}[i])$ is the following set

$$\{aq^{m-1} + bq^{m-1}i : a, b \in U(Z_q) - \{0\}\}.$$

Also, we add that $Z_{p^m}[i] \cong Z_{p^m} \times Z_{p^m}$, the center of $\Gamma(Z_{p^m} \times Z_{p^m})$ is the set $\{(x, y) : x, y \in Z(Z_{p^m}) - \{(0, 0)\}\}$. We will give the “center” for the general case. Let be that the element m and n natural number. Let $R = R_1 \times R_2 \times \dots \times R_n \times F_1 \times F_2 \times \dots \times F_m$, that every R_j is a commutative Artinian local ring with unity which is not a field and every F_j is a field. For each $j = 1, 2, \dots, m$, define the ideal $I_j = \{0\} \times \{0\} \times \dots \times F_j \times \{0\} \times \dots \times \{0\}$. So, the center of $\Gamma(R)$ is the following set

$$C = J(R) \cup \left(\bigcup_{j=1}^m I_j \right) - \{(0, 0, \dots, 0)\}, \text{ where } J(R)$$

is the Jacobson radical of R (Redmond, 2006).

If M_j is the maximal ideal of R_j , then $J(R) = M_1 \times M_2 \times \cdots \times M_n \times \{0\} \times \{0\} \times \cdots \times \{0\}$. Now, let us study the maximal ideals of the elements in the *Artinian decomposition* of $Z_n[i]$ where

$$n = 2^m \prod_{j=1}^r p_j^{r_j} \prod_{j=1}^s q_j^{s_j} \prod_{j=1}^t q_j$$

with $s_j \geq 2$ (Osba et al., 2011). The maximal ideal in $Z_2m[i]$ is $\langle 1 + i \rangle$. For $Z_{q^m}[i]$, the maximal ideal is $\langle q \rangle$, while $Z_{p^m}[i] \cong Z_{p^m} \times Z_{p^m}$ and the maximal ideal in Z_{p^m} is $\langle p \rangle$. Thus each $p_j^{r_j}$ in the decomposition of n gives rise to two factors in the Artinian decomposition of $Z_n[i]$. If the Artinian decomposition of $Z_n[i] = R_1 \times R_2 \times \cdots \times R_l \times F_1 \times F_2 \times \cdots \times F_t$, then $R_1 = Z_2m[i]$ if n is even. Otherwise, R_j is either of the form $Z_{q^m}[i]$ or Z_{p^m} and $F_j = Z_q[i]$ for some q . If l is the number of local rings in the Artinian decomposition of $Z_n[i]$, then $J(R) = \{(z_1, z_2, \dots, z_l, 0, \dots, 0) : z_j \in Z(R_j)\}$. The following theorem is reached (Osba et al., 2011).

Theorem 1.1. If the Artinian decomposition of $Z_n[i] = R_1 \times R_2 \times \cdots \times R_l \times F_1 \times F_2 \times \cdots \times F_t$, where n is divisible by at least two distinct primes, then the center of $\Gamma(Z_n[i])$ is given by

$$C = \{(z_1, z_2, \dots, z_l, 0, \dots, 0) : z_j \in Z(R_j)\} \cup \left(\bigcup_{j=1}^t I_j \right) - \{(0, 0, \dots, 0)\}, \text{ where } I_j = \{0\} \times \{0\} \times \cdots \times Z_q[i] \times \{0\} \times \cdots \times \{0\}.$$

The eccentricity of each vertex in $\Gamma(Z_n[i])$, where n is a power of a prime, is determined by Nazzal and Ghanem (2012). If $n \neq q_1 q_2$, and n is divisible by at least two distinct primes, so, $\text{diam}(\Gamma(Z_n[i])) = 3$, this together with the above theorem give the eccentricity of each vertex in $\Gamma(Z_n[i])$ when n is divisible by at least two distinct primes.

Corollary 1.2. If n is divisible by at minimum two different prime numbers, $n \neq q_1 q_2$ and $v \in V(\Gamma(Z_n[i]))$, then

$$\text{ecc}(v) = 2, \text{ if } v \in C, \text{ otherwise } \text{ecc}(v) = 3,$$

where C is the center of $\Gamma(Z_n[i])$ (Osba et al. (2011)).

The cardinality of the center of $\Gamma(Z_n[i])$, when n is divisible by two different primes, could easily be computed using appropriate formulas for the cardinality of each $Z(R_j)$ (Abu Ash et al., 2008).

Corollary 1.3. The cardinality of the center of $\Gamma(Z_n[i])$ is

$$(1) \quad 1, \text{ if } n = 2^m,$$

$$(2) \quad q^2 - 1, \text{ if } n = q^m,$$

where n is divisible by two distinct primes. (Osba et al. (2011)).

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On Zero Divisor Graph over Rings

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Abstract. In this paper, it is focused the graphs of the sets of zero-divisors of a ring by the help of the researchers by the view of the authors. It is presented that Ring Z_m to give its graph and when it is graph is planar when it is complete and some other charters of the graph. Our second examination is on the ring coming from the power set of a finite set as $R = T(U) \neq \emptyset$, with the operations, $M + N = (M \cup N) - (M \cap N)$ and $MN = M \cap N$. Finally, we are focusing on the well-known ring that the ring of all two by two matrixes on a ring by identity element and by traditional operations that “+” and “.” of square matrixes.

Keywords: ring, graph, zero divisor, planar

Introduction

Many research studies conducted on zero divisor graphs with some special characteristic ways of the ring as finite or infinite, commutative or noncommutative (Anderson, and Livingston, 1999; Carter and Emmos, 2005; Redmond, 2004; Smith, 2002 and Tongsuo, 2005). By this paper, it is modulated the graphs on the sets of zero-divisors of some special rings. We present that graphs models and give the characteristic ways by the view of the authors.

Definition: Let R be a ring. Let $GRAF$ be a graph with elements of R as vertices that two non-zero elements $x, y \in R$ are adjacent if $xy = yx = 0$ (Carter and Emmos, 2005).

We are focusing the following ring to note graphs of them:

- $R = Z_k$, the set of integers modulo k with respect to addition modulo m and multiplication modulo k with the ring system $(Z_k, +_k, \cdot_k)$; for $x, y \in Z_k$, the operation definitions as below,

$$\begin{aligned} x +_k y &= (x + y)_k, \\ x \cdot_k y &= (x \cdot y)_k \end{aligned}$$

- $R = T(U)$, the power set of a nonempty finite set with respect to addition ‘+’ and multiplication ‘.’ with the ring system $(T(U), +, \cdot)$; for $M, N \in T(U)$, the operations are defined as below,

$$\begin{aligned} M + N &= (M \cup N) - (M \cap N) \\ M \cdot N &= M \cap N \end{aligned}$$

- $R = MAT_2(P)$, the ring of all 2×2 matrixes over a ring P with identity with respect to matrix addition ‘+’ and matrix multiplication ‘.’ of matrixes with the ring system $(MAT_2(P), +, \cdot)$; for $A = (a_{ij})_2, B = (b_{ij})_2 \in MAT_2(P)$, the operations are defined as below,

$$\begin{aligned} A + B &= (a_{ij})_2 + (b_{ij})_2 = (a_{ij} + b_{ij})_2 \\ A \cdot B &= (a_{ij})_2 \cdot (b_{ij})_2 = (c_{ij})_2 = C \in MAT_2(P), \text{ with } c_{ij} = \sum_{k=1}^2 a_{ik} \cdot b_{kj} \end{aligned}$$

All the above special rings are useful examples in abstract algebra as well as in elementary ring theory. For the definitions of a ring, a group, a subring of a ring, zero divisors, units, ideal, commutative ring, abelian group and other related concepts with examples, the reader should read one of the famous and basic abstract algebra books written by Hungerford (1986) or Herstein (1994).

Zero Divisor graphs in Ring Z_k

Z_k is a commutative ring with identity element with respect to addition of integers modulo k and multiplication of integers modulo k (Bhat, Raina, Nehra and Prakash, 2007).

For $k = p$, p a prime number; the graph has no edges as Z_k in this case is a field and has no non-zero zero divisors. If k is not a prime number; it is assumed that

$$k = (r_1)^{p_1} \cdot (r_2)^{p_2} \dots (r_k)^{p_k}, \quad p_i \text{ prime numbers,}$$

so, the possible adjacent vertices are (r, ts) with $ts < k$ and $rs = k$. it was illustrated for some natural numbers (Bhat, Raina, Nehra and Prakash, 2007):

For $k = 4$, the edge is $(2, 2)$.
 For $k = 6$, the edges are $(2, 3)$ and $(4, 3)$.
 For $k = 8$, the edges are $(2, 4)$; $(4, 4)$; $(4, 6)$.
 For $k = 9$, the edges are $(3, 3)$; $(3, 6)$; $(6, 6)$.
 For $k=12$, the edges are $(2, 6)$; $(4, 6)$; $(6, 6)$; $(8, 6)$; $(10, 6)$; $(3, 4)$; $(9, 4)$.
 For $k = 120$, the possible edges are
 $(2, 60)$; $(4, 60)$; ... ; $(118, 60)$;
 $(3, 40)$; $(6, 40)$; ... ; $(117, 40)$;
 $(4, 30)$; $(8, 30)$; ... ; $(116, 30)$;
 $(5, 24)$; $(10, 24)$; ; $(115, 24)$;
 $(6, 20)$; $(12, 20)$; ... ; $(114, 20)$;
 $(8, 15)$; $(16, 15)$; ... ; $(112, 15)$;
 $(12, 10)$; $(24, 10)$; ... ; $(108, 10)$;
 $(20, 6)$; $(40, 6)$; ... ; $(100, 6)$;
 $(24, 5)$; $(48, 5)$; ... ; $(96, 5)$;
 $(30, 4)$; $(60, 4)$; ... ; $(90, 4)$;
 $(40, 3)$; $(80, 3)$ (Bhat et al. 2007).

By using similar method, it is easy to find for other natural number k . We note that if $k = p$, a prime number, in this situation, the graph is obviously planar.

For $k = 4, 6, 8, 9, 12, 14, 15, 16, 18, 20, 21, 24$ and 25 ,

the graph is planar. For general classification, it is used to use following theorem (Harary, 1969):

Theorem. Let $k = pq$, where p and q are distinct prime numbers. Consider the ring Z_k as above. Define in Z_k a graph as (' x ' is adjacent to ' y ' if $xy = 0$, where $x, y \in Z_k$). If the isolated vertices are ignored, then the graph is bipartite.

Proof. The authors accepted that, n has only two prime factors, all multiples tp of p with $tp < k$ in one row and all multiples kq of q with $kq < k$ in the other row. In this position, it is reached a bipartite graph (Bhat, Raina, Nehra and Prakash, 2007).

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Opportunities for The Chemical Sciences - Energy II

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Abstract. Chemical energy research must turn out the probable technique to get several potential solutions. Focusing global difficulties means progressing essential scientific information in chemical science investigation. It needs an interdisciplinary approach and the Royal Society of Chemistry must form connections between chemistry's disciplines, and other related sciences. We believe that international active networks of this organization could be instrumental in implementing of the possible chemical solutions. The chemical sciences, according to our approach, can play a clear and an efficient role in following maintainable development and in getting technological explanations to the difficulties of humanity now and in the next times.

Keywords: chemical science, energy, environment, supply, energy efficiency, solar energy

Introduction

Energy investigation is an interdisciplinary subject. A big diversity of major methods are suggested and followed to address the many topics of sustainable energy source approaches (Prest, 2009; Schlögl, 2010). Chemistry as a vital goals of getting tools and procedures for changing of substance is at the critical point of the energy positions (Doroodian and Boyd, 2003). Energy alteration systems run on chemical energy transporters and want to work appropriate method. Doroodian and Boyd noted that the huge scale of the system loads optimal levels outside the marginal developments of experiential findings. The systematic methods are complete to reach at accessible and maintainable resolutions (Schlögl, 2010).

Teitelbaum (2007) and Prest (2009) pointed out that researchers would be needed to advance maintainable energy resolutions and, to discover effective methods of manufacturing, and operating fossil fuels at the conversion. In this paper, we overview the challenges and the opportunities which classifies the basic R&D ranges for the chemical sciences which are necessary to give the supportable progress of energy source. The key factors are as below;

- Energy effectiveness
- Fossil fuels
- Biopower & biofuels
- Solar energy

Energy effectiveness

Developments are required for the effectiveness by which electricity is produced and transferred (International Energy Agency, 2016). According to its report, it points to an energy loss of fifteen terawatts (TW) across the planet by 2050. It is noted in this report, over energy efficacy and social events to decrease the situation, families can get about nine billion tons of CO₂ a year by 2020 (Prest, 2009; Advancing UK bioenergy, 2009).

Materials chemistry has an important character to show in getting coming necessities as noted below (Prest, 2009; Royal Society of Chemistry, 2009):

- creating protecting tools,
- decreasing CO₂ emissions,
- developing to nanotechnology to rise the power of physical things.

Fossil fuels

Fossil fuel operating is uncontrollable and related with greenhouse gas construction. An effective using of fossil fuels is essential together with technologies which confirm lower environmental effect (Prest, 2009; HM Treasury, 2007). HM Treasury pointed out that the quantity of the world's major energy source providing by renewable energy technologies would raise. Also, it is noted that fossil fuels would continue quantity of the energy levels. The organization recommended that the world trusts to fossil fuels for about 80 percent of the whole energy source.

According to the report, it is very important to get fossil fuels and the crops more powerfully in technologies which would confirm lower environmental effect, when using of fossil fuels in the coming is used (Prest, 2009). We believe that technological innovations will be required in:

- developing advanced catalysts to improve combustion for emissions clean-up
- rising price effective gas refining technology,
- developing extraordinary temperature supplies for enriched performance.

Biofuel and Biopower

Fuels should be created from biological sources in a style which is economics, and environmental (Prest, 2009; Boole, 2008). He noted that the quantity of solar radioactivity which stretches the Earth's surface every year is more than 10,000 the present yearly total energy consumption. Biomass is supposed to get positive effect over 10 per cent of international energy and much than 80 per cent of the energy is used for cook and heat in homes (IPCC Fourth Assessment Report, 2009). We see that many industrialized countries are rotating to pass for biomass using as a fuel source to improve fossil fuel tradition. In this report, it is noted that yields as sugar cane could develop fast and could shot daylight with an efficacy (Prest, 2009).

According to Boole (2008) and Prest (2009), the effort to rise using of biomass and energy sources has move to the bio-refinery conception. And, chemical technologies on thermo style are significant systems of transforming biomass to carrying fuels. Also, he noted that the comparatively less translation proficiency of daylight to biomass have the same way which big parts of farming places could be necessary to yield important amounts of biofuels applying existing technological methods (IPCC Fourth Assessment Report, 2009) (figure 1).

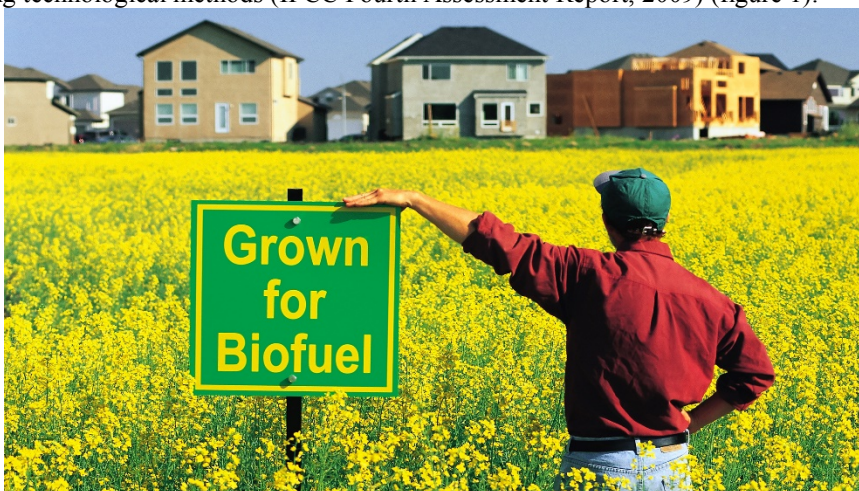


Figure 1. Vegetable oils are potential fuel sources for cars
(<http://s.hswstatic.com/gif/biofuel-quiz-177800130.jpg>)

Prest (2009) pointed out that floras can be processed to yield suitable crops. Moreover, we understand that it would be occasions to advance techniques of creating fuel from different sources.

Solar energy

Improvement of current technologies to be more rate effective and emerging the future population of solar cells is significant to do the potential of solar energy. Connecting the energy of the sun could offer a clean and secure source of electricity, heat and fuels (Prest, 2009; www.hydrogensolar.com/Paths.html, available at 25.06.2018).

“The sun is a source of energy many times abundant than required by man; harnessing the free energy of the sun could therefore provide a clean and secure supply of electricity, heat and fuels. Developing scalable, efficient and low-intensity-tolerant solar energy harvesting systems represents one of the greatest scientific challenges today. The sun's heat and light provide an abundant source of energy that can be harnessed in many ways. There are a variety of technologies that have been developed to take advantage of solar energy. These include photovoltaic systems, concentrating solar power systems, passive solar heating and daylighting, solar hot water, and solar process heat and space heating and cooling” (Royal Society of Chemistry, 2008).

Result

Chemistry could offer maintainable resolutions for energy supply conceptions inhibiting us to get supplementary large experimentations to international warming with part of the regular environment. Chemistry is a tactical and critical scientific area for solving the energy challenge (Schlögl, 2010). By process strategy it offers vital fundamentals of maintainable energy supply chains founded on physical charge carrier separation.

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Opportunities for The Chemical Sciences - Energy I

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Abstract. Focusing universal challenges is progressing essential scientific knowledge, supporting in chemical investigations. It needs an interdisciplinary approach and the Royal Society of Chemistry must body links between chemistry's subareas, and other disciplines. We believe that international active networks of this organization could be instrumental in implementing of the possible chemical solutions. The chemical sciences, according to our approach, can play a clear and an efficient role in maintainable growth of the future for a livable environment or for a health world.

Keywords: chemical science, energy, environment, supply

Introduction

Chemistry is at the focus of the energy challenge and opportunities (Schlögl, 2010; Prest, 2009; Doroodian and Boyd, 2003). Many energy translation systems operate on chemical energy carters and necessity for the use appropriate process. Doroodian and Boyd noted that the huge scale of the application stresses optimization outside the incremental developments of experiential findings. Systematic methods are absolute to reach at maintainable solutions. Optimization of the procedures observed by catalysis for chemicals manufacture (Schlögl, 2010).

Energy need universal continues to rise, and the world's people grows, and the evolving world economies are extending step by step. Our idea with the current strategies that international energy demand would be more than 55 per cent higher in 2040 than now (British Wind Energy Association, 2008). According to scientific data, outstanding funds of fossil fuels would show an important part in meeting the world's energy necessities for the predictable future, and traditions of dropping emissions should be added (Prest, 2009; Teitelbaum, 2007).

In this paper, we overview the challenges and the opportunities and classifies the key R&D areas for the chemical sciences which are required to sustenance the maintainable expansion of energy supply, and to support in the conversion to a maintainable energy future (Prest, 2009). The key tasks are as below;

- Energy storage
- Nuclear energy
- Hydrogen

Energy storage

The performance of energy conversion and storage technologies requires to be amended better practice of renewable electricity foundations and the growth of maintainable transportation (Schlögl, 2010; HM Treasury, 2004). Statistically, the amount is increasing as commercial growing takes the profits of extensive car usage to the world's evolving and developing economic structures (Prest, 2009; HM Treasury, 2007).

The main points that technology needed (International Energy Agency, 2016):

- essential developments in inexpensive and harmless resources,
- improving power and energy densities,
- dropping and exchanging critical resources,
- developing material recycling strategies.

This agency pointed out that growths should be attached with developments in the important science of chemistry, electrochemistry and the enhanced displaying of thermodynamics and kinetics for continuous developments (Prest, 2009) (figure 1).



Figure 1. A model for energy storage technologies from Canada.
(<https://www.smart-energy.com/wp-content/uploads/2016/07/energy-storage.jpg>)

Nuclear energy

Nuclear energy model is a vital solution approach to the energy challenges. The methodological way is for the effective attaching of nuclear energy, discovering technologies (Prest, 2009; The Royal Society of Chemistry, 2009).

Nuclear power in 2005 determined 16 percent of universal electricity generation (IPCC Fourth Assessment Report, 2007). In 2007 nuclear power calculated for 19 percent of the UK's electricity generation and 7.5 per cent of total energy stores (IPCC Fourth Assessment Report, 2009) (figure 2). According to this report, nuclear energy generation is a significant element of the energy mix (Prest, 2009).

The last years of generated devices have the possible to transport profits. According to scientific data, nuclear fusion is at the progress phase.



Figure 2. Modular Nuclear Reactors in UK.

(<https://4k4oijnpiu3l4c3h-zippykid.netdna-ssl.com/wp-content/uploads/2018/11/cooling-tower.jpg>)

Using waste form chemistry, which contains the fundamental science of elements used in directing nuclear waste, could help operate several waste administration matters. We think that and enhanced devices and new nuclear waste in the long period is needed. Strategies would demand creating new resources. They will also require a greater understanding waste - cement interactions (Prest, 2009; British Wind Energy Association, 2008; NSW, 2011).

Hydrogen

The elimination and storage of this item have some difficulties (Prest, 2009). According to him evolving new elements and practices which we could securely and proficiently harness hydrogen. He noted that hydrogen joined with fuel cell technology presents a different way to the present reliance on fossil fuels for transportation and producing power.

Constructing hydrogen from water by electrolysis by means of renewably produced electricity is extremely effective as the procedure is hygienic and maintainable (Boole, 2008). Emerging new heat conversation resources would be essentially to encounter the needed constancy situations (The Royal Society of Chemistry, 2009). The following steps are needed to reach an upper level (Prest, 2009):

- developing the situations for hydrogen construction by fermentation,
- applying microorganisms to produce hydrogen from waste,
- discovering new microorganisms or genetically modifying existing organisms.

Technology innovations needed for alternate storing options at emerging progressive materials, such as carbon nanotubes (figure 3).

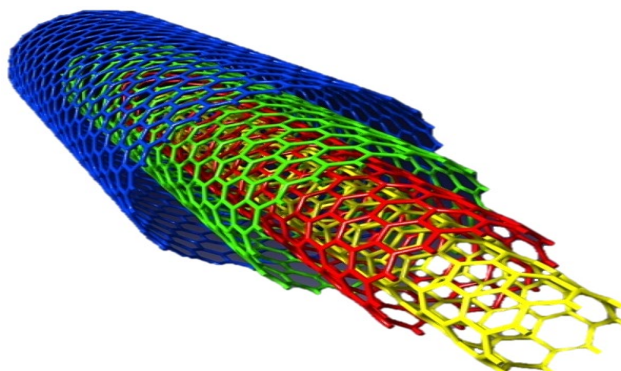


Figure 3. The world of nanoscience: carbon nanotubes.
(worldofnanoscience.weebly.com/uploads/3/2/2/5/32255511/6391931_orig.png)

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ÖĞRENCİLERDE ALKOLLÜ İÇECEK KULLANIMININ VERİ MADENCİLİĞİ YÖNTEMLERİ İLE İNCELENMESİ

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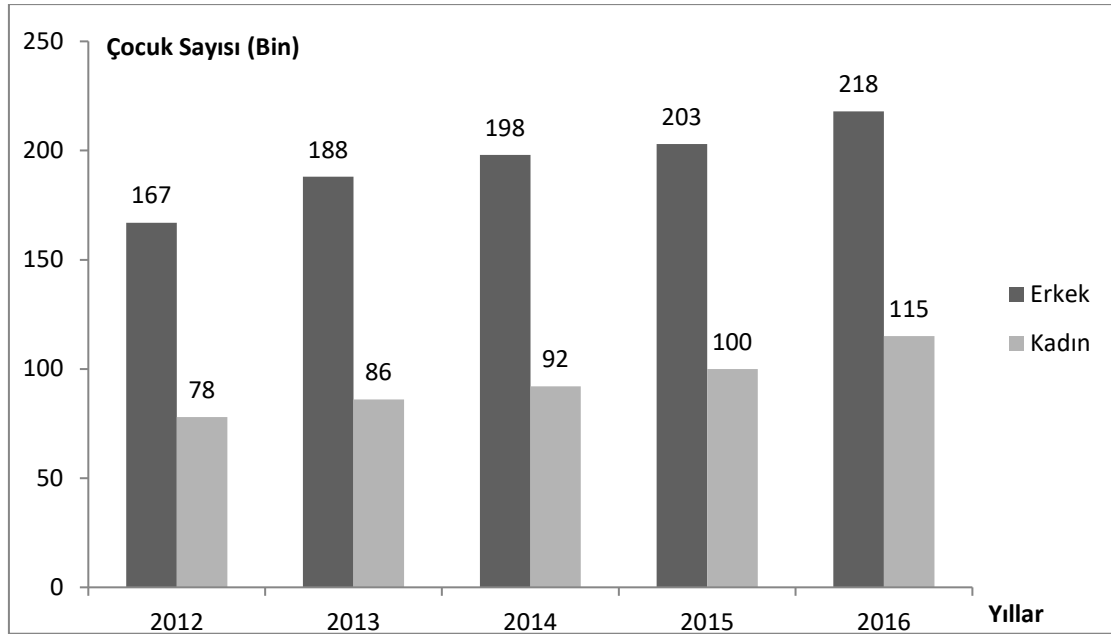
Özet: Günümüzde alkollü içkiler ve benzeri tehlikeli maddelere bağımlılık riski özellikle gençler için her geçen gün artan şekilde tehlike yaratmaktadır. Bu tehlikeli maddeleri kullanmaya başlama yaşı ülkeden ülkeye değişmekle beraber alınan tüm yasal düzenlemelere rağmen 10'lu yaşlara kadar düşmüştür. Gençler yetişkinlere kıyasla hem risk almaya daha fazla açıktır hem de daha az deneyime sahiptir. Tehlikeli deneyimler gençler için çekicidir ve yetişkinlerin dünyasına bir tür ait olma çabasıdır. Gençlerde alkol bağımlılığı çok daha hızlı olduğu gibi gençlik dönemindeki sakıncalı alkol tüketimi, ilerleyen yıllarda alkol bağımlılığı riskini yükseltmektedir. Bu çalışmada popüler veri madenciliği yöntemleri kullanılarak gençlerde alkol tüketimi belirli faktörler ile birçok ilişkiyi inceleyen kapsamlı bir çalışma yapılmış ve sonuçları ortaya konmuştur.

Anahtar Kelimeler: Veri Madenciliği, Faktör Analizi, Karar Ağacı, C 5.0 Algoritması, Alkollü İçki Tüketimi

Giriş

Alkol tüketimi yaş ortalamasının her geçen gün düştüğünü göz önüne aldığımızda gençler arasındaki yaygınlığı tüm dünyada bir sorun haline gelirken, gençlerin alkol tüketimine yönelmesinde aile, arkadaş ortamı, çevre gibi sosyal etkenlerin rol oynadığı da bilinmektedir. Alkollü içki tüketimi, genç nüfus ağırlıklı ve gelişmekte olan ülkemiz içinde çok önemli toplumsal bir sorundur. Bağımlılık yapıcı madde tüketim yaşı ise günden güne düşmektedir. Çoğu genç başta tecrübe etme, heves gibi amaçlarla alkol kullanmakta daha sonra bıraksa bile başta masum görünebilecek bu denemeler ileride alkol veya zararlı madde kullanımına hazırlık anlamına da gelmektedir (Herken, Özkan ve Bodur, 2000). Hiyerarşik sırada ilerleyen sigara, alkol ve madde bağımlılığı zararlı alışkanlıklarını yapılan çalışmalarda göstermektedir (Mercer ve Kohn, 1980, Sieber ve Angst, 1990). Bu nedenle zararlı alışkanlıklara eğilim göstermiş gençlerin demografik özelliklerinden faydalanarak gelecekte eğilim göstermesi ihtimali bulunan gençlerin tespit edilmesi, yönlendirilmesi ve kazanılması pek çok açıdan önem arz etmektedir.

Ülkemizde Türkiye İstatistik Kurumu'nun (TÜİK) 1 Ağustos 2017 yılında açıkladığı bir çalışmada suça sürüklenen çocukların %33,2'si bağımlılık yapan madde kullandığı ortaya çıkmıştır. TÜİK tarafından yapılan bu çalışmada uygulanan anket formu, 1997-2006 yılları arasında 27 ilde Jandarma Genel Komutanlığı'na ve Emniyet Genel Müdürlüğü'ne bağlı güvenlik birimlerinde uygulanmış olup, 2007 yılından itibaren 81 ilde uygulanmaya başlamıştır. Güvenlik birimlerine suça sürüklenme nedeni ile getirilen 108 bin 675 çocuğun 36 bin 87'sinin bağımlılık yapan madde kullandığı görüldü. Bağımlılık yapan madde kullanan çocukların %84,5'ini 15-17 yaş grubu, %15'ini ise 12-14 yaş grubundaki çocuklar oluşturmuştur. (Türkiye İstatistik Kurumu, 2016)



Şekil 1. Güvenlik birimine getirilen çocuklar 2012-2016 (TÜİK, 2016)

15 - 22 yaşları arasındaki belirli sayıda öğrenciden elde edilmiş gerek kişisel gerek okul gerekse aile durum bilgilerini içeren veriler ışığında öğrenciyi alkol tüketimine itebilecek olası faktörler analiz edilecektir.

Literatürde gençlerin alkol kullanımını etkileyen farklı faktörlerin etkisi çeşitli çalışmalarda incelenmiş ve sonuçlar elde edilmiştir. Yapılan bir çalışmada ailenin çocuklarına normalde ayırdığından daha fazla zaman ayırmasının çocukların alkol ve hatta sigara kullanımını azalttığını belirtilmiştir (Cohen ve ark., 1994) Bir diğer çalışmada ise çocuğun alkol kullanımına yatkınlığına sebep olacak nedenlerden biri olarak ailenin çocuğa karşı desteğinin azalmasının gösterilmiştir (Schor, 1996).

Materyal ve Yöntem

Bu çalışmada kullanılmış olan, internet erişimine açık "UCI Machine Learning Repository" sitesinden alınan Student Alcohol Consumption veri seti içeriği Portekiz'de 2005- 2006 yılında eğitim gören devlet okulu öğrencilerine aittir. Verilerin toplanmasında öğrencilerin okul raporları ve raporlardaki eksikliklerin tamamlanmasında, uzmanlarca gözden geçirilen 37 soruluk anket formu uygulanmıştır. Çalışmada, matematik sınıfı öğrencilerine ait 1044 veri kullanılmıştır. Verilere ilişkin detaylı bilgi aşağıdaki tabloda verilmektedir.

	Sütun Adı	Açıklama	Veri Tipi	İçerik
1	okul	Öğrencinin okulu	binary	"GP" - Gabriel Pereira veya "MS" - Mousinho da Silveira
2	cinsiyet	Öğrencinin cinsiyeti	binary	"F" - kadın veya "M" - erkek
3	yas	Öğrencinin yaşı	numeric	numeric: 15 ila 22 arası
4	adres	Öğrencinin ev adresi türü	binary	"U" - kentsel veya "R" - kırsal
5	aile_uyesayisi	Ailedeki üyelerin sayısı	binary	"LE3" - 3 veya daha düşük veya "GT3" e eşit - 3'den büyük
6	ebeveyn_birliktelik	Ebeveynin birlikte yaşama	binary	"T" birlikte yaşamak veya "A" - ayrı

7	A_egitim	Annenin eğitimi	numeric	0 - yok, 1 - ilköğretim (4. sınıf), 2-5 ila 9. sınıf, 3 - orta öğretim veya 4 - yükseköğretim
8	B_egitim	Babanın eğitimi	numeric	0 - yok, 1 - ilköğretim (4. sınıf), 2-5 ila 9. sınıf, 3- orta öğretim veya 4 - yükseköğretim
9	A_is	Annenin işi	nominal	"öğretmen", "sağlık" bakımı ile ilgili, sivil "hizmetler" (örneğin idari veya polis), "at_home"
10	B_is	Babanın işi	nominal	"öğretmen", "sağlık" bakımı ile ilgili, sivil "hizmetler" (örneğin idari veya polis), "at_home"
11	okul_tercihsebep	Bu okulun seçilme nedeni	nominal	"ev" e yakın, okul "itibar", "ders" tercihi veya "diğer"
12	veli	Öğrencinin velisi	nominal	"anne", "baba" veya "diğer"
13	yol_sure	Evden okula gidiş dönüş süresi	numeric	1 - <15 dakika, 2 - 15 - 30 dakika, 3 - 30 dakika - 1 saat veya 4 -> 1 saat
14	calisma_sure	Haftalık çalışma süresi	numeric	1 - <2 saat, 2 - 2 - 5 saat, 3-5 - 10 saat veya 4 -> 10 saat
15	zayif	Geçmiş sınıf başarısızlıklarının	numeric	1 <= n <3 ise n, başka 4
16	burs	Ekstra eğitim desteği	binary	Evet veya hayır
17	aile_destegi	Aile içi eğitim desteği	binary	Evet veya hayır
18	ders_ucretiodemesi	Adet ders ücreti ödemesi	binary	Evet veya hayır
19	aktivite	Müfredat dışı etkinlikler	binary	Evet veya hayır
20	anaokulu	Anaokuluna devam etti	binary	Evet veya hayır
21	master_istegi	Yükseköğrenim görmek istiyor	binary	Evet veya hayır
22	internet_erisimi	Evde internet erişimi	binary	Evet veya hayır
23	romantic	Romantik bir ilişkisi var mı?	binary	Evet veya hayır
24	aile_iliskikalitesi	Aile ilişkileri kalitesi	numeric	1'den - çok kötü - 5'e - mükemmel
25	bos_zaman	Okul sonrası serbest zaman-	numeric	1'den - çok düşükten 5'e - çok yüksek
26	ark_disaridavakit	Arkadaşlarıyla dışarı çıkıyor	numeric	1'den - çok düşükten 5'e - çok yüksek
27	Dalc	Günlük alkol tüketimi	numeric	1'den - çok düşükten 5'e - çok yüksek
28	Walc	Hafta sonu alkol tüketimi	numeric	1'den - çok düşükten 5'e - çok yüksek
29	saglik	Güncel sağlık durumu	numeric	1'den - çok düşükten 5'e - çok yüksek
30	devamsizlik	Okul devamsızlıkları	numeric	0 ila 93 arası

31	G1	İlk dönem notu	numeric	0 - 20 arası
32	G2	İkinci dönem notu	numeric	0 - 20 arası
33	G3	Final notu	numeric	0 - 20 arası

Tablo 1. Veri seti içeriği

Veri madenciliği araçları için üzerinde işlem yapılacak olan veri setini belirli formatlara sahip olmalıdır. Veri setinin çalışmaya uygun hale getirilmesi amacıyla veri seti bir ön işleme tutulur. Bu işlemler sırasıyla eksik, gürültülü ve tutarsız olan verileri iyileştirme amacıyla yapılan veri temizleme işlemi, veri birleştirme işlemi, veri dönüştürme işlemidir. Uygulanacak modele katkısı olmayacağı düşünülen normal dağılım göstermeyen ve modeli gereksiz yere yorup modelin yönetimini zorlaştırabilecek alanların tespiti ve eliminasyonunun yapılmış ve faktör analizi ile de kontrolü sağlanmıştır.

Faktör analizi yapılmadan önce veri setinin korelasyon matrisinde bazı korelasyonların veri setinden çıkarılması gerekir. Bu değişkenlerin korelasyonları %30'dan küçüktür. Bu çıkarma işlemi ile veri seti faktör analizine daha uygun hale gelecektir. Bundan sonraki aşamada ise kısmi korelasyon katsayılarına bakılır. Kısmi korelasyon katsayıları yüksek ise, veri seti iyi temsil edilemeyeceğinden faktör analizinin uygulanmaması gerektiği anlaşılabilecektir. Faktör analizinin uygunluğunun araştırılması için gerekli test yaklaşımı literatürde mevcuttur. Bu testte korelasyon matrisinin birim matrise eşit olup olmadığı sınanır. Bu test, Bartlett küresellik testi olarak adlandırılır. Bu test, verilerin çok değişkenli normal dağılım ana küteden geldiği örneklerde geçerli olup test sonucunda anlamlılık % 5'den büyük çıkarsa faktör analizi uygulanmamalıdır.

Kaiser-Meyer-Olkin (KMO) Testi, verilerinizin Faktör Analizi için ne kadar uygun olduğuna dair bir ölçektir. Modeldeki her değişken için örnekleme yeterliliğini ve modelin tamamını ölçen bu istatistik, ortak varyans olabilecek değişkenler arasındaki varyans oranının bir ölçütüdür. Oran ne kadar düşük olursa, veriler o kadar uygun olur. KMO 0 ile 1 arasında bir değer döndürür. KMO değerleri 0.6'dan küçük olduğunda örneklemin yeterli olmadığını ve düzeltici önlemlerin alınması gerektiğini göstermektedir. KMO testi formülü şu şekildedir;

$$KMO_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} u_{ij}^2}$$

Burada R = [rij] korelasyon matrisini U = [uij] ise kısmi kovaryans matrisini ifade eder.

Barlett's test ise aynı KMO gibi değişkenler arası ilişki gücünü ölçümler. Sağlıklı bir faktör analizinin yapılabilmesi için KMO>0.6 ve Bartlett sig<0.05 şeklinde değerler elde etmek yeterlidir.

Çalışmada, SPSS ve Clementine programları aracılığı ile Veri Madenciliği tekniklerinden “Lojistik Regresyon” ve en yaygın kullanılan karar ağaçlarından C 5.0 algoritması kullanılmıştır. Lojistik regresyon, belli bağımsız değişkenlerle kategorik bağımlı değişkendeki değişimi tahmin edip öngörebilme işlemidir. Lojistik Regresyon metodunda Maksimum Olabilirlik Yöntemi (Method of Maximum Likelihood) kullanılır. Entropiye dayalı ID3 algoritmasının eksiklerini gidermek için geliştirilen C 4.5 algoritmasının ileri bir versiyonu olan C 5.0 algoritması ise doğruluğu artırılmış bir tekniktir. C 5.0 algoritması bellek verimliliği sağlamaya, basit ağaç oluşumuna, kural tabanlı modellemelere ve değişken öneme sahip değerlendirmelere olanak sağlar(Kuhn ve Johnson, 2013).

Bulgular ve Tartışma

Çalışma grubunda ankete katılan 15-22 yaş arasındaki 1044 öğrenciden 591'i (%56,6) kız ve yaş ortalamaları 16.7 iken, 453'ü (%43,4) erkek ve yaş ortalamaları 16.6'dır. Kız öğrencilerden %21'inin, erkek öğrencilerden %44'ünün riskli alkol kullanıcısı kategorisine alınabileceği tespit edilmiştir.

Veri setinde devamsızlığı 5'in altında olan öğrenciler “1” ile daha fazla devamsızlığa sahip olan öğrenciler ise “2” ile kodlanmıştır. Dalc ve Walc sütunlarından haftalık alkol tüketimi hesaplanarak yedi günlük alkol kullanımı üzerinden düzenli olarak haftada en az iki ve üzeri oranında alkol kullanımı gerçekleştiren öğrenciler riskli grup olarak adlandırıldı ve RiskALC kategorisi oluşturulmuştur. Veri seti üzerinde “string” şeklinde yer alan veriler

ilgili metotların üzerinde çalışabilmesi amacıyla “numeric” ifadelere dönüştürülmüştür.

Faktörlerin ortak varyanslılık değerleri incelendiğinde hiçbir faktörün faktör yükü 0.30'un altında olmadığı için , faktörlerden herhangi biri faktör analizinden çıkarılarak, faktör analizi yenilenmemiştir. KMO>0.6 ve Bartlett sig<0.05 çıkmıştır. Dolayısıyla bu değere bakarak analizi sağlıklı şekilde gerçekleştirilebileceği ortaya çıkmıştır.

Communalities

	Initial	Extraction
cinsiyet	1,000	,622
yas	1,000	,574
adres	1,000	,642
aile_uyesayisi	1,000	,552
ebeveyn_birliktelik	1,000	,649
A_egitim	1,000	,723
B_egitim	1,000	,652
A_is	1,000	,509
B_is	1,000	,539
okul_tercihsebep	1,000	,564
veli	1,000	,588
yol_sure	1,000	,587
calisma_sure	1,000	,442
zayif	1,000	,564
burs	1,000	,655
aile_destegi	1,000	,508
ders_ucretiodemesi	1,000	,580
aktivite	1,000	,597
anaokulu	1,000	,474
master_istegi	1,000	,409
internet_erisimi	1,000	,414
romantic	1,000	,575
aile_iliskikalitesi	1,000	,544
bos_zaman	1,000	,599
ark_disaridavakit	1,000	,708
saglik	1,000	,557
devamsizlik	1,000	,386
G3	1,000	,579
riskalc2	1,000	,591

Extraction Method: Principal Component Analysis.

Tablo 2. Faktör yüklerini gösteren tablo

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,646
Bartlett's Test of Sphericity	Approx. Chi-Square	2441,077
	df	276
	Sig.	,000

Tablo 3. KMO ve Bartlett's testi

Bu çalışmada bağımlı değişken olan öğrencilerin alkol tüketimini sonuç ölçütü olarak alıp, bağımsız değişken olarak Faktör Yüklerini gösteren tabloda adı geçen faktörler seçilmiştir.

“Cinsiyet”, “ebeveyn_birliktelik”, “A_egitim”, “B_egitim”, “A_is”, “B_is”, “burs”, “aile_destegi”, “anaokulu”, “master_istegi”, “romantic”, “aile_iliskikalitesi”, “ark_disaridavakit”, “devamsizlik” kategorileri giriş “RiskALC” kategorisi hedef olarak belirlenerek çalışılan C 5.0 algoritması sonucunda toplam 11 tanesi ‘riskli’ 4 tanesi ‘risksiz’ sonuç veren kurala ulaşılmıştır. Bu kurallar tablo x’te gösterildiği gibidir.

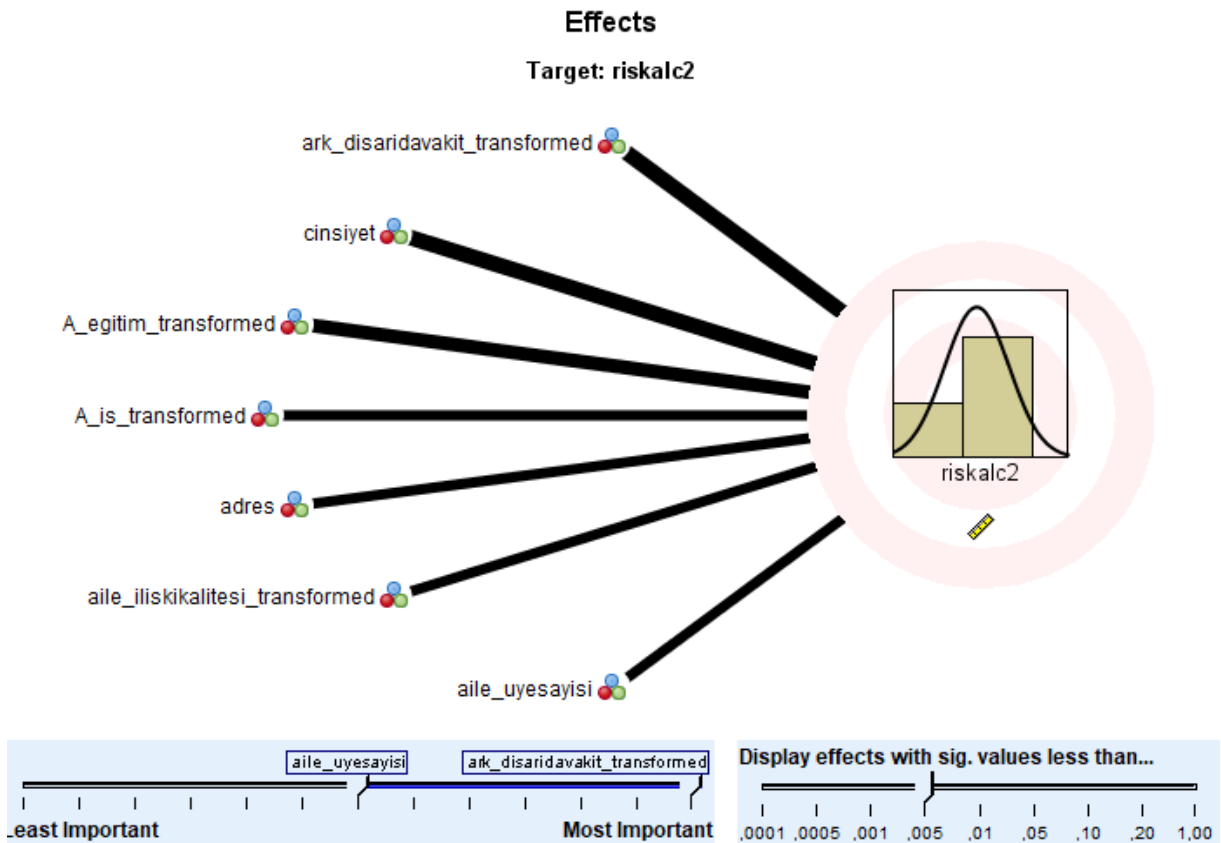
Riskli	
Rule 1 for Riskli (11; 0,923) if cinsiyet = 1,000 and A_is = 1,000 and burs = 2,000 and ark_disaridavakit = 4,000 then Riskli	Rule 2 for Riskli (10; 0,917) if cinsiyet = 1,000 and A_is = 5,000 and aile_destegi = 1,000 and aile_iliskikalitesi = 4,000 and ark_disaridavakit = 3,000 then Riskli
Rule 3 for Riskli (7; 0,889) if cinsiyet = 1,000 and aile_destegi = 1,000 and master_istegi = 2,000 and ark_disaridavakit = 3,000 then Riskli	Rule 4 for Riskli (31; 0,848) if cinsiyet = 1,000 and aile_destegi = 2,000 and master_istegi = 2,000 then Riskli
Rule 5 for Riskli (4; 0,833) if cinsiyet = 1,000 and A_is = 5,000 and aile_destegi = 1,000 and aile_iliskikalitesi = 3,000 and ark_disaridavakit = 3,000 then Riskli	Rule 6 for Riskli (4; 0,833) if cinsiyet = 1,000 and A_egitim = 1,000 and B_egitim = 1,000 and A_is = 3,000 and ark_disaridavakit = 4,000 then Riskli
Rule 7 for Riskli (53; 0,818) if cinsiyet = 1,000 and romantic = 2,000 and ark_disaridavakit = 5,000 then Riskli	Rule 8 for Riskli (65; 0,791) if cinsiyet = 1,000 and anaokulu = 1,000 and ark_disaridavakit = 5,000 then Riskli
Rule 9 for Riskli (19; 0,714) if cinsiyet = 1,000 and B_egitim = 3,000 and burs = 2,000 and ark_disaridavakit = 4,000 then Riskli	Rule 10 for Riskli (24; 0,654) if cinsiyet = 1,000 and B_egitim = 2,000 and burs = 2,000 and master_istegi = 1,000 and ark_disaridavakit = 4,000 then Riskli
Rule 11 for Riskli (93; 0,526) if cinsiyet = 1,000 and ark_disaridavakit = 4,000 then Riskli	

Risksiz	
Rule 1 for Risksiz (248; 0,8) if ark_disaridavakit = 2,000 then Risksiz	Rule 2 for Risksiz (591; 0,793) if cinsiyet = 2,000 then Risksiz
Rule 3 for Risksiz (119; 0,744) if burs = 1,000 then Risksiz	Rule 4 for Risksiz (955; 0,707) if master_istegi = 1,000 then Risksiz

Tablo 4.. C 5.0 Karar ağacı kural sonuçları

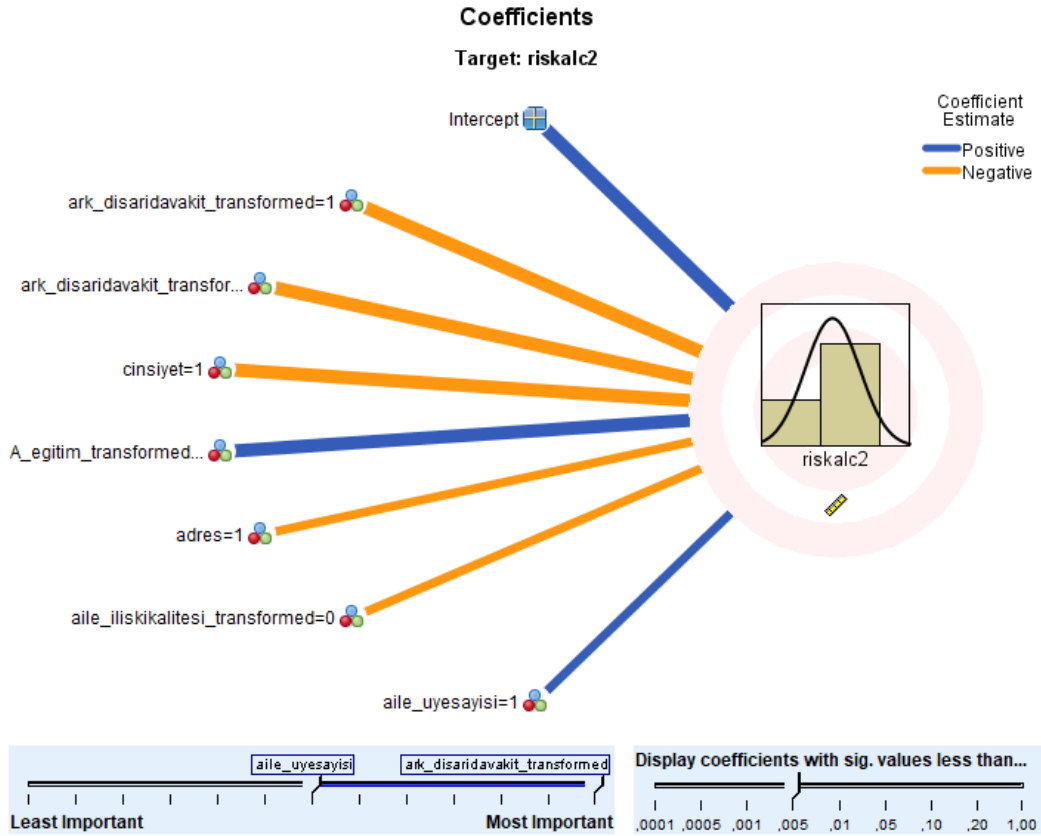
Bu sonuçlara göre Riskli kategoride oluşan kuralları yorumladığımızda kız öğrencilerden, annesi ev hanımı olanların, okul için burs desteği almayan ve arkadaşları ile ortalamanın üzerinde vakit geçirenlerin “Riskli” grupta çıkması oranı %92.3 bulunmuştur. Kız öğrencilerden master yapmak istemeyen ve aile desteği almayanların “Riskli” grupta çıkması oranı ise %84.8 çıkmıştır. Bir diğer “Riskli” bölge kuralı ise kız öğrencilerden, anne ve babası orta öğretim mezunu, annesi ‘diğer’ kategorisinde çalışan ve arkadaşları ile dışarıda normal süreler içinde vakit geçirenlerin “Riskli” grupta çıkmasının doğruluk olasılığı %83.33 olarak bulunmuştur.

Lojistik Regresyon sonuçları incelendiğinde ise elde edilen sonuçlar Şekil 1 ve Şekil 2’deki gibidir.



Şekil 1. Dış Faktörlerin riskALC’ye etkileri

Şekil 1’de görüldüğü üzere veri setinde bahsi geçen gençlerin alkollü içecek tüketiminin sırasıyla “arkadaşları ile dışarıda geçirdikleri vakit”, “cinsiyet”, “annenin eğitimi”, “annenin işi”, “kentsel ya da kırsal alanda yaşama durumu”, “aile arasındaki ilişki kaliteleri” ve “ailenin üye sayısı” etkilemektedir.



Şekil 2. Dış Faktörlerin riskALC'ye pozitif veya negatif etkileri

Şekil 1'deki sonuçlara ek olarak Şekil 2'de görüldüğü üzere öğrencinin alkollü içki tüketimine negatif etkisi olan toplamda dört faktör gözlemlenmiştir. “Arkadaşları ile dışarıda geçirdikleri vakit” iki farklı değerde etkilemek üzere, “cinsiyet”, “adres” ve “aile arasındaki ilişki kalitesi” dış faktörlerinin gencin alkol tüketimine negatif etkisi olduğu gözlenmiştir. Pozitif etki gösteren dış faktör sayısı ise ikidir. Bunlar ise “annenin eğitimi” ve “aile üye sayısı” olmuştur. “Arkadaşları ile dışarıda geçirdikleri vakit” en yüksek değerleri aldığı anda, “aile arasındaki ilişki kalitesi” en düşük değeri aldığı anda, “adres” kentsel bir alanda olduğunda ve öğrencinin “cinsiyeti” ise erkek olduğunda bu durumların öğrencinin alkol tüketimini arttıracak ortaya çıkmıştır.

“Annenin eğitimi” düşük olmadığında ve “aile üye sayısı” kategorisinde ise kalabalık aile olmaması risk grubunu pozitif yönde etkilemektedir. Bu durumda öğrencinin alkollü içecek tüketme ihtimali düşüktür. “cinsiyet”, “annenin eğitimi”, “annenin işi”, “kentsel ya da kırsal alanda yaşama durumu”, “aile arasındaki ilişki kalitesi” ve “ailenin üye sayısı” etkilemektedir.

Sonuçlar

Yapılan bu çalışmada, Portekiz’de 2005- 2006 yılında eğitim gören devlet okulu öğrencilerine ait veri seti üzerinde veri madenciliği teknikleri uygulanmıştır. Günümüz teknolojisi sayesinde gençleri alkollü içecek tüketimine iten sebepler ve bu durumun yarattığı sonuçlar günün sonunda birer veridir. Bu veriler işlenip bilgi haline getirildiğinde ise sebeplerin ortadan nasıl kaldırılacağı, sonuçların nasıl hafifletileceği öngörülebilir. Öğrencilerin alkol tüketimlerinin faktörler analizi ve veri madenciliği tekniklerinden karar ağacı yapısı C 5.0 algoritmasının kullanılması ve lojistik regresyon yöntemleri ile elde edilen sonuçlar ışığında öğrencilerin demografik özelliklerinin alkollü içecek tüketim eğilimlerinin üzerinde etkisi olduğunu söyleyebiliriz. Öğrencileri bu eğilimlere iten faktörler ortadan kaldırıldığında ya da azaltıldığında başta kişinin kendisi olmak üzere toplumda olumlu yönde etki edeceği düşünülebilir.

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PASSENGER SATISFACTION ASSESSMENT OF COMFORT CONDITIONS IN LIGHT RAILWAY STATION BUILDINGS: BURSA/TURKEY

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Abstract Aim: The objective of this research paper is to investigate users' perception of building comfort in light railway station buildings, focusing on thermal comfort, acoustical comfort, visual comfort and air quality. The study consists of three main parts: literature review, evaluation of user satisfaction survey, and discussion of the research findings. **Method:** A user's satisfaction survey was conducted for light railway station buildings that people use most intensively which are Uludag University, Acemler, Osmangazi, Sehkustu, Arabayatagi, Emek light railway stations in Bursa. The questionnaires were applied to users, subjecting building comfort parameters of the light railway station buildings. The answers have statistically analyzed in terms of percentages. **Results:** In the research findings part, investigated comfort parameters of the survey are presented in tables. As a result of the survey on the evaluation of each comfort, most respondents answered that they were dissatisfied with the thermal comfort conditions but were satisfied with acoustic and visual comfort conditions and also ambient air quality. **Conclusion:** The research findings of the interaction between the environment and passengers can be transferred into the design process of light railway station buildings considering thermal, visual, acoustical parameters required for users' well-being and comfort.

Key Words: Passenger Comfort, Light Railway Station Buildings, Building Comfort

1. Introduction

User comfort and air quality are certain issues associated with human health and well-being of society as a total sense of physical, mental and social well-being. World Health Organization (WHO, 2000) reported that maintaining optimum indoor climate in buildings is important for occupants in terms of human health, comfort and productivity. User requirements for air quality and climate are covered American Society of Heating, Refrigeration and Air Conditioning Engineers Standard 55 (ASHRAE, 1992) and The International Organization for Standardization ISO EN 7730 standards (ISO EN, 1994).

Surface rail and railway station buildings systems play an important role in the movement of millions of passengers worldwide. Today, many investigations are carried out worldwide to improve comfort levels of railway station buildings passengers. Such research papers subjecting passenger comfort in railway station buildings were conducted either as questionnaire surveys or computer simulations and experimental analysis of building elements in-situ. (Ye et al., 2010; Award, 2002; Seaton et al., 2005; Johansson and Johansson, 2003; Abbaspour et al., 2008; Chun and Tamura, 2005; Ordody, 2000; Han et al. 2016; Lee et al. 2003; Margarita et al., 2017; Aarnio et al. 2005; Ji-Eun et al. 2015; Assimakopoulos and Katavoutas, 2017). Compared to research studies on other building typologies, user requirements and environmental comfort studies in railway station buildings in Turkey are limited. This fact further supports the need for this research. In this research, the objective of this research paper is to investigate the user perception of building comfort conditions in light railway station buildings through case studies. In this context, selected six light railway station buildings in Bursa district were evaluated based on the user requirements and the determinants of building comfort conditions including thermal, visual, acoustical comfort and air quality aspects.

2. Methodology

The user perception of the building comfort can be examined from the responses of the user surveys. From this point of view, a fieldwork was conducted to determine user expectations about comfortable indoor conditions in light railway station buildings and to what extent these expectations are met. The research aims to cover heating, air-conditioning, ventilation, natural and artificial lighting, air quality, acoustical and visual issues depending on the user responses. The questionnaire regarding the key themes such as: user's view on light railway station

buildings thermal, acoustical and visual comfort sensation and air quality perception. The scope of this paper is limited to comfort perception of light railway station buildings.

To ensure consistency, the field study arranged considering the maximum occupied hours of light railway station by each member of the survey team. Data is acquired by the total number of responses reached an average of 100 participants for each light railway station. The answers have statically analyzed in terms of percentages. The attained results are illustrated in tables in the research findings section.

3. Case Study: Light Railway Station Buildings In Bursa, Turkey

Bursa is located between the south-east coast of the Marmara Sea and the north western slopes of Uludag Mountain. Temperate climate of the region is characterized with warm summers and mild winters. The survey was conducted in November 2016, during the heating season.

Bursa with a population of 2.5 million is the 4th most populated metropolitan city in Turkey. With BursaRay Light Rail System, thousands of passengers are transported every day in the city, which sprawls in the east-west directions. BursaRay's route at the North starts at the Emek Station and its route at the West starts at the University Station, these two routes merge at Acemler station. The route continues through the Ankara Road, passes from Kent Meydanı and Sehrekustu Squares, continues through the Hasim İscan Road and reconnects with the Ankara Road via a viaduct and ends at the Arabayatagi Station.

There are 23 stations in BursaRay's A and B sections of its 1st Phase, and 5 of which are underground. The total length of the two-track route is 22,043 kilometers and is completely separated from the highway. On the İzmir road (West Route) there are the Küçük Sanayi, Ataevler, Besevler, Fatih Sultan Mehmet and Nilufer Stations, and on the Mudanya Road (North Line) there are Organize Sanayi, Hamitler-Fethiye, Bağlarbasi-Esentepe, İhsaniye and Karaman Stations. Acemler, Pasa Ciftligi, Sirameseler, Kulturpark, Merinos, Osmangazi, Sehrekustu, Demirtaspasa, Gokdere, Davutdede, Duacinari, Yuksek Ihtisas Hastanesi and Arabayatagi Stations follow the point where the two routes merge in the direction of Ankara (East Line). BursaRay Phase 2 has a total of 6 stations on the University Line, and one of those stations is an underground station. The names of the stations on this 6,622 km long line are University, Batikent, Yuzuncuyil, Ozluce, Ertugrul, and Altinsehir. There are 2 stations on Mudanya Road Line and one of them is underground. The names of these stations on this 2,233 km long line are Korupark and Emek.

In Figure 1, All of the light railway station are shown (URL – 1), and in Figure 2, case study locations are marked on the aerial photograph (URL - 2).



Figure 1. BursaRay route (URL - 1)

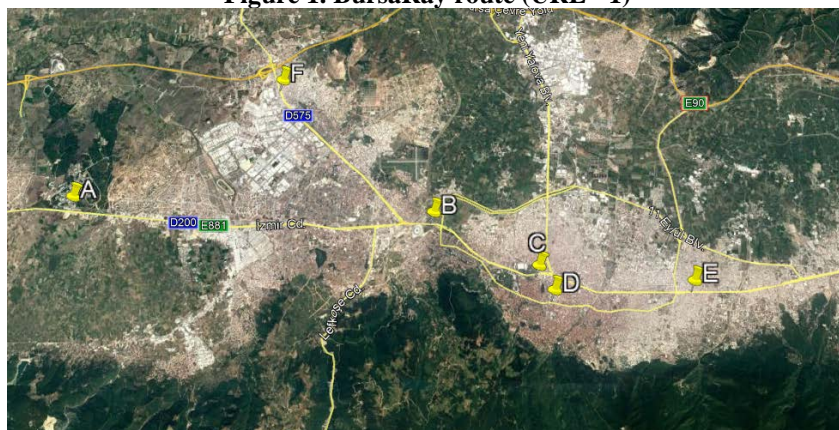


Figure 2. Location of the Case Buildings: A) Uludag University Station, B) Acemler Station, C) Osmangazi Station, D) Sehrekustu Station, E) Arabayatagi Station, F) Emek Station (URL - 2)

A user's satisfaction survey was conducted to light railway station buildings that people use most intensively which are Uludag University, Acemler, Osmangazi, Sehkustu, Arabayatagi, Emek light railway station in Bursa. were investigated in this paper. The Basic Features of the Case Studies are given in Table 1.

Table 1. The Basic Features of the Case Studies in Bursa

	Case Study Building	Opened year	Average number of passengers per day
A	Uludağ University Station	2011	14500
B	Acemler Station	2006	11400
C	Osmangazi Station	2006	22730
D	Sehkustu Station	2006	21000
E	Arabayatagi Station	2008	8400
F	Emek Station	2012	10000

Sample A - Uludag University Station: University light railway station is on the Bursa - Izmir highway and it the last stop of the rail system. Uludag University light railway station users are university staff, students and patients visiting the medical faculty. The station is located above the ground and transit is provided at via an underground passage. The station has three entrances and exits and is located at the entrance to the university and the hospital. Passengers waiting at the ground level of the station are negatively affected by noise generated by heavy private vehicle, bus, minibus, ambulance traffic. Passengers are also adversely affected by factors such as wind, snow, rain, cold and hot because the platform is only covered from the top (Figure 3).



Figure 3. Photographs taken from the outside and inside of Uludag University Station

Sample B - Acemler Station: Acemler station is used extensively because it is both a transit point and also surrounded by heavily used places such public buildings, a stadium, etc. Because it is an underground station, the passengers are partially protected from climate factors such as wind, snow, rain, cold, and hot (Figure 4).



Figure 4. Photographs taken from the outside and inside Acemler Station

Sample C - Osmangazi Station: Osmangazi station is in the city center. Because the station is located underground, the passengers are partially protected from climate factors such as wind, snow, rain, cold, and hot. The structure is artificially illuminated (Figure 5).

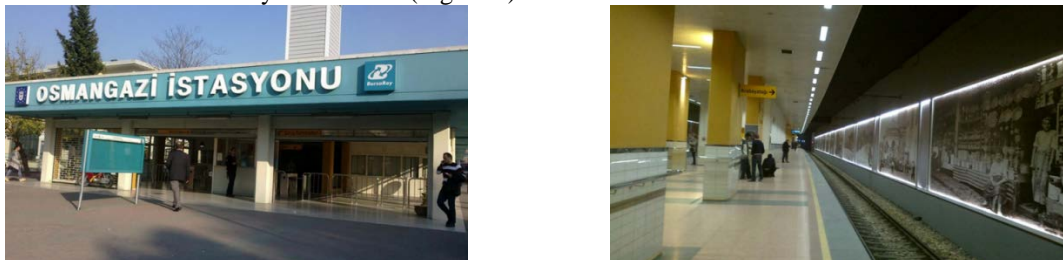


Figure 5. Photographs taken from the outside and inside of Osmangazi Station

Sample D - Sehkustu Station: Sehkustu station is located in the city center. Because the station is located underground, the passengers are partially protected from climate factors such as wind, snow, rain, cold, and hot. The structure is artificially illuminated (Figure 6).



Figure 6. Photographs taken from the outside and inside of Sehkustu Station

Sample E - Arabayatagi Station: The station is located at Yildirim district of Bursa, which is at the east of the city. Arabayatagi Station was opened in 2016 and transfers passengers to the Kestel district of Bursa. The station connects settlements in the East to the city center. Because the station is on the ground and open, passengers are affected by climate factors such as wind, snow, rain, cold, and hot (Figure 7).



Figure 7. Photographs taken from the outside and inside of Arabayatagi Station

Sample F - Emek Station: Emek station is located on the Izmir Road. The rail system runs above the ground in this area, therefore the station is also above the ground. This station, which is located in the middle of İzmir road, can be reached by underpasses from both sides. These entrances have top covers. This station is heavily used because it is a connection point for transportation to Mudanya District. Illumination in the station is provided by fluorescent lamps placed on eaves of the top cover. As the station is above the ground and open, passengers are affected by climate factors such as wind, snow, rain, cold, and hot (Figure 8).



Figure 8. Photographs taken from the outside and inside of Emek Station

4. Research Findings

In the first section three questions were asked, mainly consisting of the passenger's socio-demographic information. Gender, age, educational status of passengers is given below respectively. Out of total 600 participants, 59% of respondents are female and 41% are male which shows that most of the respondents are male. In Table 2 the gender distribution of the passengers is seen in each of the stations. Survey results show that, 18% of the respondents are below the age of 18, 31% are between 19-25 years old, 21% are between 26-35 years old, 20% are between 36-50 years old and 10% of the respondents are above the age of 50. In Table 3 the age distribution of the passengers is seen in each of the stations. 5% of respondents report to have master, 46% have bachelor's degrees; 32% have high school education and 18% have only secondary school education or less. In Table 4 the education level distribution of the passengers is seen in each of the stations.

Table 2. Survey responses for gender

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Female	72	55	56	65	66	39
Male	28	45	44	35	34	61

Table 3. Survey responses for age

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Below 18	12	22	10	16	38	10
19-25	64	12	36	42	20	14
26-35	4	25	26	20	18	32
36-50	16	28	18	10	18	32
Above 50	4	13	10	12	6	12

Table 4. Survey responses for education level

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Secondary school or less	14	28	14	10	14	28
High school	16	31	25	21	48	48
Bachelor	70	34	54	59	34	24
Master	0	7	7	10	4	0

Table 5 shows the job distribution of passengers at each of the stations. Survey results show that 5% of the respondents are employees of the station, 11% are self-employed (doctor, architect, lawyer, etc.), 9% are white-collar workers (engineers, experts, etc.), 11% are blue-collar workers (workers, operators, foremen, etc.), 6% are private business owners (company owners, contractors, tradesmen, subcontractors, etc.), 5% are retired, 14% are housewives, and 40% are students. The results reveal that there is a diversity in terms of education among the users who participated in the questionnaire.

Table 5. Survey responses for job

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Station employee	0	11	0	0	2	16
Self-employed (doctor, architect, lawyer, etc.)	0	30	10	10	2	12
White-collar workers (engineers, experts, etc.)	2	4	6	21	5	18
Blue-collar workers (workers, operators, foremen etc...)	8	0	18	8	14	16
Private business owners (company owners, contractors, tradesmen, subcontractors, etc.)	4	6	6	6	5	8
Retired	2	4	10	4	4	6
Housewives	10	21	8	14	12	16
Student	74	24	42	37	56	8

Second part of the survey includes the passenger's perception of comfort conditions in light railway station buildings. The responses for 4 questions are illustrated in tables below. The answers reflect the impact of the current comfort conditions on passenger's perception.

According ASHRAE Standard 55, thermal comfort is defined as "The state of mind which expresses satisfaction with the thermal environment". Thermal environmental conditions is defined as acceptable when at least 80% of the occupants are comfortable within a space. The comfort temperature is a result of the interaction between the users and the built environment they are occupying. The clothing level, type of activity and environmental variables such as air temperature, humidity, air velocity and radiation affect thermal sensation and satisfaction of occupants (ASHRAE 1992; ISO EN 1994). Temperature and relative humidity are the leading factors for thermal comfort. Table 6 shows passengers' responses for the question "What do you think about ambient temperature?" Based on general evaluations the results were disturbingly hot (6%), hot (13%), convenient (33%), cool (26%), and uncomfortably cool (22%).

Table 6. Survey responses for “What do you think about ambient temperature?”

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Uncomfortably hot	4	0	0	0	27	2
Hot	14	16	6	16	13	14
Convenient	44	8	31	28	26	60
Cool	26	56	20	26	4	24
Uncomfortably cool	12	20	43	30	30	0

Next questions aim to cover acoustical comfort perception of passengers in terms of acoustical characteristics of light railway station buildings and sources of noise from indoors and outdoors, presented accordingly in Table 7. The following results were obtained according to general evaluations: environment is not very noisy (47%), environment is very noisy (53%), installation noise is not disturbing (53%), installation noise is disturbing (47%), there are no external noise problems (45%), there are external noise problems (55%).

Table 7. Survey responses for “What do you think about the light railway station buildings' noise level?”

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Environment is not very noisy	44	48	42	52	42	54
Environment is very noisy	56	52	58	48	58	46
Installation noise is not disturbing	48	48	56	68	77	24
Installation noise is disturbing	52	52	44	32	23	76
There are no external noise problems	62	38	68	66	14	22
There are external noise problems	38	62	32	34	86	78

The passenger's perception of visual comfort for the existing conditions in light railway station buildings are illustrated in the table below. Table 8 shows the passengers' opinions for the question “What do you think about the illumination in light railway station buildings?”. Based on general evaluation the opinions are “Too bright (8%), Adequate light (54%), No opinion (12%), Inadequate light (20%), Too little light, which prevents perceiving surroundings (6%).

Table 8. Survey responses for “What do you think about the illumination in light railway station buildings?”

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Too bright	4	0	6	18	2	19
Adequate	64	38	56	50	68	49
No opinion	14	24	14	2	12	8
Inadequate light	12	24	16	22	18	24
Too little light, which prevents perceiving surroundings	6	14	8	8	0	0

In ASHRAE 62 (2001) air quality (IAQ) guidelines, moisture in building assemblies, poor air quality, improper ventilation systems, inadequate ventilation rates and indoor contaminant sources are the critical factors to achieve IAQ in buildings. Table 9 shows the passengers' opinion regarding the question “What do you think about the air quality based on the ventilation in the light railway station buildings?”. Based on general evaluation the answers to the questions were “Very good (7%)”, Adequate (46%), “No opinion (15%)”, “Inadequate (27%)”, “Uncomfortably inadequate (5%)”.

Table 9. Survey responses for “What do you think about the air quality based on the ventilation in the light railway station buildings?”

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Very good	6	3	2	8	4	16
Adequate	40	38	44	43	56	54
No opinion	14	12	20	7	16	20
Inadequate	36	47	32	28	20	0
Uncomfortably inadequate	4	0	2	14	4	10

5. Conclusions

The objective of this study is to discover passengers' views about the optimal comfort conditions in light railway station buildings. In accordance with the survey data, the level of comfort score was voted within -2 and +2. Negative scores indicate user's dissatisfaction (negative points) and marked with bold characters while positive scores indicate user satisfaction (positive points). The overall evaluations of four case studies are summarized below in Table 10.

Table 10. Status of passengers' satisfaction

		Sample A		Sample B		Sample C		Sample D		Sample E		Sample F	
COMFORT CONDITIONS		S	D	S	D	S	D	S	D	S	D	S	D
Thermal Comfort	Uncomfortably hot		-8	0		0		0		-54		-4	
	Hot		-14		-16		-6		-16		-13		-14
	Convenient	44		8		31		28		26		60	
	Cool		-26		-56		-20		-26		-4		-24
	Uncomfortably cool		-24		-40		-86		-60		-60		0
TOTAL SATISFACTION SCORE			-28		-104		-81		-74		-105		18
Acoustical Comfort	Environment is not very noisy	56		52		58		48		58		46	
	Environment is very noisy		-44		-48		-42		-52		-42		-54
	Installation noise is not disturbing	52		52		44		32		23		76	
	Installation noise is disturbing		-48		-48		-56		-68		-77		-24
	There are no external noise problems	38		62		32		34		86		78	
	There are external noise problems		-62		-38		-68		-66		-14		-22
TOTAL SATISFACTION SCORE			-16		42		-40		-84		14		96
Visual Comfort	Too bright		-8		0		-12		-36		-4		-38
	Adequate	64		38		56		50		68		49	
	Inadequate light		-12		-24		-16		-22		-18		-24
	Too little light, which prevents perceiving surroundings		-12		-28		-16		-16		0		0
	TOTAL SATISFACTION SCORE		32		-14		12		-24		46		-13
IAQ	Very good	12		6	4		16		8		32		
	Adequate	40		38	44		43		56		54		
	Inadequate		-36		-47		-32		-28		-20		0
	Uncomfortably inadequate		-8		0		-4		-28		-8		-20
	TOTAL SATISFACTION SCORE		8		-3		12		3		36		66

S: Satisfied D: Dissatisfied (very satisfied +2, satisfied +1, neither satisfied nor dissatisfied 0, dissatisfied -1, very dissatisfied -2, can't choose 0)

When the results of the research are evaluated, it was determined that passengers were only satisfied of the thermal comfort conditions in sample F station and not satisfied in 5 out of 6 stations. The station, of which passengers were satisfied, is open to outdoor weather conditions. It is interesting to see such a result because among the other stations there were stations that are closed to outside weather conditions. From another point of view, it has been found that comfort couldn't be ensured in the stations both open and closed to outdoor conditions, and users felt uncomfortable. Because the light rail system goes both underground and on the ground, cold air flow is felt even at closed stations, which adversely affects passengers both in closed and open stations.

When the results were evaluated in terms of acoustical comfort it was seen that 3 of the stations had positive results whereas 3 had negative results. Sample A, C and D stations, which had no acoustical comfort have a larger number of passengers per day compared to other stations. It was determined that usage intensity is an important factor for providing acoustical comfort.

When the results obtained were evaluated in terms of visual comfort, 3 of the stations that were examined had positive results whereas 3 had negative results. Two of the stations with low visual comfort are located underground, and one station which was expressed with good visual comfort is located also underground. In this case, it can be said that despite difficulties in fulfilling visual comfort conditions in underground stations, visual comfort of passengers can be ensured if adequate levels of artificial lighting are provided. Lighting levels can be optimized using photocell lamps, especially at underground stations.

When the results obtained were evaluated in terms of air quality, 5 of the stations that were examined had positive results and 1 had a negative result. Because the light rail system goes both underground and, on the ground, airflow is continuous, and passengers do not feel discomfort with the air quality.

When the results of the research were evaluated in general, it was determined that the perception of passengers was negative with -372 points in terms of thermal comfort, positive with +12 points in terms of acoustical comfort, positive with +39 points in terms of visual comfort and positive with +122 points in terms of air quality. This result suggests that waiting areas in light rail system station constructions should be designed that can protect passengers from outside weather conditions.

Physical and psychological well-being and tranquility of the users influenced by the building comfort conditions provided in the built environment. The survey reveal that, achieving optimal thermal, audial, visual comfort and IAQ is important to create positive impact on passengers' perception of environmental quality in light railway station buildings. This knowledge can further contribute towards the improvement of future light railway station buildings designs addressing comfort parameters.

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PRELIMINARY RESULTS OF GENOTOXICITY OF AGBR, CUI NANOPARTICLES AND AGBR:CUI COMBINATION ON ROOT MERISTEM CELLS OF ALLIUM CEPA BY COMET ASSAY AND RAPD ANALYSIS

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Abstract: Nanomaterials are used in dye, fuel, medicine, food industry and many other fields and they are released to the environment during production, transportation, recycling and use. Increased production of nanomaterials in very different areas is inevitable accumulation in the environment, and non-target organisms can be negatively affected. Metallic nanoparticles, such as Ag and Cu, are frequently used NPs because they exhibit broad antibacterial activity. Ag:Cu NPs combination of these two metallic NPs have more antibacterial effect than AgNP and CuNP, and its use is thought to be widespread. In this study, genotoxicity of AgBr NP (50 nm), CuI NP (90 nm) and Ag: Cu NP mixture (65 nm) were evaluated using the Single Cell Alkali Gel Electrophoresis Assay (COMET) method and molecular markers (RAPD) in Allium cepa root meristem cells.

According to the results of the tail length parameter obtained from the COMET test, 10 ppm and 25 ppm doses of CuI NP were statistically significant ($p < 0.001$) compared to distilled water (negative control group). At other doses, the differences were not statistically significant.

Five primers (UBC 178, UBC 190, UBC 159, UBC 149 ve OP-A 01) of 20 primers scanned were selected for genomic stability analysis. The result of RAPD analysis also supports the results obtained from the COMET test. The DNA profile of distilled water was significantly different from EMS. DNA Profiles of 10, 25 and 50 doses of CuI NP appear to be similar to those of EMS. The results indicate that the primers selected for RAPD analysis may be candidate primers for the evaluation of genotoxicity. However, it would be appropriate to continue scanning the new primers and continue to work with the most appropriate ones selected.

PRELIMINARY RESULTS OF LEAF-LITTER DECOMPOSITION IN BEECH-CHESTNUT MIXED FORESTS IN WESTERN BLACKSEA REGION OF TURKEY

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Introduction

Many studies have revealed that both the plant nutrients and the stored carbon stocks in managed forest ecosystems have declined significantly. For this reason, the best preservation and sustainable use of existing forest areas, as well as the rehabilitation of degraded forest areas and the determination of ecosystem functions becomes as the fundamental ecosystem researches in forest ecosystems. Knowing the litter decomposition presents very important information about the ecosystem functions such as primary production, carbon and nutrient cycles. The data obtained from this kind of researches can be used for long-term decisions on forest ecosystems and the information necessary to sustain them in a sustainable manner. Therefore the aim of this study is to determine biomass and carbon content of plant, litter and soil and dynamics of litter and to estimate leaf litter decomposition rates in eastern beech (*Fagus orientalis* Lipsky) and Sweet chestnut (*Castanea sativa* Mill.) mixed stands in Duzce-Akçakoca located in Western Black Sea Region of Turkey.

Material and Methods

Eight sites (2 aspects x 4 altitudes) were used leaf-litter decomposition experiment. Each study site was divided into six 20 m x 20 m plots where three plots were chosen as chestnut dominated and the other three plots were chosen as beech dominated sites. To determine litter decomposition rates, 3 litter bags each containing 5 g leaf-litter samples were placed on mineral soil surface on each plot in 2011 and were collected in 2015. The litterbags were opened and the decomposed leaf-litter samples were air dried initially, brushed to remove adhering soil particles, and finally oven dried at 65 °C for 48 hours and weighed to be able to determine mass loss by using the difference between initial mass and the decomposed mass.

Results

According the preliminary results of this study, it has been estimated that 50-70% of beech and 60-80% of chestnut leaves were decomposed according the fourth year analyses of leaf-litter decomposition. This shows that mass loss of chestnut leaves were greater than those of beech leaves. Decomposition rate has varied among the elevation and aspects for both species. This means spatial or temporal variation in temperature and moisture might have affected decomposition rates.

Discussion

Results of the studies from different regions have suggested that at the regional scale, climatic variables especially evapotranspiration exerts the strongest influence on litter decomposition. However, litter chemistry is the driving variable of decomposition process at the local scale. Equations for litter decomposition derived from this study may be used for similar ecosystems and help to make more accurate models for mountainous sites like the study area. It also may be submitted to global estimations made by various organizations. Additionally, data obtained from these ecosystems may be stored for long-term monitoring and evaluation.

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Keywords: Beech, Chestnut, Leaf-Litter Decomposition.

PROLIFERATIVE AND APOPTOTIC EFFECTS OF DIFFERENT DOSES OF TAMOXIFEN ON MOUSE OVARY

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Abstract: The objective of this study was to investigate the effect of Tamoxifen (TAM) treatment on ovarian morphology and follicle number in pubertal mice. In this study, 80 female mice (8 week-old) were used. Animals divided four groups; non-injected (control A), injected with TAM's vehicle solution (control B). The mice in groups TAM 0.5 and TAM 1.5 were treated with TAM at a dose of 0.5 and 1.5 mg/mouse/day respectively. TAM was dissolved with 10% ethanol: 90% corn oil. Mice were given daily subcutaneous injections for 5 days. Ovarian weights and body weights gain were determined, ovarian histology was examined, and follicles were counted. Ovarian sections were stained with Ki 67 (cell proliferation marker), triple staining for examining the general structure and TUNEL method for apoptosis. In the present study, there were no significant differences in body weight gain and ovarian weight between all groups. The number of primordial follicles was higher in the TAM-treated groups than in the control groups while the number of antral follicle and corpus luteum reduced. In addition, follicular atresia was increased, cell proliferation rate was decreased with TAM treatment. However, the interstitial cells were increased, follicular cysts were formed in the stroma. As a result, the TAM-treated doses suppressed the follicular development and had a negative effect on ovarian morphology.

Keywords: Apoptosis , Follicle, Ki 67, Ovary, Tamoxifen

INTRODUCTION

The ovary is a very dynamic organ designed to maintain the species by producing ova that undergoes morphological, physiological and biochemical changes with the influence of various hormones in each cycle (Balla et al. 2003). It is well established that, in the primate ovary, more than 99% of all follicles present at birth will never take part in ovulation (for review see Gougeon 1996). These follicles (resting as well as growing follicles) degenerate by a process called atresia which is independent of the ovarian cycle. Atresia is characterised by the disruption of granulosa cell (GC) intercellular contacts (Rune et al. 1992), the irregular shape of the follicle, cytoplasmic shrinkage of the oocyte, disintegration of the follicular epithelial layers and pyknosis of the cell nuclei (Tsafiri and Braw 1984; Hirshfield and Midgley 1978). The follicle reserve in the ovary decreases with natural progression as well as with many other conditions and causes infertility or early menopause in women. The first of these factors is the high dose of radiotherapy and chemotherapy used today in the treatment of cancer. These treatments significantly increase cancer survival, but also cause significant side effects such as ovarian failure and sterility in young patients (Blumenfeld et al. 2002; Fong et al. 2008; Meirow and Nugent 2001). Breast cancer is the third most common cause of cancer-related deaths in women, followed by lung cancer and colorectal cancer, and is responsible for one in four women with cancer (Greenlee et al. 2000). Tamoxifen (TAM) is a nonsteroidal triphenylethyl compound that belongs to a class of selective estrogen receptor modulators (SERMs), endogen competes with estrogen and binds to estrogen receptors (ERs) and elicits estrogen agonist or antagonist responses, depending on the target tissue (MacGregor and Jordan 1998; Pasqualini et al. 1998). TAM is one of the commonly used agents for adjuvant chemotherapy following breast cancer (Dowsett et al. 2010). In addition to the antiestrogenic effect of TAM, there is also an estrogenic effect that results in different lesions in female genital tracts. In vivo and in vitro studies have shown strong estrogenic effects in the endometrium, liver, bone and vagina (Jordan and O'Malley 2007; Peterson and Novak 1956; Wolf and Jordan 1992). The information in TAM 's influence on the ovaries is contradictory in the studies that have been done and there have been no studies of the effects of different doses of TAM' s on follicle atresia or proliferation in the ovary which is functioning as an estrogen resource. Therefore, in this study, it was aimed to investigate the effects of TAM, which is frequently used in breast cancer treatment, on follicle atresia or cell proliferation in the ovary.

MATERIAL AND METHODS

Animals and experimental protocol

Eighty female BALB/C mice (8 week-old) obtained from the Experimental Animals Breeding and Research Center, Uludag University, Turkey, were used throughout the experiments. The animals were housed five per cage in temperature (20-24 °C), humidity (60-70%), and lighting (12 h light/dark cycle) controlled conditions and was provided with feed and water *ad libitum*. The experimental protocols were approved by the Animal Care

and Use Committee of the Uludag University (2012- 09/04). Mice were randomly divided into 4 groups. (1) Control group (control A, n = 20), remained without any treatment. (2) Control B group, (vehicle treated, n = 20) received an equal volume of solvent, (3) 0.5 TAM group, (n = 20) received 0.5 mg/mouse/day of TAM and (4) 1.5 TAM group (n = 20), received 1.5 mg/mouse/day of TAM. TAM was dissolved in 10% ethanol: 90% corn oil and the solution prepared for this dissolution was used for control B (0.1 ml / mouse). The dissolved TAM was injected into the animals for 5 days in a total of 0.1 ml subcutaneously at a dose of 0.5 mg / mouse and 1.5 mg / mouse. TAM was freshly prepared every day before injection. At the end of the treatment, the animals in the proestrus period by vaginal smear were separated and weighed and anesthetized by ether inhalation. They were sacrificed by cervical dislocation. Right ovaries of each mouse were dissected aseptically and immediately weighed. The ovaries were fixed in 10% neutral buffered formalin and embedded in paraffin blocks. Five μ m thick sections were cut from paraffin blocks, mounted on slides, and dried overnight. After dewaxing and rehydration, sections were used for Crossman's triple staining to determine ovarium morphology (Crossman 1977). Other sections were used for staining Ki 67 to determine cell proliferation (Ki 67) (Lab Vision- Clone SP6) and *in situ* terminal deoxynucleotidyl transferase-mediated dUTP-biotin end labelling (TUNEL) was used to determine the apoptotic cells (Chemicon, CA, USA).

Immunohistochemistry analysis

Standard streptavidin biotin peroxidase complex technique was carried out using Histostain Plus Kit (Zymed, South San Francisco, CA) and ImPRESS reagent kit (MP 7405, MP 7401). Antigen retrieval was carried out by boiling sections in microwave oven at 750 W in sodium citrate buffer (1 M, pH 6.1) for Ki 67 staining. After cooling, slides were rinsed with PBS and endogenous peroxidase activity was blocked by 10 min incubation at room temperature in 3% H₂O₂ solution in distilled water. After blocking with non-immune serum into kit for 1 hour to reduce nonspecific antibody binding, sections were incubated with primary antibodies, a rabbit monoclonal antibody to Ki 67 (Clone SP6) diluted to 1:500 for overnight at 4°C. Sections were then incubated with biotinylated secondary antibody for 15 min at room temperature followed by application of streptavidin conjugated to horseradish peroxidase for 10 min at room temperature. Finally, 3,3'-diaminobenzidine (DAB) was used for colour development and counterstaining was performed with haematoxylin. Slides processed without primary antibodies were included for each staining as negative control.

In situ localization of apoptotic cells

To visualize apoptotic cells, sections from each specimen were stained with TUNEL method using an ApopTag *in situ* apoptosis detection kit (Chemicon, CA, USA) according to the manufacturer's protocol. Briefly, the deparaffinised and hydrated sections were washed in PBS and treated with 20mg/L proteinase K for 20 min at 37°C. Specimens rinsed in PBS were immersed in 3% H₂O₂ for 5 min at room temperature to inhibit endogenous peroxidase activity. After rinsing in distilled water for 10 min, the equilibration buffer was applied to sections for 10 min and then they were incubated at 37°C with working buffer containing reaction buffer and terminal deoxynucleotidyl transferase (TdT) enzyme in a humidified chamber for one hour. The reaction was stopped by soaking sections in wash buffer, followed by rinsing in PBS. The samples were later incubated in anti-digoxigenin peroxidase conjugate for 30 min at room temperature. After washing in PBS, sections were immersed for 10 min in DAB (3,3'-diaminobenzidine) for peroxidase colouring reaction. Sections were then counterstained with methyl green (0.5% in 0.1 M sodium acetate, pH 4.0), rinsed in distilled water, and examined under microscope (Nikon Eclipse 80i; Tokyo, Japan). As negative controls, sections were incubated with TUNEL label only by omitting either TdT or anti-digoxigenin antibody. Positive control sections received the same treatment but were pre-treated with DNase I (Roche, Indianapolis, USA) for 30 min at 37°C prior to TUNEL.

Follicle numbers and stages

Paraffin-embedded ovarian tissues were sectioned at 4-5 μ m. The largest cross-section was used for Crossman's triple staining in order to count the follicles in each developmental stage under light microscopy (Crossman 1977). A digital camera attached to a light microscope (Nikon eclips 80i, Tokyo, Japan) was used for the count. The follicles were classified into the general categories listed in Table according to Hyttel et al. (Hyttel et al. 2010).

Table 1: Ovarian follicle classification.

Follicle Classes	Oocyte	Follicular epithelial cells surrounding the oocyte
Primordial Follicle	Primary Oocyte	An oocyte surrounded by squamous pre-granulosa cells of which not more than one is an enlarged granulosa cell.
Primary Follicle	Primary Oocyte	Consists of a single-layer cubic granulosa cell
Secondary Follicle	Primary Oocyte	An oocyte surrounded by more than three layers of granulosa cells with no apparent antrum.
Antral Follicle	Primary Oocyte	Consist of 5 or more cubic granulosa cell layers with distinctive theca layer and showing antral cavity
Graff Follicle	Primary Oocyte	Contains the cumulus-oocyte complex, the antral cavity and theca layer are quite distinctive

Quantitative evaluation of immunostaining and TUNEL

Intensity of immunostaining and TUNEL was rated independently by two observer after the examination of all follicles at the largest section under direct visualization at X400 magnification. Follicles were defined as atretic if the majority of granulosa or pregranulosa cells or the oocyte were TUNEL positive and represented as a percentage of the total number of follicles (Burcombe et al. 2006). The percentage of Ki 67 positive follicles was defined as the ratio of Ki 67 positive follicles to the total follicle number (Burcombe et al. 2006).

Body Weight Gain

To determine the weight gain of the animals, the weights of the animals were weighed at the beginning and end of the experiment. The difference between them was determined as the weight gain during the experiment of the mice.

Statistical analysis

Statistical significance between the groups was analyzed by one-way ANOVA test followed by Tukey's post-hoc test. The level of significance was defined as follows: **a**, different from control A and control B ($p \leq 0.01$); **b**, different from 0,5TAM group. ($p \leq 0.05$). **c**, different from control A and control B ($p \leq 0.05$).

RESULTS

Body weight gain and ovarian weights

There were no animal deaths or physical signs during the study. Body weight gain and ovary weight data are summarized Fig. 1. We found no differences body weights gain, as well as ovarian weights between control and treatment groups ($p > 0.05$).

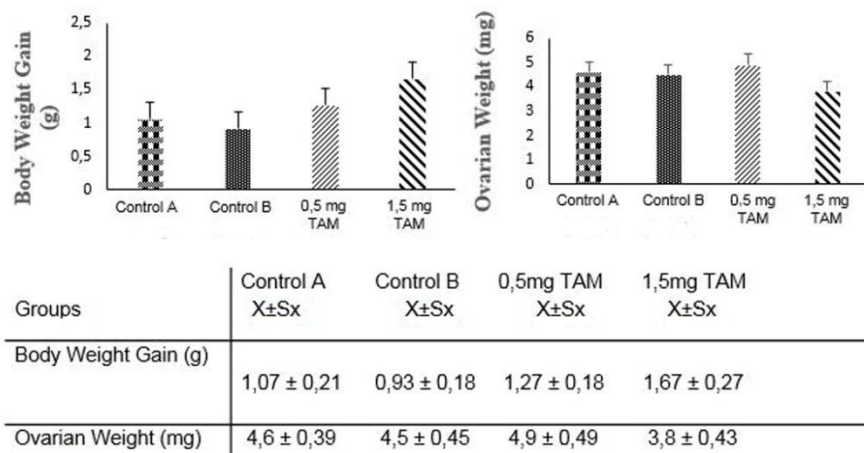


Figure 1. Mean body weight gain (gr) and ovarian weight (mg) values of the groups after the experiment.

Ovarian histology

At the end of the experimental procedure, it was observed that numerous follicles on the surface of the ovary were determined and cortex and medulla regions could not be distinguished in the control group animals (Fig. 2A). In the TAM-injected groups, it was determined that the number of developing follicles and corpus luteum were very low than control groups. The cortex and medulla distinction on the surface of the ovarium was prominent, the interstitial area was large and the interstitial cells were increased and cysts were present in the ovarium (Fig. 2B).

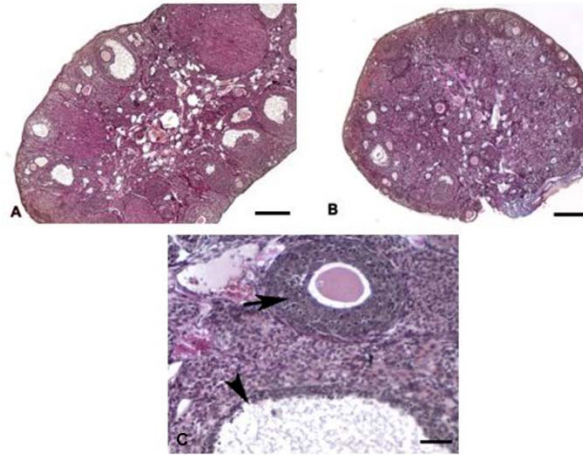


Figure 2. Overview of the ovary; (A) Control A group, (B) 1,5 TAM group. (C) Healthy (arrow) and atretic follicles (arrow head). Triple stain, (Bar 250 µm).

Follicle numbers

Follicles of all stages were observed in ovarian sections of both the controls and TAM groups. While the number of primordial follicles in the control groups was significantly lower than in the TAM treatment groups ($p \leq 0,01$), similar number in the TAM groups. No differences in the primary and secondary follicles numbers were observed in the all groups ($p \geq 0,05$). There was significantly fewer antral follicles in the TAM groups than the control groups ($p \leq 0,01$), **And in the high-dose TAM group, there is a decrease in the number of corpus luteum compared to the low-dose TAM group ($p \leq 0,05$).** However, TAM exposure was not affected the number of total follicle ($p \geq 0,05$). The follicle counts and follicle stages in all groups are presented in Fig. 3.

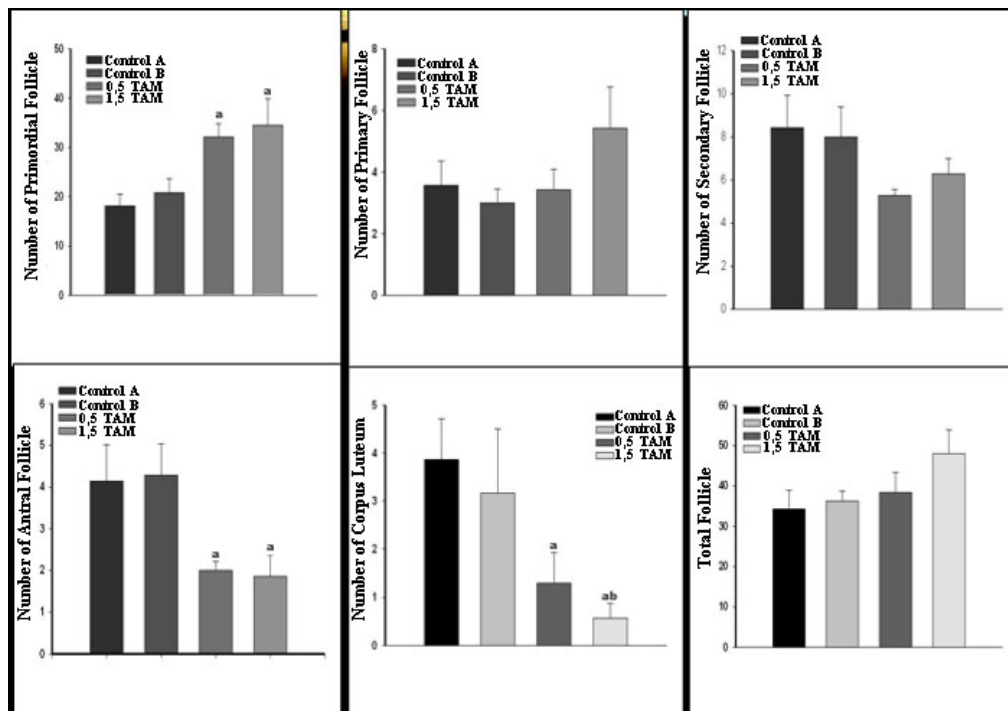


Figure 3. Follicle stages and follicle counts in groups. **a;** In same column, different from control groups ($p \leq 0.01$), **b;** , In same column, different from 0,5TAM group. ($p \leq 0.05$).

Evaluations of Follicle Atresia

TUNEL and Triple staining

Follicles were histologically classified into healthy and atretic (Fig. 2C). Healthy follicles had an intact granulosa layer with a compact and well organized arrangement by triple staining. In the granulosa, there were no TUNEL-positive cells noted in the healthy follicles although there was a positive TUNEL reaction in atretic follicles (Fig. 4A). In all the groups, no atresia was observed in primordial and primary follicles, and atresia was observed in secondary and antral follicles. The ratio of atretic follicles reacting TUNEL positive to all evaluated follicles was determined as percent (Fig. 4B). There was no statistical difference between the groups in the number of atretic follicle. However, the number of atretic follicle was higher in the TAM groups than control groups (Fig. 4B).

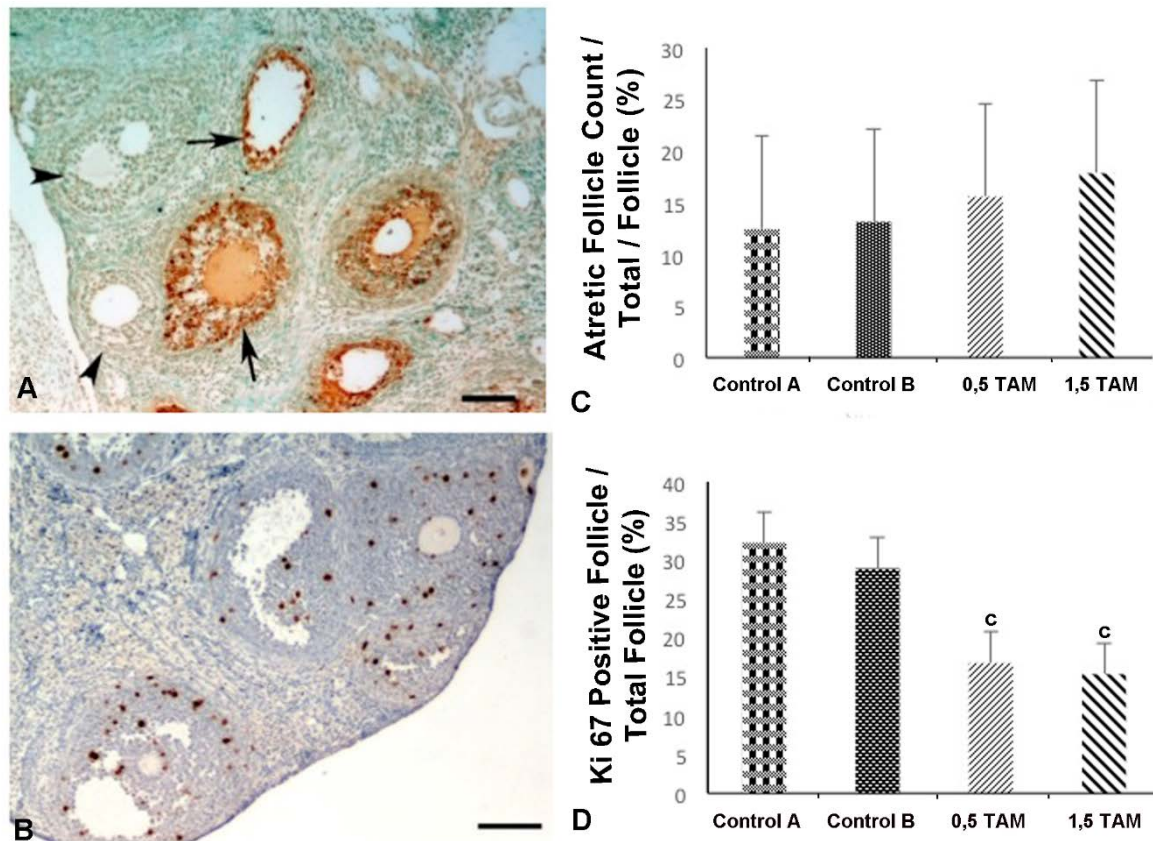


Figure 4. TUNEL immunoreactivity in follicles (A) Atretic follicles (arrows), healthy follicles (arrow heads) (Bar 100µm). (B) Percent value of atretic follicles in total follicles. (C) Ki67 immunoreactivity in the control group follicles, (Bar 50µm). (D) Percent value of follicles showing Ki67 positive reaction, ^c; different from control A and control B ($p \leq 0,05$).

Expression of Ki 67

Ki 67 protein expression was observed the nuclei and granulosa cell cytoplasm of the follicles (Fig. 4C). Ki 67 positive reaction in all groups was observed in antral follicles. However, immunoreactions were also observed that in oocytes and granulosa cells of a small number secondary follicles. No immunoreaction was observed in the granulosa cells of atretic follicles. Statistical differences were determined between the groups in terms of the ratio of Ki 67 positive reacting follicles to all evaluated follicles. Accordingly, the percentage of follicles showing proliferation among the groups was lower in the TAM-administered groups compared to the control groups ($p \leq 0,05$) (Fig. 4D).

DISCUSSION

In our study, while body weight gain is increased, ovarian weight was decreased after high dose of TAM treatment compared to the other groups. Studies have shown that body weight gain was increased after TAM administration (Hard et al. 1993; Pala et al. 2015). It has been found that TAM acts as a full estrogen agonist for food intake and body weight (Hoyt et al. 1998). Döhler et al. injected TAM to neonatal rats and, in agreement with our results, observed an increase in body weight and a decrease in ovarian weight (Döhler et al. 1984).

TAM have varied biological effects ranging from estrogen antagonism to estrogen agonism depending upon its concentration, application dose and time and target tissue (Long et al. 2001; Kennel et al. 2003; Tsujioka et al. 2009). We found that TAM in the administered doses had an estrogen agonist effect on body weight. Tsujioka et al. observed decreases in ovarian weight after 2 and 4 weeks TAM administration (Tsujioka et al. 2009). However, our results are consistent with studies that show decreases in ovarian weight (Gao et al. 2007; Kothari et al. 1997; Tsujioka et al. 2009). In the present study, we determined the effect of TAM on healthy and atretic follicular numbers in the ovary. As a result, we found that the number of primordial follicles was higher and the number of healthy antral follicles was lower in TAM-treated groups compared to other control groups. Moreover, our results showed that TAM administration is associated with decreased numbers of secondary, antral follicles, corpora lutea and increased number of atretic and cystic follicles and interstitial cells. Interstitial cells are well known to arise from thecal cells of atretic follicles (Davis et al. 1999). The increase in the interstitial cells observed in the present study may have resulted from the increase in the large atretic follicles. Similar to our results, Kossoy et al. reported that the numbers of primordial follicles and atretic follicles were high and the numbers of corpus luteum were low after TAM application in mammary tumor rats (Kossoy et al. 2005). In another study, Akduman et al. also reported the number of preantral, antral follicles and corpora lutea decreased and the number of atretic follicles increased following 0.1 mg single dose TAM exposure to mice. In the same study, decreases in serum AMH levels were attributed to the decrease in preantral and antral follicle counts (Akduman et al. 2014). Tsujioka et al. observed that the administration of TAM to rats at different concentrations (0.005, 0.03, and 0.2 mg / kg / day oral) increased atretic follicle number and decreased number of corpus luteum (Tsujioka et al. 2009). In addition, some researchers reported that raloxifene administration, another SERM compound, suppressed follicle development and decreased the number of corpus luteum and observed anovulatory hemorrhagic follicles in the ovary (Cohen et al. 2000; Long et al. 2001). The effect of TAM on follicle development may be at any stage--from primordial to primer, from primer to preantral follicles, or from preantral to antral. In the present study, the effect of TAM on folliculogenesis was observed in the transition period of preantral follicles to antral follicles according to the statistical evaluation of follicle numbers. Contrary to our work, in recent years Mahran et al. reported that primordial and antral follicle numbers were higher in the TAM group than in the control group, and that TAM stimulated the development of the ovarian follicle. In our study, folliculogenesis was suppressed (Mahran et al. 2013). We speculate that this difference may be related to the applied TAM dose. It has been reported that TAM's effect on the ovary may be agonistic or antagonistic (Kossoy et al. 2005; Tsujioka et al. 2009). In the antiestrogenic TAM mechanism, it is reported that TAM temporarily reduces serum estrogen levels by blocking estrogen receptor in the hypothalamus, which indirectly induces ovarian stimulation and follicle development by increasing gonadotropin secretion of pituitary gland (Jotles et al. 1990; Plouffe and Siddhanti 2001). Also, TAM has a direct effect on the ovary and that the level of estradiol is elevated and that the estrogen agonist effect is caused by the development of many follicles in the ovary (Terada et al. 1993). Consequently, the ovaries may become hyperstimulated, form cysts, and produce more estrogen. Long-term TAM administration has been reported to cause cyst formation in the ovary of premenopausal and postmenopausal women due to hyperestrogenic effect (İsmail 1999). In addition, in our study, the appearance of cystic preantral follicles and extensive stromal involvement is similar to the morphological features of PCOS in rats (Skrtic et al. 2011). Thus, in the present study, the high dose TAM appears to have had a hyperestrogenic effect directly on the ovary. In addition, we analyzed Ki-67 expression to determine cell proliferation. Ki-67 is a significant survival factor in ovarian malignancies (Kazandi et al. 2002). In our study, Ki 67 positive reaction was observed in the oocyte cytoplasm in the granulosa cells of the antral and secondary follicles. There was no immunoreaction in the granulosa cells of atretic follicles. It was determined that the percentage of proliferating follicles was lower in the TAM administered groups than in the control groups. Decensi et al. used TAM in 120 women with hormone receptor positive breast cancer and observed a similar decrease in Ki-67 positivity with doses of 1, 5 and 20 mg/day for 28 days (Decensi et al. 1996). At the same time, Kisanga et al. evaluated Ki-67 variation after TAM treatment during 28 days, using doses of 1, 5 and 20 mg/day. A significant reduction in Ki-67 was observed with the two different doses compared to the placebo group (Kisanga et al. 2001). There was a similar reduction using the two doses.

CONCLUSION

In our study we determined that there were atresia and cysts in the ovary, the low number of antral follicles and the suppression of follicle development in the TAM groups, thus making it inevitable that the proportion of follicles showing Ki 67 protein expression in the follicle proliferation is lower in TAM-administered groups than in the control group.

In conclusion, we observed that both TAM doses applied in our study suppressed follicle development, reduced number of corpus luteum, increased the number of interstitial cells, caused atresia in preantral and antral follicles, and affected ovarian morphology by showing formation of follicular cysts in stroma similar to polystic ovary syndrome. In relation to the TAM dose; Especially in the high-dose TAM groups antral follicle-low

numbers and absence of corpus luteum, observation of numerous cystic follicles suggests that, TAM suppresses follicle development by disrupting the pituitary hypothalamus feed back mechanism.

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PROTECTING MASONRY SURFACES FROM MOLD GROWTH WITH MINIMUM RISK ANTIMICROBIAL AGENTS

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Abstract

Sanitation efforts in public institutions quietly operate behind the scenes to ensure comfort and safety of the building occupants. Without extremely consistent, detail oriented service, the aesthetic appeal and sanitation of surfaces can quickly deteriorate to a level that puts the occupants of a building at risk. Public restrooms are one of the most mission-critical areas in a janitorial regimen due to the number of revolving occupants and the activities conducted therein. Though a significant amount of research has been dedicated to developing sanitary architectural design practices, many of these practices were not utilized in prior construction and are not being adopted in new construction. This creates a critical and immediate need for coatings and sealants that can aid janitorial efforts in keeping surfaces clean and hygienic. Researchers from West Texas A&M University (Canyon, Texas, USA), in collaboration with Buffalo Technology Group LLP (Canyon, Texas, USA) explored several mixtures of antimicrobial additives that could be incorporated into commercially available masonry sealants to provide tile grout and other masonry surfaces with protection from fungi and bacteria. These additive mixtures were subjected to standardized microbiologically testing procedures against mold (*Aspergillus niger*) by agar diffusion disk method. Results from microbiological testing indicate that the sealants enhanced with the antimicrobial additives could provide surfaces that are inhospitable to fungi growth and propagation. These results are significant because the additive material eliminates the primary sources of aesthetic and hygienic contamination on masonry surfaces in public areas and can be easily and safely applied to existing and new surfaces without the additional environmental concerns of common sterilizing cleaners.

Keywords: Mold Resistant Coatings, Public Sanitation, Building Products, Minimum Risk Pesticides

Introduction

Fungi grow well in warm, moist environments, and are perfectly suited to the ecosystem within a large number of households throughout the world. Mudarri and Fisk report that *47 percent of all homes in the United States have substantial mold* and dampness (2007), and these unwanted house guests are wreaking havoc on our health and economy. In the US alone there are an estimated *4.6 million cases of asthma attributed to household mold growth* (2007). The travesty of this preventable sickness is also causing significant economic damage. Americans are estimated to spend \$22.4 billion on various illnesses attributed to household mold (Mudarri, 2016). Researchers have recognized the importance of creating surfaces that resist microbiological growth and propagation, including that of mold and mildew, through surface chemistry (Morones (1998), Zhao (1998), Faille (2002)) and surface roughness (Vasilev, 2009; Zhao, 1998; Faille, 2002) in a host of industries. One method of creating surfaces that are inhospitable to microbiological growth is by doping a coating matrix with antimicrobial compounds. The authors recently demonstrated the feasibility and benefits of enhancing coatings to resist microbiological growth by enhancing a coating matrix with antimicrobial additives in a variety of industries and coating systems (Hunt et. al, 2017, Hunt, et. al, 2017, Hunt, et. al., 2016, Chiu, et. al, 2016). This method of enhancing existing coatings to provide more robust protection against microbiological organisms is a growing trend to fulfill the call of industry for a solution to the problems associated with microbial growth.

At the same time that there is a growing need for surfaces that resist microbiological growth, there is also an increasing demand from consumers for antimicrobial solutions that are more environmentally friendly and less toxic (Laroche, 2007). This demand, along with the growing concern over pharmacologically resistant strains of harmful microorganisms "Super Bugs" has produced a resurgence in the utilization of naturally derived antimicrobial agents to protect surfaces from microorganisms. These materials, some of which are classified as Minimum Risk Pesticides by the United States Environmental Protection Agency (EPA), inherently resist the growth of mold, mildew, and bacteria on their surfaces. These materials can be optimized for use in various coating matrices to resist microbial growth without the use of environmentally ambiguous compounds and procedures. One type of coating matrix that that could reap substantial benefits by possessing an antimicrobial

surface from environmentally friendly materials is masonry sealant. Figure 1 shows mold growth in a bathroom with exposed grout and standard masonry sealant.

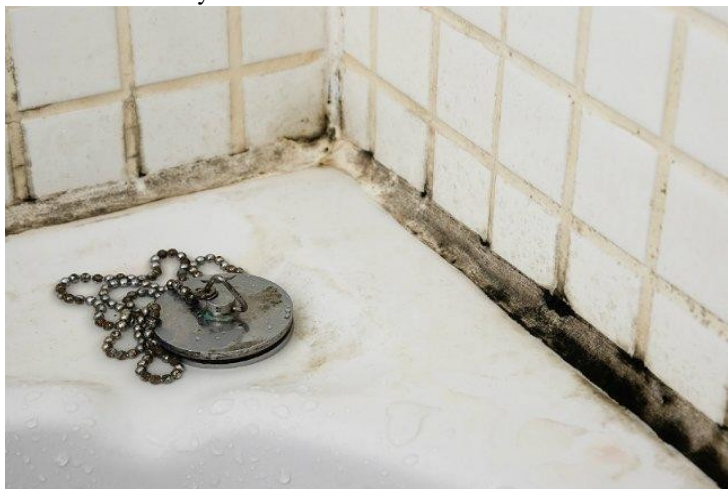


Figure 1. Mold growth on grouted surface in tiled tub surround

Tiled surfaces are a popular finish style for commercial and residential buildings throughout the world. Within tiled surfaces, the surface area of grout can be up to 50% of the total covered area depending upon the size of tiles and the thickness of the grout lines. The morphology of grout surfaces inherently collects and holds moisture while simultaneously resisting scrubbing and disinfecting efforts. These characteristics provide an excellent platform for microbiological growth and propagation on grouted surfaces. Sealing the grout with a variety of commercially available grout sealants can decrease the hospitality of the surfaces to harboring microbiological organisms, but even when coated with a sealant, grout lines are routinely the most microbial dense areas of a tiled surface and are often the first to become impacted by staining due to mold and mildew. By doping commercially available grout sealants with combinations of antimicrobial agents it may be possible to decrease microbial growth on grouted surfaces without the use of harsh chemicals or excessive scrubbing.

Materials and Methods

Experiments were performed to evaluate the effectiveness of several additive mixtures against *Aspergillus Niger* by utilizing agar diffusion disk method. A list of 6 potential antimicrobial agents were selected from the United States Environmental Protection Agency list of Minimum Risk Pesticides. Figure 2 shows the experimental coating additive solutions as mixed prior to experimentation.



Figure 2. Mixtures of experimental antimicrobial agents

The independent agents shown in Table 1 were selected based on an extensive literature review and preliminary testing against various mold strains. The list features several essential oils as well as the active ingredient

(Eugenol) in several more essential oils. Zinc Oxide, a known fungicidal compound, is also included in the list and has been used historically in cosmetics and sunscreens.

Table 1: Potential antimicrobial agents classified as minimum risk by the US Environmental Protection Agency.

Antimicrobial Agent	CAS Number
Thyme oil	8007-46-3
Cedarwood oil	8000-27-9
Cinnamon leaf oil	8007-80-5
Lemongrass oil	8007-02-01
Eugenol	8000-34-8
Zinc Oxide	1314-13-2
Thyme oil	8007-46-3
Cedarwood oil	8000-27-9

Using these chemicals, experimental sealant solutions, displayed in Table 2, were prepared using an industry leading, water-based commercial grout sealer. Lecithin was added to the experimental solutions to help suspend the active ingredient within the solution. Circular disks (6 ± 0.5 mm diameter) of filter paper (Whatman Grade 1: 11 μ m) were immersed in the various solutions and allowed to dry on waxed paper. Once dry, the samples were then placed on petri dishes filled with agar and inoculated with spores of *Aspergillus Niger*. The petri dishes were incubated at 25 C for 24 hours before examination.

Table 2: Experimental grout sealant solutions.

Sample	Components
A	Thyme India 20% in Coating w/ Lecithin & Water
B	Cedarwood Virginia 20% in Coating w/Lecithin & Water
C	Lemongrass 20% in Coating w/Lecithin & Water
D	Cinnamon Leaf 20% in Coating w/Lecithin & Water
E	Eugenol 20% in Coating w/Lecithin & Water
F	Control Coating
G	Composite Oil Mixture with Zinc Oxide
H	Control Coating

Results and Discussion

Qualitative analysis was performed on images of the petri dishes captured 24 hours after inoculation of the mold spores. The antimicrobial efficacy of each disk was categorized by the zone of inhibition created around the disk. Each disk was categorized as having no impact on the mold growth (0) whereby the boundaries of the disk were overcome by mold, having limited impact on mold growth (1) whereby the disks maintained their boundaries, or having significant impact on mold growth (2) whereby a zone of growth inhibition was created around the disks. These qualitative results are displayed in Table 3.

Table 3: Qualitative zone of inhibition results of experimental antimicrobial grout sealant mixtures against *Aspergillus Niger*.

Sample	Observation	Score
A	No impact	0
B	Limited impact	1
C	No impact	0
D	Limited impact	1
E	Limited impact	1
F	Limited impact	1
G	Significant impact	2
H	No impact	0

As described in Table 3 and shown in the photographs of Figure 3, samples B, D, E, and F showed slight inhibition of the mold. These samples maintained the boundary of the disks and were not overcome by mold growth. Furthermore, Sample G displayed significant impact to mold growth by creating a sizeable zone of inhibition around each of the sample disks. Samples A, C, and H had no impact on retarding the spread of mold onto the disks.

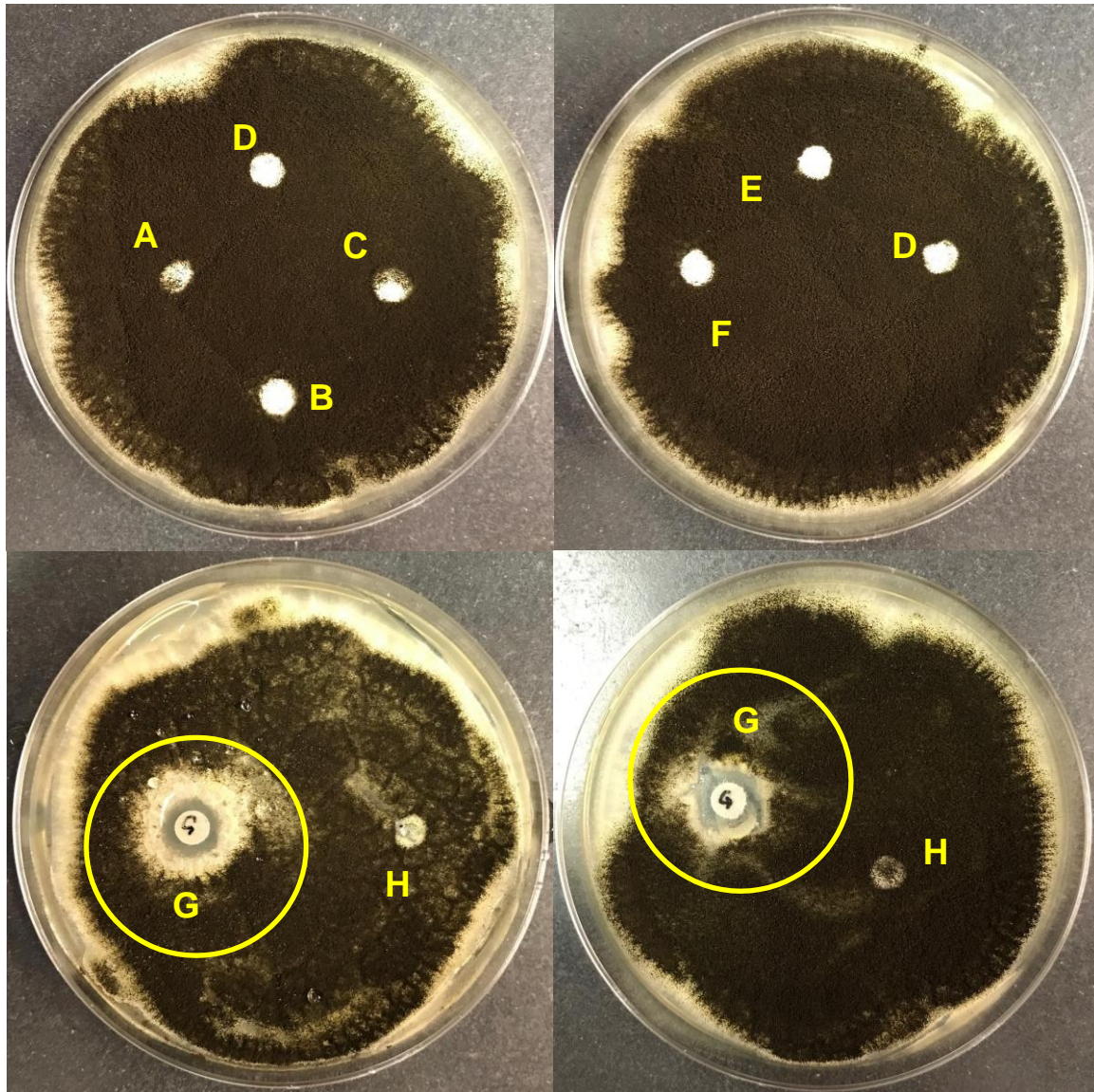


Figure 3. Zone of inhibition of experimental solutions 24 hours after mold inoculation.

Based on data from the images in Figure 3, G (composite oil mixture with zinc oxide) created the largest zone of inhibition and is the most effective solution for inhibiting mold growth. Sample H, which consisted of the leading commercial grout sealer on the market with no additional additive, did not inhibit mold growth in any way. In fact, it was overrun with mold growth. By using H as a baseline, it is apparent that every experimental solution from Table 2 improved the mold resistance of the coating.

Conclusion

The results of this study show that a composite solution of zinc oxide and various essential oils can be mixed within a commercial grout sealant to create an effective barrier against mold growth in laboratory settings. The solution created a significant zone of mold growth inhibition and could be a suitable solution for mold growth on masonry surfaces. This technology leverages the antimicrobial efficacy of materials classified as minimum risk by the US Environmental Protection Agency to create a solution to mold growth on masonry surfaces that is safe, effective, and exhibits limited environmental impact. Further investigation will be performed to determine the minimum concentration of antimicrobial agents necessary to inhibit mold growth on coated surfaces as well as explore any potential impact the additives have on clarity, surface morphology, and life expectancy of the coating,

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Python Programming Language

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Abstract: Rapid technological developments in the world of information have led to a rapid change of hardware and software. Hardware and software, which are inseparable pairs, have not changed at a parallel speed. In the hardware world, a faster development has been observed. But in the software world, they have not developed at the same speed.

Without a software, we know that a piece of hardware cannot sum two numbers. Therefore, the programming language, which is the main factor in the production of software, has a great importance. The most widely used programming languages are C, C ++, Java, C# programming languages.

The aim of this study is to make sure that the reasons that will enable university students to turn to scripting languages in their programming language teaching curriculum. It is to explain the basic features of the Python programming language and to explain that it is easy to learn. Python programming language to explain what can be done with examples.

Keywords: Programming Language, Script Programming Languages, Python Programming Language, Ruby Programming Language

Introduction

Python is a programming language written by a Dutch programmer named Guido Van Rossum. Python started its development in 1990. While many people think that the name Python comes from the python snake, this is not the case. Python developer Guido van Rossum inspired his programming language with the name of Monty Python's Flying Circus, a British comedy group called The Monty Python. Although it is the case, the Python programming language has become a tradition.

Unlike Python language C - C ++, Interpreter is an interpretive language. Therefore, you can run without compiling and thus you can develop applications very quickly. If you know any programming language, the speed of learning Python will be very high. Using Python's simple syntax, it is much easier to write programs in Python or to read a program written by someone else than in other languages. Python can be run on many systems thanks to cross platform support. Many Linux distributions include Python 2.x or higher. Popular Linux distributions also use Python to develop various applications. (For example, Ubuntu Software Center) Python, Google, Youtube, Yahoo! used by companies to develop software. Google also provides business opportunities for people with advanced Python knowledge. Python developer Guido Van Rossum worked on Google from 2005 to 2012. Using Python, desktop programming, game programming, portable device programming, web programming and network programming can be developed. Python optimizes your application's memory usage thanks to its Garbage Collector. It is capable of working with Python, Java and .NET platforms. Python is a free language.

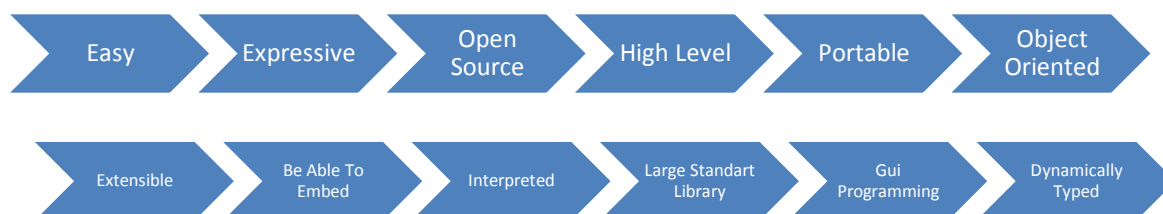


Figure 1: Python Features

1. Python Installation

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official

website of Python <https://www.python.org/>

It can be download Python documentation from <https://www.python.org/doc/>. The documentation pages are available in popular document format. Python deployment is available for a wide variety of platforms. You can only download and install the distribution on your computer.

Windows Installation;

- Open <https://www.python.org/downloads/> address in a web browser
- Click download windows installer link.
- Run MSI file (Your system must support Microsoft Installer). Install Wizard starts. Accept default settings.

You can check Python installation on Windows. Open command prompt and type it python --version



```

C:\>python --version
Python 3.6.5
C:\>

```

Figure 2: Learn Python version

Running Python;

In Linux/Unix

\$ python

In Windows

C:\> python

```

C:\>python
Python 3.6.5 (v3.6.5:f59c0932b4, Mar 28 2018, 16:07:46) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>

```

Python is an interpreted programming language, this means that as a developer you write Python (.py) files in a text editor and then put those files into the python interpreter to be executed.

The way to run a python file is like this on the command line:

C:\> python helloapp.py

“helloapp.py” is the name of Python file.

1.1. First Python Program

You can use Integrated Development Environment such as Eclipse PyDev, PyCharm, Spyder, Thonny. We will use Eclipse on this article. You can download PyCharm in <https://www.jetbrains.com/pycharm/> web address.

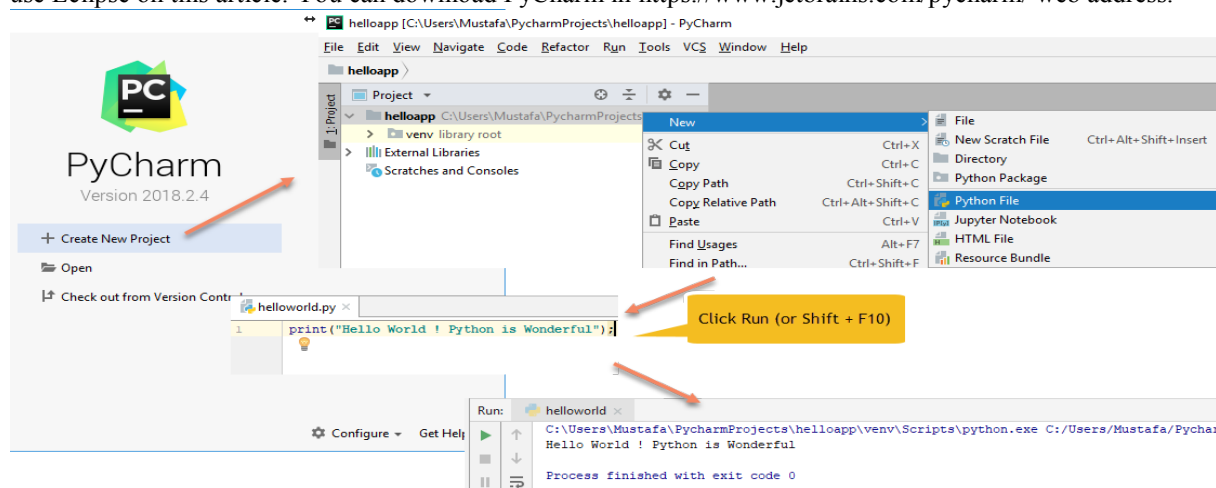


Figure 3: First Python program in PyCharm IDE

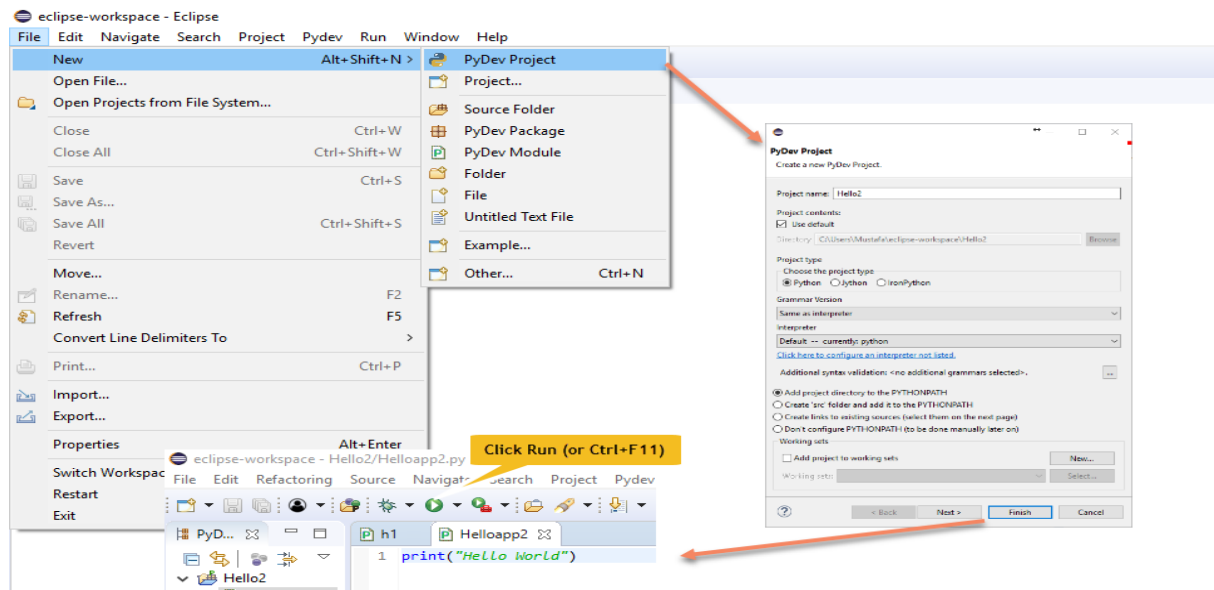


Figure 4: First Python program in Eclipse PyDev IDE

Python programs could be run with python command.

Example:

```
C:\>python.exe C:/Users/Mustafa/PycharmProjects/helloapp/helloworld.py
Hello World ! Python is Wonderful
```

*If Python command doesn't run check PATH environment variable with "path" or "set" command.

2. Python Programming Rules

As with any programming language, there are some basic rules of the Python programming language.

Syntax;

Where in other programming languages the indentation in code is for readability only, in Python the indentation is very important. Python uses indentation to indicate code block.

Example;

```
if(10 > 5):
    print("Ten is greater than five")
```

If you type an error occurs;

```
if(10 > 5):
print("Ten is greater than five")
print("Ten is greater than five");
^
```

IndentationError: expected an indented block

Comments;

```
# Comments
```

```
print("Hello Students")
```

You can use multi line comments with

```
Comments Line 1
```

```
Comments Line 2
```

```
Comments Line 3
```

```
"""
```

2.1. Variables Using

Unlike some programming languages, there is no need to declare a variable. A variable is created you first assign a value to it.

```
d = 10 # d type is int
name = "Mustafa" # name type is string
print(d)
print(name)
```

Result:

```
10
```

```
Mustafa
```

You must follow these rules when determining variable names

- Variable name must start with a letter or underscore character
Answer, _monthly_values

- Variable name can not start with a number
Month1, Week2
- Variable name can only alpha-numeric characters and underscores (A-Z, 0-9 and _)
Amount_products
- Variable names are case-sensitive
section, Section, secTion (These are different variables)

```
department = "Computer"
Department = "Accounting"
departMent = "Chemistry"
print(department)
print(Department)
print(departMent)
```

Result:

```
Computer
Accounting
Chemistry
```

Python print command is used to output variable. When using multiple variables type “+” character between variables.

```
name = "Nihan"
print("Student's name is " + name)
school = "Kocaeli University"
department = "Computer Technology"
all = school + " " + department
print(all)
```

Result:

```
Student's name is Nihan
Kocaeli University Computer Technology
d = 10
e = 20
print( d + e )
```

Result:

```
30
```

But if you type this; it seems an error

```
d = 5
name = "Eren"
print(d + name)
```

Result:

```
print(d + name)
TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

Conclusions

Developing a program is not as difficult as it is thought. Anyone with an analysis ability and who is in the world of computing can develop an application. Developing a software and running it is a really good feeling. Starting with high-level programming languages is much more reasonable. Using a good development environment (IDE), an application can be said to be a simple operation. In today's world the need for programmers is increasing day by day. Programming has become a profession with high income and can be used in all areas. Consideration should be given to the advanced features of the Python programming language, such as the easy structure and fast operation. Python is a language that can be used in various fields and is easy to learn. It is a language with a library according to the desired needs. Programming can be started with Python. Especially high school and higher level students must meet Python. According to research, students have shown more interest in simple programming languages. Python stands out with ease here.

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RELATIONSHIP BETWEEN DENSITY OR PROPAGATION LENGTH AND ULTRASONIC WAVE VELOCITY IN CEDAR (*Cedrus libani*) WOOD

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Abstract: This study investigated the effect of density and propagation length on ultrasonic wave velocity. In this study, cedar test samples, 20, 30, and 40mm length, and 20x20mm cross section, were used to conduct measurements. Slope of grain and fiber orientation or angle were taken into consideration while preparing the test samples. Therefore, effect of these parameters could be minimized. Samples were acclimatized at 65% relative humidity and 20°C temperature till their weight became constant. It took around 6 or 8 weeks. 2.25MHz longitudinal wave contact type transducers were used for ultrasonic wave propagation. Certified contact medium was used to ensure contact between transducers and provide fewer signals to noise ratio. According to results, it's found that there are significant relations between density or propagation length and ultrasonic wave velocity.

Keywords: Cedar, Density, Ultrasonic Wave Velocity, Non-destructive Testing & Evaluation

Introduction

In material science, knowing the material property is crucial for usage of the parts separately or system as a whole. To ensure the safety of a construction is depend on knowing the material properties and using conditions. Environmental conditions also must be known because they also affect the material behavior while in use. To determine material properties, there are lots of test methods but in general we can classified them two; destructive and non-destructive tests. Developing technologies provide easier way to test the materials. Ultrasonic testing (UT), which is a non-destructive test method, is one of these tests. And, it does not alter the mass properties of the tested material and does not put user's life in danger in terms of radioactivity or else.

UT depends on the excitement, transmitting or receiving, and scattering of elastic waves in solid materials (Langenberg et al. 2012). UT of material depends on some factors such as environmental (moisture content, temperature etc.), material properties (density, structure etc.) and test parameters (frequency, propagation length, amplitude, propagation method etc.). For example, in general, ultrasonic velocity in solids is contingent upon elastic constants and density (Hughes and Kelly, 1953; Bergman and Shahbender, 1958). In furtherance, ultrasonic velocity which propagated through the wood strongly affected by density (Bucur and Chivers, 1991; Oliveira and Sales, 2006), elastic constant (Bucur and Archer, 1984; Ivkovic et al. 2009), and moisture content (Sakai et al. 1990; Oliveira et al. 2005). Propagation velocity of the ultrasonic waves in solids including wood is an important parameter which can be used to determine the quality characteristics of material without destruction (Krauss and Kudela, 2011). But when literature reviewed it's seen that there are counter expressions about effect of density on ultrasonic velocity in wood. Bucur and Chivers (1991) and Hasegawa et al. (2011) reported negative relation between longitudinal ultrasonic velocity and density. Also, neither positive nor negative relation between velocity and density was presented by Mishiro (1996) and reported that velocities of seven softwoods and 12 hardwoods were independent from density. In wood science, density of the material greatly changes with the moisture content. And according to Calegari et al. (2011) moisture content and density are the main and the second factors that affect the ultrasonic wave velocity, respectively.

Density is a key property which describes the mechanic properties of wood (Bucur, 2016). Density can well reflect the mechanic properties of wood only when wood material is assumed as perfect (Kretschmann, 2010). But as well known, due to structure and nature of the wood material it's difficult to prepare test sample which is free from all

defects. Therefore, some defects which cannot be removed from the wood material may have effects on measured mechanic properties as Kretschmann (2010) reported.

Propagation length expresses the path which ultrasonic wave beam travels. Transmitted ultrasonic wave propagates through this path. But, this path can be changed by the inner flaws or discontinuities of the material. Therefore, measured time of light values become more than actual in terms of defects free sample. Properties of tested material and especially propagation technique and frequency of the used probe are essential parameters of the ultrasonic measurements (Berke, 2000). According to Cochran (2012) attenuation of the ultrasonic wave depends on the path length and frequency.

According to the aforementioned matters, this study tried to figure out whether density and propagation length have effect on ultrasonic velocity in Taurus cedar (*Cedrus libani*) or not.

Materials and Methods

Taurus cedar (*Cedrus libani*), one of the most important and native softwood species of Turkey, was used in this study. Trees, around 50cm diameter and straight trunk, were harvested from Bucak forest sub-district directorate in Burdur city. Sections around 2 meters long following the 1.3 meters of the stem were used to obtain logs. Logs were sawn into timber and then timbers were air dried. 20, 30 and 40mm long and 20x20mm cross-cut test samples were prepared from the laths. Samples were acclimatized at 20°C temperature and 65% relative humidity. Acclimatization period took around 6-8 weeks and samples weigh became nearly constant. Before tests, TS 2472 (2005) standard was used to determine sample densities. Densities calculated using equation (1).

$$\delta_{12} = m_{12}/V_{12} \text{ (gr/cm}^3\text{)} \quad \text{Equation (1)}$$

where; δ_{12} is air dry density, m_{12} and V_{12} are weight (gr) and volume (cm³) in equilibrium moisture content, respectively.

Ultrasonic measurements were conducted using Olympus EPOCH 650 (Olympus, USA) flaw detector. Contact type transducers, propagates 2.25MHz longitudinal wave, attached to the detector. Official contact medium used to ensure contact between transducers and sample. Direct propagation method used to measure time of flight values of the ultrasonic wave. Angle between the opposing surfaces was almost 0° and direction of the transducers was opposed to each other. And then ultrasonic wave velocity calculated by using equation (2).

$$V = L/T \text{ (m/s)} \quad \text{Equation (2)}$$

where; V is ultrasonic velocity, L and T are specimen length and measured time-of-flight values, respectively.

Results and Discussion

Moisture content, density and ultrasonic wave velocity values of the test samples were presented in Table (1). Density of the cedar wood samples ranged from 0.48 to 0.49 gr/cm³. Bal et al. (2012) reported 0.574 and 0.588 gr/cm³ density values of juvenile and mature cedar wood, respectively.

Table 1: Moisture content, density and ultrasonic velocity values of the test samples.

Propagation Length (mm)	M.C. (%)	Density (g/cm ³)				Velocity (m/s)			
		\bar{x}	Min.	Max.	V(%)	\bar{x}	Min.	Max.	V(%)
20	12.6	0.48	0.46	0.51	4.87	3331.52	3253.16	3400.00	1.37
30	12.2	0.49	0.46	0.52	4.33	3663.90	3544.20	3886.62	2.79
40	12.4	0.49	0.46	0.52	4.39	3780.13	3674.03	3909.00	2.18

Pearson correlation analysis was performed to determine the statistically effect of density on ultrasonic wave velocity. And, as seen in Table 2, it's figured out that there is significant effect of density on velocity according to the results. Variance analysis was done to determine the effect of propagation length on velocity. SPSS v20 software was used for analysis. And, as seen in Table 3, it's figured out that there is significant effect (P<0.05) of propagation length on ultrasonic wave velocity. According to Duncan test results as seen in Table 4, each propagation length group formed individually.

Table 2: Pearson correlation results between density and ultrasonic wave velocity

		Density	Velocity
Density	Pearson Correlation	1	.449**
	Sig. (2-tailed)		.000
	N	59	59
Velocity	Pearson Correlation	.449**	1
	Sig. (2-tailed)	.000	
	N	59	59
**. Correlation is significant at the 0.01 level (2-tailed)			

Table 3: Variance analysis of propagation length and ultrasonic velocity

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2068495.656 ^a	2	1034247.828	158.735	.000
Intercept	761172373.565	1	761172373.565	116823.941	.000
Propagation length	2068495.656	2	1034247.828	158.735	.000
Error	364870.869	56	6515.551	158.735	.000
Total	765907927.747	59			
Corrected Total	2433366.524	58			
a. R Squared = 0.850					

Table 4: Duncan homogeneity results of propagation length and velocity

Propagation Length (mm)	N	Subset		
		1	2	3
20	19	3334.59		
30	20		3663.90	
40	20			3780.13
Sig.		1.00	1.00	1.00

It's found that longitudinal ultrasonic wave velocity a bit increased with the increase in density and propagation length. According to Bucur (2006) larger specimen dimensions mean higher accuracy of measurements. Ultrasonic velocity of the 20, 30 and 40mm samples were calculated as 3331.52, 3663.90 and 3780.13 m/s, respectively. Higher velocity obtained from the samples which was 40mm and had 0.49 g/cm³ density. Coefficient of variation of sample velocities varied from 1.37 to 2.18. In a same manner with this study, positive relation between density and velocity was reported by Oliveira and Sales (2006). As seen in figure 1, relations between density and velocity of the each propagation lengths (20, 30 and 40mm) were presented using linear regression models. Coefficient of determination (R^2) figured out that the results were statistically significant. R^2 values of the 20, 30 and 40mm samples were approximately calculated as 0.87, 0.89 and 0.84, respectively. In order to estimate the effect of density on ultrasonic wave velocity, some factors must be taken into consideration. And, slope of grain, micro-fibril angle, heartwood or sapwood, sample geometry, propagation direction, share of the juvenile or mature woods in a sample, moisture content, temperature, etc. Hasegawa et al. (2011) mentioned that measuring position is important to eliminate the effect of alterations in the tracheid length and micro-fibril angle when test sample contains juvenile and mature wood. In this study, samples were prepared from sapwood section of the laths.

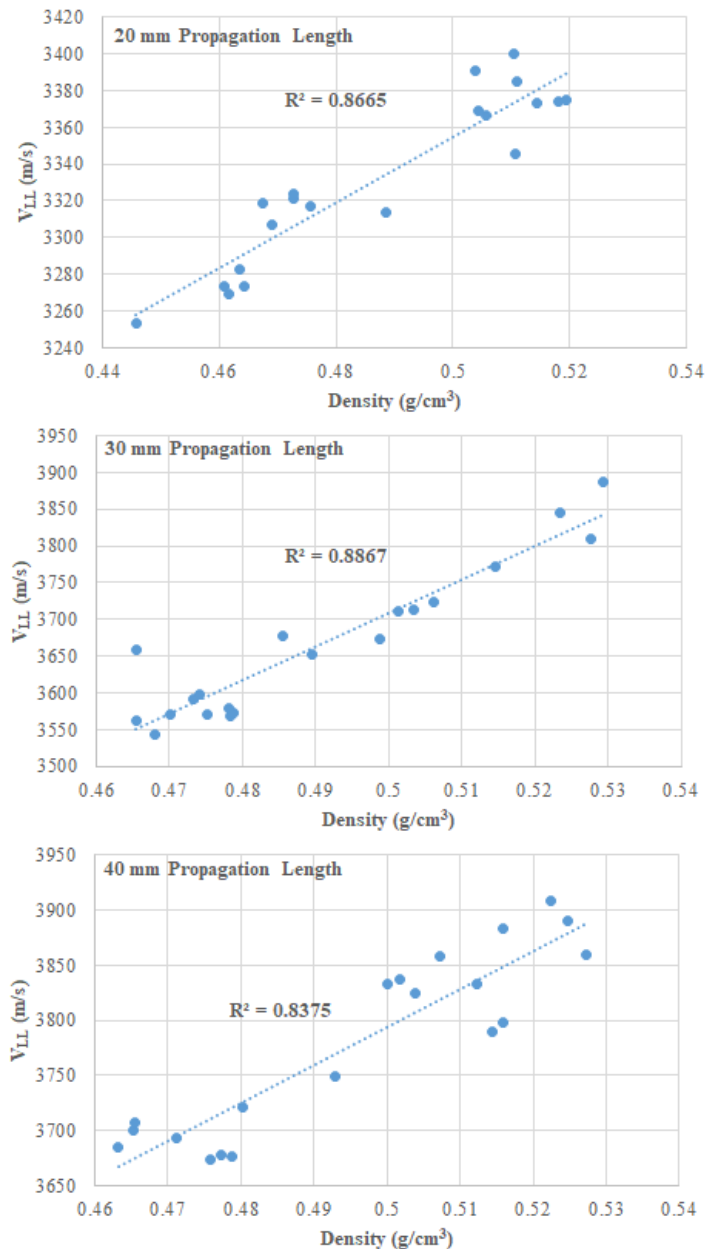


Figure 1. Relationship between density and ultrasonic velocity for each propagation length

Conclusion

In this study, effects of density and propagation length on ultrasonic wave velocity in Taurus cedar wood were investigated. Effects of density and propagation length on velocity were separately evaluated. It's seen that there is a positive relation between wood material density and velocity. And, this relation was statistically significant. Coefficient of determination values approximately varied from 0.84 to 0.89. Also, statistically significant increase in ultrasonic velocity was observed with increase in propagation length. Consequently, it's concluded that density and propagation length have effects on longitudinal ultrasonic wave velocity in Taurus cedar wood.

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REMOVAL OF MALACHITE GREEN WITH MAGNETIC CHARGED PUMPKIN SHELLS

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Abstract: Due to the high performance and low adsorbent costs, the use of agricultural wastes in removing dyestuffs is an attractive alternative. Adsorption experiments were applied to adsorption of dyestuff and equilibrium data to Langmuir and Freundlich adsorption isotherms. As a result of the study, the adsorbent obtained from the modification of the pumpkin shell was found to be effective in removing the dyestuff from the aqueous solution and its use as adsorbent was demonstrated.

Keywords: Agricultural waste, Dyestuff, Adsorption

Introduction

Population growth throughout the world and increasing environmental pollution in parallel with industrial development cause more pollution of life resources. Water, which is the source of life, is exposed to more intensive pollution than air and soil by the pollutants released as a result of industrial activities (Bhatnagar et al. 2010). Agricultural wastes are considered as raw material due to their availability and low cost for water pollution control (Hameeda and El-Khaiary, 2008).

There are many types of structural paints, such as acidic, basic, dispersing, azo, diazo, anthraquinone type dyes and metal complex dyes. Most of these dyes are toxic, mutagenic and carcinogenic. Wastewater containing dyestuffs are well known contaminants of the recipient bodies in industrial areas. Because of the negative effects on the environment, removal of dyestuffs is a matter of great care and attention (Xu et al. 2004, Gupta and Suhas, 2009). Recently, various low-cost adsorbents from agricultural wastes, industrial by-products or natural materials have been used extensively in the removal of dyestuff from aqueous solutions. Some of these alternative adsorbents include palm ash and chitosan / palm ash, schist oil ash, Posidonia oceanica fibers, water hyacinth, pomelo (Citrus grandis) shell, soybeans, sunflower seed shells, mandarin shells, sawdust, bran, guava leaf powder and almond shells. and wheat (Hameeda and El-Khaiary, 2008).

The use of inanimate biomass, such as agricultural wastes, has some advantages over other biosorbents. The availability for water pollution control is abundant as a source, because it is obtained as a by-product after harvesting, it does not need to be produced separately, and it draws attention as raw material due to its low cost. Pumpkin, Cucurbita pepo L., Cucurbitaceae is a herbaceous plant of the family. One of the most demanding vegetables in Asia and the Pacific region (Hameeda and El-Khaiary, 2008, Njoku et al. 2013).

It is recommended to use as an adsorbent in dye removal from aqueous solutions in order to make better use of cheap and abundant agricultural waste. The aim of this study is to investigate the removal of dyes from aqueous solution by modifying the pumpkin shells consumed in Sakarya.

Methods

Adsorbent

The dyestuff used in this study was purchased from malachite green (MY) Sigma-Aldrich. The formula of the dyestuff is shown in Figure 1. All chemicals used in the study are of analytical purity. NaOH, HCl, MY, FeSO₄.7H₂O and FeCl₃.6H₂O are the Merck brand and purchased from Germany.

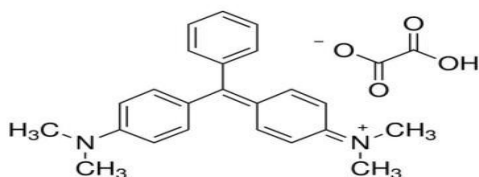


Figure 1. Chemical Formula of Malachite Green

Adsorbent

The pumpkin shells obtained from the local market were washed with boiled water several times in the laboratory and finally with deionized water. Then, after being dried and crushed in the oven, it was stored in plastic bottle for use in adsorption processes. No other chemical or physical treatment has been performed prior to adsorption experiments.



Figure 2. Pumpkin vegetable

Adsorption Work

Maximum adsorption capacity of adsorption isolates

$$q_e = \frac{(C_o - C_e) \times V}{m} \quad (2.1)$$

is calculated by correlation. Here, q_e , the malachite green adsorption capacity in equilibrium (mg / g); C_o indicates the initial concentration (mg / L), V , solution volume (L), and m shows the amount of adsorbent (g).

Results and discussion

Effect of pH on Adsorption Yield

The pH of the solution affects the surface charge of the adsorbent and the degree of ionization of the adsorbent. It is seen that dye adsorption increases with the increase of pH. It is thought that this is due to the excess OH ion in the environment and the cationic structure of the dyestuff. It is thought that the excess OH ion in the environment in basic pH environment is complex with the cationic dyestuff and reduces the adsorption.

Adsorption Isotherms

Adsorption isotherms are one of the effective factors for the design of adsorption systems. In fact, the adsorption isotherm explains the interaction between adsorbent and adsorbate (Humanlike, .2011, Suteu., 2010).

Equal amounts of samples were analyzed by UV visible spectrophotometer. Adsorption of the adsorbed substances and (3.1) with the number of Langmuir equation 3.1,

$$\frac{1}{q_e} = \frac{1}{Q_{\max}} + \left(\frac{1}{Q_{\max} b} \right) \frac{1}{C_e} \quad (3.1)$$

It was calculated by using the adsorption material obtained as a result of adsorption and using Freundlich equation (3.2). The k_f and n constants are calculated by utilizing the equation with the appropriate parameters.

$$\log q_e = \log k_f + \frac{1}{n} \log C_e \quad (3.2)$$

Conclusions

As a result of the studies, the adsorbent obtained from the modification of the pumpkin shell was determined to be effective in removing the dyestuff from the aqueous solution and its use as an adsorbent in wide application areas as alternative adsorbents was explained.

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Renewable Energy Technologies

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Abstract. In this paper, we present an overview containing essentials, of some basic renewable power technology production, bright, hydro, Breeze power. We need to reflect the charge of renewable power technology production. We think that not a simple situation to determine the reason of very power technology production, some elements determine price. The ecological profits of renewable power technology production are not easy to consider because of charge reserves over fewer loss to the environment. We believe that it is best way to take a life cycle price approach at the stage that demanding to analyze the price of the technology production.

Keywords: renewable power, power technology, bright power, hydro power, Breeze power

Introduction

Temperature revolution has big effect and big problems in this century. Very influences could be escaped when struggles are moved to change existing power structures. Renewable power resources mean a big possible to relocate emissions of the gases for temperature revolution. We believe that renewable power resources could give positive advantages to public and financial improvement, to a sustainable power supply, and to decrease of bad effects to healthiness of people (Ottmar at all. 2012).

We deal with six renewable power resources: bio power, direct bright power, geothermal power, upgrade power, ocean power and Breeze power. Also, we will focus the incorporation to current and coming power structures. (Ottmar at all. 2012; Hunt, 2001).

Bright Power

Bright power technology production could be shared to two parts (Unido, 2009):

- bright thermal structures
- bright electric structures

Bright thermal structures: Bright thermal structures benefit from the energy of sun via heat power of vanishing and conserving. They are limited according to global crops, particular to a nation or a local part of someplaces (Unido, 2009; Hunt, 2001).

Fundamental bright thermal structures used in rising nations are mentioned at next items:

- “Bright thermal engines” benefit from composite focusing the collectors to yield more temperatures (Unido, 2009).
- “Bright water heating structures” could be used in clinics or education centers. The code of the organization is to warm the cold water, by special instruments and stock water in a container till needed. Heating materials are planned to gather the warm in the very effective, way (Unido, 2009; Harrison, & Tiedeman, 1997) (figure 1).

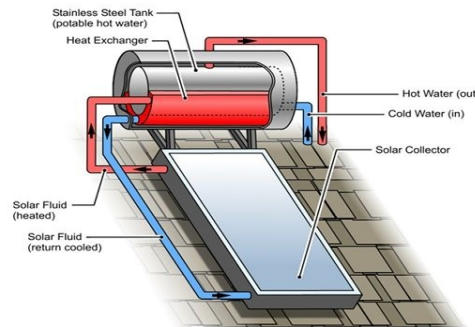


Figure 1. A hot water bright water heating system

(www.google.com.tr/search?q=A+hot+water+bright+water+heating+system&rlz)

- “Bright drying system”, in the open air conditions, applied many times and many different places all over the world. Bright drying structures are using of the sun’s power in an effective way (Unido, 2009).
- “Bright cookers structures” could be significant for the improved lack of firewood gas in most rising nation areas. These are essentially two kinds of cooker: oven and stove (Unido, 2009; Sovacool, 2009).

Photovoltaic (PV) structures: this device converts sun bright indirectly to electric power. The quantity of power could be manufactured is openly reliant on the sunlight strength (Unido, 2009). PV expedients could yield electric, for example, in winter and throughout cloudy meteorological conditions. Usual cycles in the environment of PV structures have three special magnitudes (Forslund and Arvidson, A 2009; Sovacool, 2009).

Hydro power

Upgrade power is the abstraction of power from dropping water that from a higher to a lower height at the time that is ended to permit through a power alteration material, for example, a water turbine. A water turbine translates the power of water to mechanical power. Upgrade power could be removed from river flows at the time an appropriate instrument is located indirectly in a river. The strategies engaged in the situation are usually recognized as a river existing turbines (Unido, 2009).

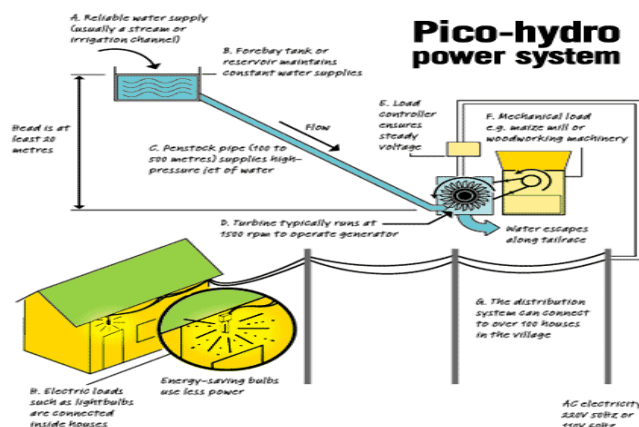


Figure 2. Diagrammatic of a pico-hydro system

(www.google.com.tr/search?q=Diagrammatic+of+a+pico-hydro+system&rlz)

Breeze power

A Breeze turbine crops power by translating the power of the Breeze, which is kinetic power, doing on the airfoil blades, which is revolving power, to torque, which is spinning power or machine-driven power. The revolving power is applied in a producer to yield electric or, that is applied in a straight way for pouring materials, for example, milling machineries or water propels (Unido, 2009; Levanthall, 2006 and Bearwald at all. 2008). Undo stressed that water propelling submissions are widely using in unindustrialized nations (figure 3).

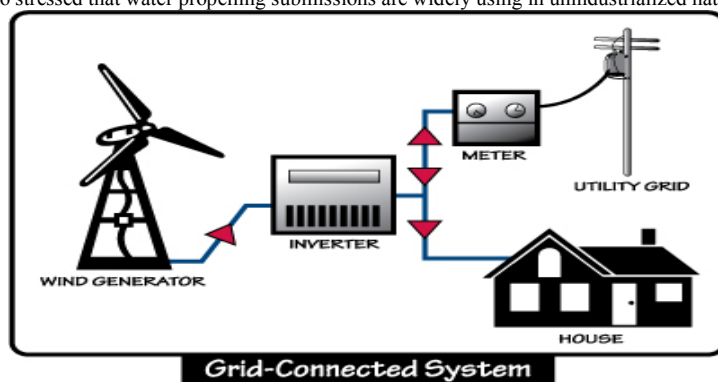


Figure 3. Breeze power system

(www.google.com.tr/search?q=Breeze+power+system&rlz)

Result

We present some overviews on the renewable energies by the light of some authors. Renewables energies could be applied to electric and warm sector. Moreover, this crop has a extensive renewable power technology production appropriate for application in emerging nations for many areas (Unido, 2009). Renewable power could help to system-correlated group and closed model applied ways could be appropriate for isolated models in emerging nations.

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SCIENCE AND VALUES

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Abstract

Scientific discoveries, academic researches and new technologies are basic to talk the world's most pressing problems. Technology, engineering and chemistry education can develop national capacity, but only if science and education systems focus attention on one of the most essential learning activities and exploring how the interaction of human values and beliefs affect national policy decisions. Unfortunately, national fixed targets with easily measurable outcomes is using too many academicians and educators. Instead of consequential academic success testing, we need consequential learning that prepares young people for life, work and human.

To the level that science can determine what we should do, it is only by providing us with empirical information, which can be set into a moral reasoning. The base of such method can in no way be determined from the scientific method. They can be created from philosophy and common sense.

Key words: *Science, chemistry, human values*

Introduction

Life and death power are interesting when the concepts generated by the evidence-based enterprises of science, technology and engineering correlation of beliefs and human values. There is no lack of controversial issues that demand consideration of that intersection, including global warming or global erosion. The production, quality, safety and distribution of the world's supplies of food, water and, lifesaving drugs are still widespread around the world. According to Earp, & Trafimow, (2016), "we have to sufficiently harness the potential for technology in the service of such values-driven issues as ending poverty"

The enterprise of science needs the adoption of certain values that are adhered to by its practitioners with exceptional rigor (Wrangham, Peterson, 1996). They explained that the values also provide the basis for enhancing human capabilities and human welfare. Truth and honor are of the utmost importance of life. According to Wrangham and Peterson, any scientist who manufactures data risks being ostracized indefinitely from the scientific community, and he or she jeopardizes the credibility of science for the larger society. A scientist may make mistake in interpreting data, but no one can accept the fabrication of data (copy of data). Group studies has become essential in most fields of science, and it requires that all the members of the group receive the recognition they deserve. Contributions are also cumulative, and each should be recognized for his or her contribution. It is a sentiment well captured in Isaac Newton's famous phrase that "if I have seen farther than most, it is because I have stood on the shoulders of giants".

Biochemistry and molecular biology are largely chemical in cast and substance. The interesting story of the unraveling of the deoxyribonucleic acid structure has moved us to home, the great importance of understanding the detailed chemical structure and behavior of the basic units out of which our bodies are constructed (Libby, 2004). He underlined that "nothing gives more promise for our future than the understanding and development and revelation of the chemical basis of heredity". Another way, genetic changes can be made by chemical treatment at a future day.

Discussion

Science and Scientist need the freedom to enquire, to challenge, to think, to imagine the unimagined in every branch of it (Earp, 2016). He declared that "it cannot function within the arbitrary limits of convention, nor can it flourish if it is forced to shy away from challenging the accepted". Science and technology advances by overthrowing an existing paradigm, or at least substantially expanding or modifying it to connected knowledge or subject. This mean that there is a certain constructive traitorousness built into the scientific enterprise, as a new generation of scientists adds the positive contribution. Earp stayed "our respect and admiration for Newton are not diminished by the achievements of Albert Einstein. We can admire both. This constant renewal and advancement

of our scientific understanding is a central feature of the scientific enterprise". So, in this perspective, it needs a positive association with the opposite view that is settled in disputes arbitrated by the rules of evidence. The science (chemistry, physics and biology) and engineering disciplines that gave us both life: "depriving" and "life-saving devices" (Libby, 2004). According to him, the processes are at their core evidence-based enterprises. However, he insisted the knowledge that is generated gets applied through the prism of values and beliefs. We understand from his approach that it is vital that the ways in which these contributors to decision-making influence one another are addressed explicitly in formal education. Also he added that "our failure to do so, either intentionally or to avoid conflict undermines democracy, permitting power, demagoguery and prejudice to rule". Science needs rationality and promotes civility in discourse. Ad hominem attacks are not accepted (Kaufman, 2012). Science treats all humans equally. Scientists are concerned with the content of the scientific work, not with the person who produced it, or not the country that presented it. Science is open to all, regardless of nationality, race, religion, country or sex. These values of science are universal values worth defending, not just to promote the pursuit of science but to produce a better and more humane society to create livable world.

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SEED PRIMING WITH CONSORTIA OF PLANT GROWTH PROMOTING RHIZOBACTERIA PROMOTES WHEAT GROWTH AND SOIL PROPERTIES UNDER CONTRASTING SOILS

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Abstract

Plant growth promoting rhizobacteria (PGPR) have gained considerable interest in plant sciences because of their eco-friendly nature in agri-systems. But no report is available that shows comparative efficacy of PGPR in promoting wheat growth as well as effects on soil properties under different soil conditions. In the present investigation, different strains of PGPR viz. *Bacillus megaterium*, *Pseudomonas fluorescens* and *Bacillus subtilis* were evaluated for their growth promoting effects on wheat as well as their effects on soil properties under field conditions at two different sites having sandy loam and silt loam type of soils. PGPR strains were evaluated either singly or in consortia. Amongst all the treatments, wheat inoculated with consortia of PGPR strains with half dose of NPK was found most effective as it increased number of tillers upto 27%, biomass up to 43%, grain yield up to 50% and 1000 grains weight upto 29% over control in silt loam soil, whereas, corresponding effects in sandy loam soil were less pronounced as effect of 25%, 28%, 31% and 14% was observed in corresponding treatments, respectively. Enhanced effects on soil properties were also more intense in silt loam as there was an increase of 205% organic matter as against sandy soil where this value was 110%. Similar behavior was observed in case of available P and K. It was generally concluded that PGPR work better under silt loam soil as compared to sandy loam soil. Moreover, 50% of recommended NPK dose can be substituted by the combined inoculation of these PGPR strains to enhance wheat yield and soil properties and to avoid ill effects of commercial inorganic fertilizers.

Keywords: Rhizobacteria, Bacillus, Pseudomonas, Wheat, Soil properties

Simulation Approaches in Construction

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Abstract. Visual simulation has turned out to be as a main development instrument for a projected constructed setting. The procedure system permits effective building, reducing period and monitoring funds, machineries and resources. Construction sector has progressed from old-style site construction to offsite contemporary approaches of building. Very effective and operative arrangement and management procedures are required, and it should need applying visual methods in modern construction to offer an influential administration stage for arrangement and directing projects (Rohani at all, 2013). In this paper, we analyse some projects, focus on some critical points of those projects.

Keywords: construction-simulation, construction-visualization

Introduction

Building sector has developed from old-style to contemporary version in last years. Using site construction systems has transformed to industrial invention replace with old-style site manufacture methods. The choice to build a plan by new method building is encouraged by the necessity to encounter the extension of schedule, to spend minimum price, to decrease unwanted situation and to achieve high quality project production. Then, old-style administration approaches could not be appropriate for scheduling and directing development funds. In this, extremely effective and operative site scheduling and managing approaches are required and functioning in a powerful scheduled effective situation could be in highly potential of plan funds (Rohania at all., 2013; Mahbub 2008).

Many investigators arranged the project disappointments and the explanations of the failures (Uddin, 2012; Abdu at all.2010). The research group pointed out that simulation of projects is accepted to be a significant answer to prevent the project failure points and simulation could support to work the building effort on plan, since comprehensive applications are carefully and deeply monitored. Finally, they stressed that simulation technologies can set planning and analyzing building operations performed in advance anticipating problems So, simulation organizations are applied to plan resources to source in a building work and analyze a procedure (Uddin at all, 2012) (Figure 1).



Figure 1. The complete building simulation system is housed.
(<http://www.thoroughtec.com/cyberquip-building-full-mission-simulators/>)

Building Project simulation

Building schemes have numerous single configurations and the single original of schemes is vital to do scheduling choices. Designers sometimes add new necessities and useful apparatus to organise the conditions and the team practice through the simulation of the typical system (Uddin, 2012; Kamat and Martinez, 2001). They could practice many types of conditions in the simulation organization that designe need to practice when the building operate be active. Building managers could advance strategies which could make simple the action of the scheme's geometric conformation on the building procedure because of the complexities found during the simulation process (Uddin, 2012; Webster at all, 1996). According to them, the common practice is protecting the procedure design at a high point and producing a modificative design for smaller breaks as the scheme map (Figure 2).

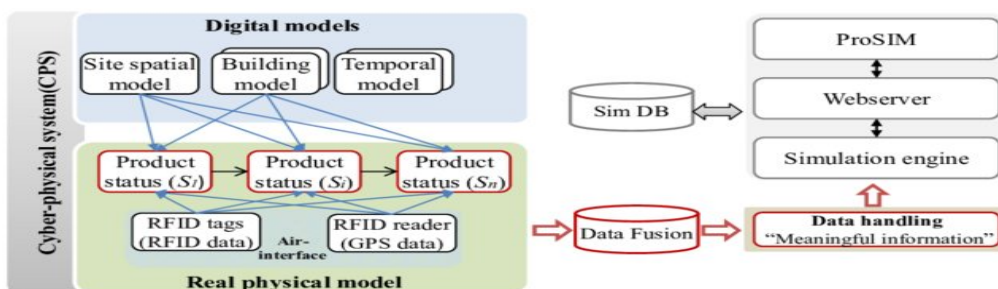


Figure 2. Integration of real data fusion of building project into simulation tool platform.
(https://www.researchgate.net/publication/314977946_Integrated_and_collaborative_process-based_simulation_framework_for_building_project_planning/figures?lo=1)

The illustration of the ended capacity that could offer basic knowledge of the concrete building work are drawn with 2-dimension presentation. By the 3-dimension presentation, geometric models of the elements of the project could be exhibited efficiently to provide better understanding of the building processes.

Simulation systems for Building Projects

There are many systems to simulate the building operations in different way and approaches. The choice for application of a suitable system directly depends on the level of simulating the building site, level of complication in building and information necessary (Uddin, 2012).

Dynamic building visualizer: It was determined that dynamic building visualizer is planned to be applied in aggregation by an extensive diversity of simulation apparatuses applying 3-dimension copies constructed in a similarly large diversity of Computer Aided Design CAD) demonstrating programs (Uddin, 2012; Kamat and Martinez, 2001) (Figure 3).

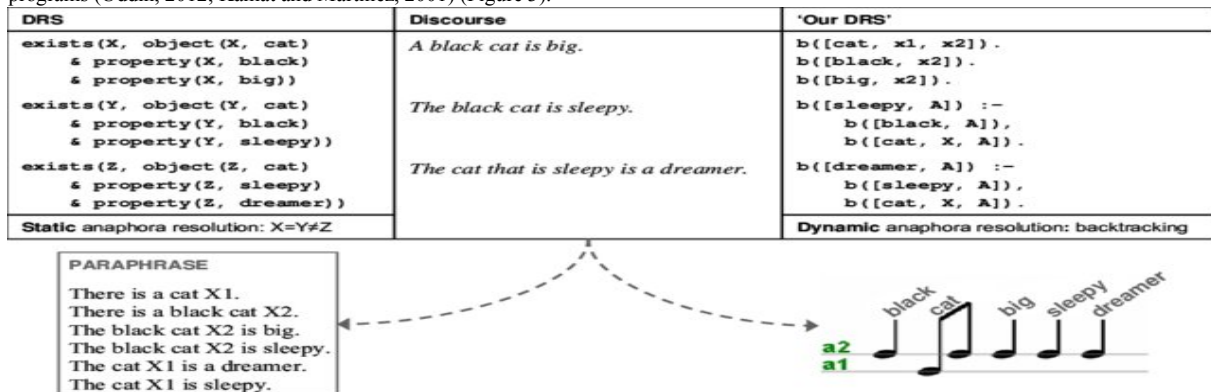


Figure 3. Static versus dynamic building for visualization.

(https://www.researchgate.net/publication/266576562_Ontological_Word_Sense_Disambiguation_for_Discourse_Representation/figures?lo=1)

This system could show the real dynamic motion of building equipment. The system could not show the conversion conditions of simulation items through visualization. Also, this demonstrates the simulation founded on confident unclear periods, but it does not give the simulation of physical deformations of objects (Uddin, 2012; Kamat and Martinez, 2001).

Augmented Reality Applications: important and final progress of computer technology permit for the mixing of improved certainty in building studies in the sector (Uddin, 2012; Webster at all., 1996; Moore, 2010). The organization involves in a display that is to do of figuring the illustrations. The system is applied by C, and C + (Figure 4).



Figure 4. An example for augmented reality applications.

(<https://www.newgenapps.com/blog/augmented-reality-apps-ar-examples-success>)

Result

In this paper, we planned to review some technologies and to make clear a probable system to present the building mission efficient and collective. Of course, successful application of the recommended technique could be tested to reach much effective results. Finally, we propose that many investigations should be applied to explore as extremely to the exploitation of the systems on new modern building and manufacturing systems.

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SOCIAL INCLUSION YOUTH THROUGH EDUCATION, TRAINING AND MEDITATION

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Abstract

The purpose of the study is to contribute to countering radicalism, violence and terrorism, by conducting pilot projects with intervention techniques in secondary schools through Meditation Technique and Quiet Time. An international consortium consisting of 12 partners, led by Villa Montesca in Italy, obtained a grant from the European Commission for conducting the above-mentioned pilot projects in secondary schools throughout Europe. The project started at January 1, 2017. Students in secondary schools are tested, the intervention technique is applied and after three months the students are tested again and compared to a control group. The intervention technique that is used is Quiet Time based on Transcendental Meditation. Along the project scientific research has been conducted, to measure the effectiveness of the used intervention technique. Pre- and posttests were conducted in experimental and control groups for teachers, students parents and school management. Demographic factors, such as age, sex and psychological well-being via STAI, MASC and Healthy Kids survey Resilience Assessment are measured in three countries (i.e., Sweden, Portugal and The Netherlands). The current study was conducted in Portugal. It was hypothesized that Quiet Time Results resulted in more positive affect and less aggression, stress, anxiety and more cooperation skills. Preliminary results indicate that TM groups become less anxious to be humiliated by others in social settings and increase their cooperation with others, with regard to a higher flexibility in relationships, higher ability to exchange information and a higher ability to express feelings and needs. The results were strongly correlated with the frequency of meditation.

Key words: Secondary Schools, Stress, Anxiety, Aggression, Violence, Transcendental Meditation

Introduction

“There is an ever-increasing state of chaos in the world; tension increases daily in the individual, in social life, in national affairs, and international relations. The great and urgent need is for something to re-establish harmony in the individual human being and to give him peace; only from such an inner peace can wisdom and happiness be born.” (Maharishi, 1960 in Domash, 2011)

In order to obtain less stress levels, less anxiousness, less aggression Maharishi made clear that what he was recommending was the practice of a technology based upon certain principles of mental functioning, and not the acceptance of a new philosophy or system of belief.

The TM Programme does not interfere with the practice or belief of any religion. Maharishi developed a finely tuned systematic approach of teaching Transcendental Meditation. All teachers from several nations,

backgrounds learn the same standardized technique: a sequence of two lectures, an interview with questionnaire, and a session of personal instruction in the actual meditation practice, which is then followed by three follow up classes over six separate days. Once learned, the individual practices the technique for about twenty minutes in the morning and again in the evening. No requirements are made regarding habits, diet, or other life-aspects.

The course in the Transcendental Meditation Technique may well be the most uniform education offered to the world's public, due to systematic, precise, and uniform taught. As such it can provide a general framework for scientific thought. Domash (2011) pointed out that the Transcendental Meditation Programme is safe and effective, can be systematically and uniformly taught, and is quick to give results. Therefore, it can be objectively measured in scientific research.

For the purpose of the larger study the definition of terrorism is:

Politically motivated violence, perpetrated by individuals, groups or state-sponsored agents intended to instill feelings of terror and helplessness in a population in order to influence decision making and to change behaviour (Moghaddam, 2005).

Based on empirical insights, Sieckeling (2018) concluded that influencing adolescents with or without ideas of radicalization starts by influencing their mindsets. The best context to do so, is the educational context. In the current study research has been conducted, to measure the effectiveness of the used intervention technique. Pre- and posttests are conducted in experimental and control groups for teachers and students.

Current Study

This study is part of a larger study to attempt to combat radicalism, violence and terrorism. Students in secondary schools were tested via questionnaires (e.g. MASC, STAI, Healthy Kids Survey Resilience Assessment). Teachers were also tested via questionnaires (e.g. Maslach Burnout Inventory). The intervention technique in the school was Quiet Time based on TM for students and their teachers. STAI is a self-assessment instrument reflecting the average or chronic level of distressing emotions. MASC measures anxiety levels for children. Healthy Kids Survey Resilience Assessment is divided into two levels: Internal (cooperation, empathy, help-seeking) and External (connection with peers, school, community, family).

The participating school introduced Quiet Time in their curriculum, by implementing 15 minutes silence at the beginning and at the end of the school day. Students are invited to practice the technique during these 15 minutes. Students who do not want to practice Transcendental Meditation are requested to perform a silent activity (e.g. reading, sitting with eyes closed) during these 15 minutes. After three months the children and teachers who actually meditated during 15 minutes (the experimental group) are tested again and were compared to a control group. Elder, Nidich, Moriarty, and Nidich. (2014) pointed out that the Transcendental Meditation program was effective in reducing psychological distress in teachers and support staff working in a therapeutic school for students with behavioral problems. These findings have important implications for employees' job performance as well as their mental and physical health.

Hypothesized results of Quiet time in the current study are: Transcendental Meditation Techniques will lead to **1)** reduction in stress level and anxiety (Alexander, Langer, Newman, Chandler, & Davies, 1989; March, Parker, Sullivan, Stallings & Connors, 1997); **2)** reduction in school dropouts rate (Colbert 2013); **3)** better relations toward school, community, peers (Alexander, Rainforth, & Gelderloos, 1991; Healthy Kids survey Resilience questionnaire), and especially for teachers **4)** decreased teacher burnout (Elder, Nidich, Moriarty, & Nidich, 2014; Maslach, & Jackson, 1981, MASC). Differences were expected based on previous cross-sectional, prospective, randomized studies of the effects of TM on (chronic) distress (see for review, Eppey et al., 1989; Alexander et al., 1990,1991).

First Results

In the current study secondary school teachers and children of the pilot group were living in Portugal. Participants: 30 teachers, 129 children (80 children experimental group, 49 children control group (see for further details: Slot, Van Assche, Vieira, & Vieira dos Santos, 2018; Vieira, Vieira dos Santos, & Gomes, 2018).

The same questionnaires were conducted after three months of Transcendental Meditation Technique, during 15 minutes in the morning and afternoon at school.

Demographic factors, such as age, sex showed no significant differences. Preliminary results indicated that Portuguese children of the TM group 1) feel less anxious to be humiliated by others in social settings and increase their cooperation with others. 2) Unfortunately there was no significant reduction in school dropouts rate. 3) They experience a higher flexibility in relationships, and a higher ability to exchange information. Furthermore they have a higher ability to express feelings and needs. 4) Finally, teacher numbers of burnout decreased.

It was emphasized that the results were strongly correlated with the frequency of meditation.

Discussion

The current study was part of a larger study to attempt to combat radicalism, violence and terrorism. Children on secondary schools were tested via questionnaires (e.g. MASC, STAI, Healthy Kids Survey Resilience Assessment). Teachers were also tested via questionnaires (e.g. Maslach Burnout Inventory). The intervention technique was Meditation Technique and Quiet Time, during 15 minutes in the morning and afternoon at school. It was hypothesized that children who meditate (TM) have a 1) reduction in stress level and anxiety; 2) reduction in school drop-out rate; 3) better relation toward school, community, and peers; and for their teachers: 4) decreased teacher burnout.

Preliminary results indicated that TM group becomes less anxious to be humiliated by others in social settings and increase their cooperation with others, with regard to a higher flexibility in relationships, higher ability to exchange information and a higher ability to express feelings and needs. All results were strongly correlated with the frequency of meditation.

Limitations of the current study is that we only tested a small group of children and teachers of a secondary school in Portugal. Therefore we recommend *further research* to expand this study to different countries and with different groups of adolescents and teachers.

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SOĞUTMA ORTAMI VE TEMPERLEME SICAKLIĞININ AISI 4140 ÇELİĞİNİN AŞINMA DAYANIMINA ETKİSİ

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Özet: Aşınma; birbirlerine göre bağlı hareket eden ve temas eden yüzeylerde, mekanik ve kimyasal etkenlerden dolayı oluşan malzeme kaybıdır. Makine parçalarının ömürlerine büyük oranda etki eden aşınma, sürtünerek çalışan makine parçalarında kaçınılmaz hale gelmektedir. Sonucunda ise hem malzeme kaybı hem de enerji kaybına yol açmaktadır. Aşınma malzemelerin; kristal yapısı, sertliği, elastisite modülü, deformasyon davranışı, yüzey pürüzlülüğü gibi birçok parametreye bağlı olarak değişmektedir. Isıl işlemler ile malzemelerin sertliği değiştirilebildiğinden, malzemelerin aşınma davranışı da kısmi olarak belirlenebilmektedir. Bu çalışmada, krank milleri, dişli ve çark sistemleri, takım tezgâh yatakları, hafif silah mekanizmaları gibi birçok yerde tercih edilen AISI 4140 ıslah çeliğinin farklı ısıtma koşullarında aşınma dayanımı incelenmiştir. Deney numuneleri 2k faktöriyel (3 seviyeli tam faktöriyel tasarım) deney tasarımı metodolojisi kullanılarak, iki farklı soğutma ortamı (su verme, tuzlu suda su verme), iki farklı temperleme sıcaklığı (200 °C, 500 °C) ve iki farklı aşınma yükü (10 N ve 50N) kullanılmıştır. Aşınma deneyleri öncesinde, numune yüzeylerinin pürüzlülükleri belirlenmiş ve ortalama pürüzlülük değerleri (Ra) referans alınmıştır. Hazırlanan numuneler ASTM 99' a uygun şekilde, oda sıcaklığında aşınma deneylerine tabi tutulmuştur. Aşındırıcı uç olarak alümina (Al₂O₃) bilyenin kullanıldığı deneyde, aşınma deneyleri 1000 m yol için gerçekleştirilmiştir. Malzemelerin aşınma sonrası ağırlık kayıplarını ölçmek adına deney öncesi ve sonrası ağırlıkları 10⁻⁴ g hassasiyetli terazi kullanılmıştır. Ölçülen ağırlıklardan özgül aşınma oranları hesaplanmış ve sonuçlar yorumlanmıştır.

Anahtar kelimeler : AISI 4140, Aşınma dayanımı, Isıl işlem, Temperleme

Abstract: Wear; is the loss of material due to mechanical and chemical agents on surfaces that move and touch relative to each other. The wear which affects the life of the machine parts in large scale becomes inevitable in the parts of the machine exposed to friction. As a result, wear results in both material loss and energy loss. Wear varies depending on many parameters such as the crystal structure of the materials, hardness, modulus of elasticity, deformation behavior, surface roughness. Since the hardness of the materials can be changed by heat treatment, the wear behavior of the materials can also be partially determined. In this study, the abrasion resistance of AISI 4140 Annealed Alloy Steel, which is preferred in many places such as crankshafts, gear wheel systems, machine tool bearings, light weapon mechanics, has been examined. The test specimens were prepared with two different cooling conditions (quenching, quenching in salt water), two different tempering conditions (200 °C, 500 °C) and two different wear loads (10 N and 50N) using the 2k factorial (3-level full factorial design) experimental design methodology. Prior to the wearing tests, the roughness of the sample surfaces was determined and the average roughness values (Ra) were taken as reference. The prepared specimens were subjected to abrasion tests at room temperature in accordance with ASTM 99. The abrasion tests were carried out for 1000 m road using abrasive alumina (Al₂O₃) balls. In order to measure the weight loss of materials after the abrasion, weights of 10⁻⁴ g were used before and after the test. Specific wear rates were calculated from the measured weights and the results were interpreted.

Keywords: AISI 4140, Wear Resistance, Annealing, Tempering

Giriş

Günümüzde mekanik sistemlerin büyük bir çoğunluğu yüksek yükler, yüksek hızlar ve sert çevre koşulları gibi zorlu çalışma koşullarında kullanılmaktadır (Höke vd., 2014). Bu nedenle mühendislikteki bilimsel çalışmaların birçoğu malzeme özelliklerinin iyileştirilmesi üzerine yürütülmektedir. Bu iyileştirmeler; mekanik özellikler, tribolojik özellikler ve kimyasal özellikleri kapsamaktadır (İpek vd., 2017). Bu özellikler arasında ise büyük bir alanı kapsayan tribolojik çalışmalar bulunmaktadır (Novak ve Polcar, 2014). Tribolojinin ana teması aşınmadır. Aşınma, sanayide en çok karşılaşılan problemlerden biri olarak görülmektedir ve hareketli sistemlerde bileşenlerin yüzeyinden başlayarak ilerleyen hasarın başlangıcını teşkil eder ve kaçınılmaz bir durumdur. Bu sistemlerde temel olarak beklenen, aşınmanın sadece yüzeysel olarak kalmasının yanı sıra sabit bir sürtünme katsayısı ve aşınmaya karşı dirençtir. Bahsi geçen konuların iyileştirilmesi için de metalik malzemelerin, aşınma,

korozyon direnci ve yüzey sertliği gibi mekanik özelliklerini artırmak yönünde çeşitli uygulamalar yürütülmektedir (Podgornik vd., 1999). Bu uygulamalar yapılırken, çalışan sistemden beklenen işe teorik olarak hesaplanan hizmet süresi kadar hasara uğramadan çalışabilmesini temin etmektir (Torres vd., 2011 ve Ekinci vd., 2011). Bu da, gereç yapımında kullanılacak çeliğin uygun seçilmiş olmasıyla doğrudan ilişkilidir. Ayrıca çeliklere, doğru bir ısıtma işlemiyle çok çeşitli özellikler kazandırmak mümkündür (Kusmoko ve Crosky, 2013). Çeliklere en çok uygulanan ısıtma işlemi sertleştirme ısıtma işlemidir. Bu işlemle çeliklerde bulunan fazlar martenzit ve beyrit gibi daha sert olan fazlara dönüştürülür. Ancak bu ısıtma işlemleri çoğunlukla tek başlarına kullanmak için uygun değildir. Aşırı iç gerilmeler barındıran bu sistemler temperleme ısıtma işlemlerine tabii tutularak sertlik değerinde ihmal edilebilecek derecelerde azalmalara karşın dikkate değer ölçülerde tokluk kazandırılmasına olanak tanır (Soydan vd., 2008).

Mekanik özelliklerin geliştirilmesi üzerine yürütülen çalışma sonuçlarının olumlu olup olmadığı konusunda çeşitli deneyler yürütülür. Tribometre (Pin-on-disc) olarak bilinen aşınma deney düzenekleri bu test metodlarından biridir. Bu test metodunda çeşitli yükler altında aşındırıcı bir uç test edilecek olan malzeme yüzeyine temas ettirilir (Torres vd., 2011 ve Nair vd., 2009). Numune belirli bir hızla, belirli mesafeler kat edecek şekilde döngüsel hareketlerle çalıştırılır. Bu döngüsel hareketler lineer veya dairesel bir rota olabilir. Ayrıca bu tür çalışmalar yağlayıcı kullanılarak veya kullanılmadan da test etmeye olanak sağlar.

Bu çalışmada, numuneler tribometre ile 50 N ve 10 N yükler altında, hem kuru hem de yağlama yapılarak dairesel bir rotada deneye tabi tutulmuş ve ağırlık kayıpları ile aşınma davranışları arasındaki ilişki araştırılmıştır.

Materyal ve Metot

Yürütülen bu çalışmada, ısıtma çeliği olarak bilinen AISI 4140 çeliği kullanılmıştır. Kimyasal bileşimi sayesinde su verme işlemine duyarlı olan ve ısıtma işlemi sayesinde belirli yükler altında yüksek tokluk özelliği gösteren alaşımlı yapı çelikleridir. AISI 4140 çeliğine ait kimyasal bileşimi Tablo 1’de verilmiştir.

Tablo 1: AISI 4140 çeliği kimyasal bileşimi

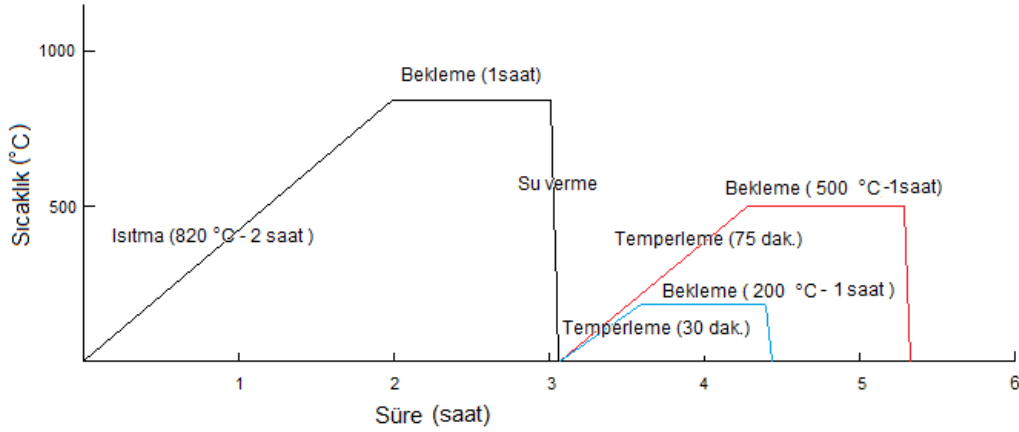
	C	Si	Mn	P	S	Cr	Mo
4140	0.41	0.22	0.12	0.032	0.037	1.02	0.26

Çeşitli işlemlerle hazırlanan numuneler Şekil 1’de gösterilen tribometre ile deneylere tabi tutulmuştur.



Şekil 1. Deneylerde kullanılan aşınma cihazı (<http://www.uts-design.com>)

Numuneler kuru ve yağlı ortamlarda olmak üzere iki farklı çalışma ortamında deneye tabi tutuldu. Numuneler, 820°C’de 1 saat argon gaz atmosferinde fırında bekletildikten sonra durgun suda su verme ve durgun-tuzlu suda su verme olmak üzere iki farklı ortamda su verme işlemleri uygulanmıştır. Su verme ısıtma işlemi basamakları Şekil 2’de verilmiştir.



Şekil 2. Numunelere uygulanan ısıtma işlemleri için sıcaklık-zaman rejimleri

Sonrasında iç gerilmeleri gidermek ve numunelerin tokluklarını yükseltmek için iki farklı sıcaklıkta (200 °C ve 500 °C) temperleme işlemi yapılmıştır. Sonrasında numuneler bakalite alınarak yüzey hazırlıkları gerçekleştirilmiştir. Yüzey işlemleri Struers marka otomatik parlatma cihazında sırasıyla MD Piano ile 5 dk., MD Largo ile 4dk., MD Dac ile 3 dk. Kullanılarak parlatılmıştır. Parlatma işlemi sonrasında numunelerin pürüzlülük değeri TR-200 model pürüzlülük ölçüm cihazı ile ölçülmüş ve ortalama pürüzlülük (Ra) değeri 0,022 µm olarak bulunmuştur. Numuneler ve uygulanan deneylere ait bilgiler Tablo 2’de verilmiştir.

Tablo 2: Numunelere uygulanan deneyler

Numune ID	Su verme ortamı	Temperleme sıcaklığı (°C)	Uygulama yükü (N)	Çalışma ortamı	Çalışma mesafesi (m)	Çalışma hızı (rpm)
1	Su	200	10	Yağlı	1000M	500
2		500	50			
3	Tuzlu su	200				
4		500				
5	Su	200				
6		500				
7	Tuzlu su	200				
8		500				

Deneyler gerçekleştirilirken her numune 10 ve 50 N’luk yüklerle deneye tabii tutulmuştur. Aynı uygulama yükleri arasında numuneler yeniden yüzey hazırlama işlemi ile hazırlanmıştır. Yağlayıcı kullanılarak gerçekleştirilen deneylerde standart makine yağı kullanılmış olup yüzeye 15(±1) sn. ‘de 1 damla (0,07 g) yağ gelecek şekilde yağlama yapılmıştır.

Test Sonuçları ve Değerlendirme

4140 çeliği aşınma dayanımını tespit etmek amacıyla gerçekleştirilen aşınma testlerinde ağırlık farkına etkisi araştırılan dört faktörün düzeylerine ait bilgiler Tablo 3’de verilmektedir. 2^k faktöriyel (2 seviyeli tam faktöriyel tasarım) deney tasarımı modeline göre dört faktörün iki seviyesi için 16 deney (2⁴) gerçekleştirilecektir. Deneylere başlamadan önce Tablo 4’te verilen deney tasarımı matrisi, Minitab istatistik yazılım programı yardımıyla oluşturulmuştur.

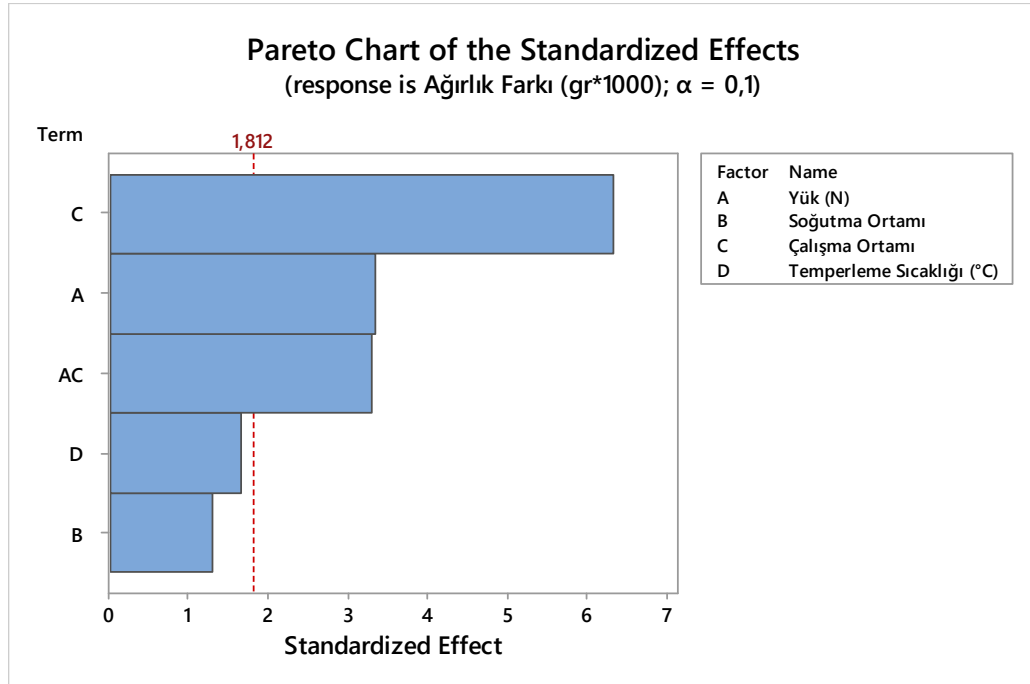
Tablo 3: Faktörler ve Alt-Üst Seviyeleri

Faktör	Birim	Değişken	Alt Seviye	Üst Seviye
Yük	N	A	10	50
Soğutma Ortamı	Text	B	Su	Tuzlu Su
Çalışma Ortamı	Text	C	Kuru	Yağlı
Temperleme Sıcaklığı	°C	D	200	500

Tablo 4. 2^k tam faktöriyel deney tasarımı

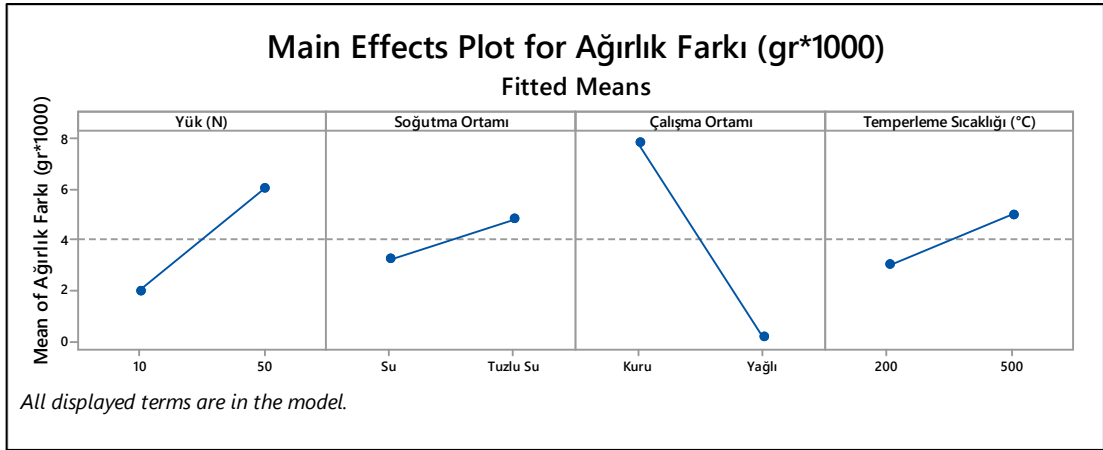
Deney Sayısı	Faktörler ve Seviyeleri			
	A	B	C	D
1	10 N	Su	Kuru	200 °C
2	10 N	Su	Kuru	500 °C
3	10 N	Tuzlu Su	Kuru	200 °C
4	10 N	Tuzlu Su	Kuru	500 °C
5	10 N	Su	Yağlı	200 °C
6	10 N	Su	Yağlı	500 °C
7	10 N	Tuzlu Su	Yağlı	200 °C
8	10 N	Tuzlu Su	Yağlı	500 °C
9	50 N	Su	Kuru	200 °C
10	50 N	Su	Kuru	500 °C
11	50 N	Tuzlu Su	Kuru	200 °C
12	50 N	Tuzlu Su	Kuru	500 °C
13	50 N	Su	Yağlı	200 °C
14	50 N	Su	Yağlı	500 °C
15	50 N	Tuzlu Su	Yağlı	200 °C
16	50 N	Tuzlu Su	Yağlı	500 °C

Deneyler sonucunda tespit edilen ağırlık farkı ($gr*1000$) değerlerine göre Minitab-18 programı kullanılarak gerçekleştirilen analiz sonucunda; $\alpha=0,10$ anlamlılık (güven) düzeyinde pareto grafiği oluşturulmuştur. Ana faktörler ve ikili/üçlü etkileşimler için oluşturulan pareto grafiği analizinde 0,10 anlamlılık düzeyindeki eşik değeri olan 1,812 çizgisini geçen faktörler ağırlık farkı değerini en çok etkileyen faktörlerdir. Grafikten de görüleceği gibi çalışma ortamı ana faktörü en etkili faktör iken ikinci öneme sahip faktör yük ana faktörüdür. Daha sonra etki seviyesi yük faktörüne oldukça yakın bir seviyede olan yük-çalışma ortamı ikili etkileşimi gelmektedir. En az etkiye sahip faktörler ise temperleme sıcaklığı ve soğutma ortamıdır.



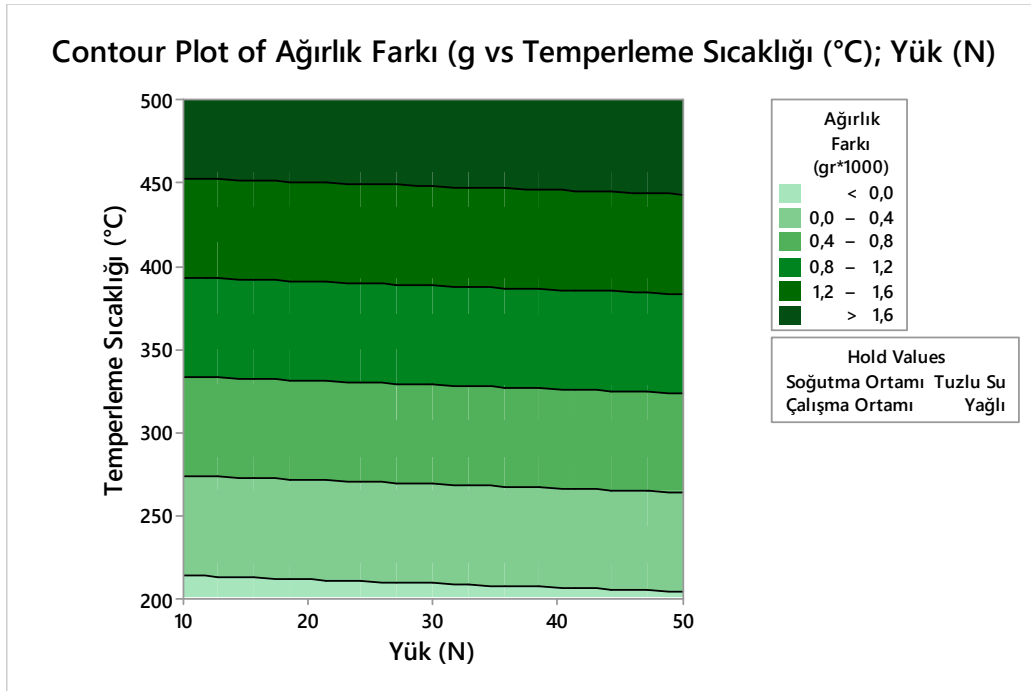
Şekil 3. Faktör etkilerini gösteren pareto grafiği

Ana faktörlerin yanıt (ağırlık farkı) üzerindeki etkilerinin grafikleri aşağıda verilmiştir. Soğutma ortamı ve temperleme sıcaklığındaki değişim hemen hemen ağırlık farkı üzerinde aynı etkiyi yaratmaktadır. Soğutma ortamının su ortamından tuzlu su ortamına değiştirilmesi ve temperleme sıcaklığının 200 °C değerinden 500 °C değerine yükseltilmesi ile ağırlık farkında yaklaşık aynı oranda artış elde edilmektedir. Diğer iki ana faktörden çalışma ortamının kuru ortamdan yağlı çalışma ortamına geçişi ile birlikte ağırlık farkında düşüş, yük değerinin 10 N değerinden 50 N değerine yükseltilmesi durumunda ise ağırlık farkında artış gözlenmektedir.

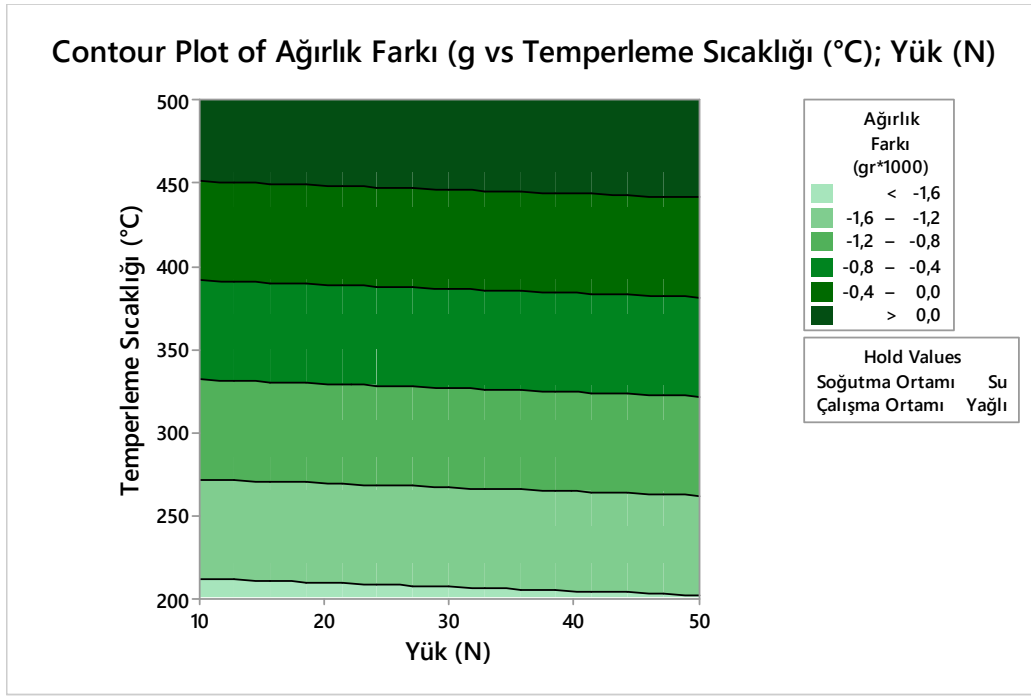


Şekil 4. Ana faktörler etki grafikleri

Temperleme sıcaklığı-yük etkileşiminin aynı çalışma ortamı (yağlı ortam), farklı soğutma şartları kullanılması durumunda ağırlık farkı üzerindeki etkilerinin eş yükselti eğrileri aşağıda verilmiştir. Düşük yük değerinde temperleme sıcaklığı da düşük seviyede tutularak ağırlık farkı en düşük değeri sağlamaktadır. Sadece soğutma ortamı değiştirildiğinde en düşük ağırlık farkı değeri yine yük ve temperleme sıcaklığı değerlerinin düşük seviyesinde sağlanmaktadır. Bu durumda en düşük ağırlık kaybını sağlayacak faktör seviyelerinin net olarak tespit edilebilmesi için optimizasyon (en iyileme) gerçekleştirilecektir.



Şekil 5. Temperleme sıcaklığı-yük ikili etkileşiminin eş yükselti eğrileri (Tuzlu su soğutma ortamı ve yağlı çalışma ortamı)



Şekil 6. Temperleme sıcaklığı-yük ikili etkileşiminin eş yükselti eğrileri (Su soğutma ortamı ve yağlı çalışma ortamı)

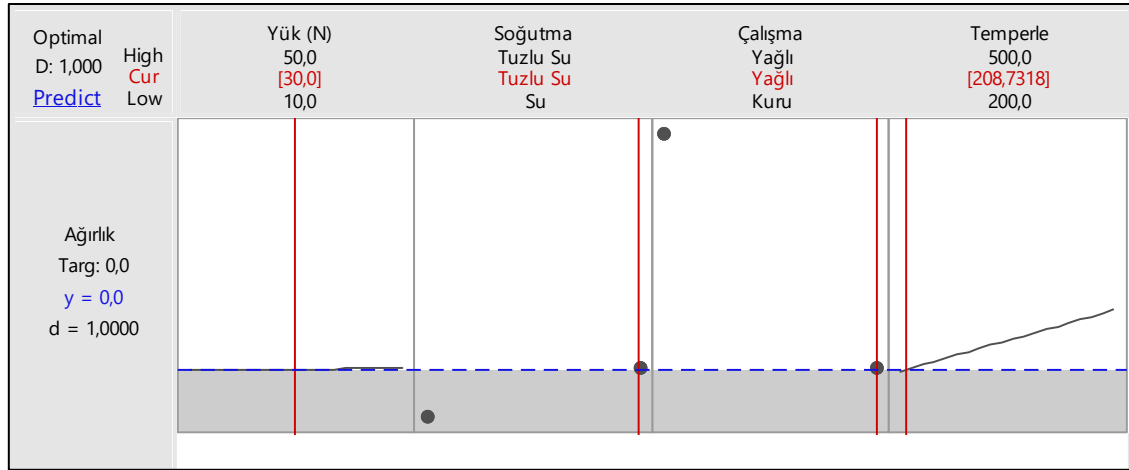
Optimizasyon:

Faktörlerin alt ve üst seviyeleri arasındaki hareketler yanıt üzerinde farklı sonuçlar ortaya çıkarabilmektedir. Çalışma kapsamında yanıtın (emilen enerji) arzu edilen değeri en iyileyecek faktör değerlerini belirlemek amacıyla en iyileme (optimizasyon) gerçekleştirilmiştir. Minitab programındaki response optimizer (yanıt en iyileyici) aracı memnuniyet fonksiyonu yaklaşımı kullanılmıştır.

Çok amaçlı en iyileme yönteminde; en iyilenecek her bir yanıt için tekil memnuniyet fonksiyonu (d) ve tüm yanıtları kapsayacak şekilde birleşik memnuniyet fonksiyonu (D) seviyesinin, faktörlerin hangi kombinasyonunda en iyi değerlere ulaşabileceği araştırılmaktadır. Tekil memnuniyet fonksiyonu (d) faktörlerin tekil olarak ulaşabileceği optimum noktayı değerlendirirken, tüm sistemin memnuniyet fonksiyonu (D) elde edilen faktör değerleri ile sonuca ne kadar yaklaşılabildiğini göstermektedir. Memnuniyet seviyesi 0 ile 1 arasında değer almaktadır. 1 değeri ideal durumu gösterirken, 0 değeri bir veya daha çok değer kabul edilebilir limitler dışına çıktığını gösterir. Yapılan analizde birleşik memnuniyet fonksiyonu D=1 olarak elde edildiği için, belirlenen en iyi faktör değerleri ile (yük 30 N, tuzlu su soğutma ortamı, yağlı çalışma ortamı ve 208,73 °C temperleme sıcaklığı) ideal duruma ulaşılabilirdiği tespit edilmiştir. Burada tek bir yanıt olduğu için sistemin birleşik memnuniyet fonksiyonu (D) ile yanıtın tekil memnuniyet fonksiyonunun (d) aynı değeri aldığı görülmektedir. En iyi faktör değerleri uygulanarak ulaşılacak yanıt (y) değeri (ağırlık farkı) ise aşınmanın olmadığı en ideal durumu tanımlayan 0 olarak bulunmuştur. Faktör seviyelerini gösteren optimizasyon sonuçları aşağıda verilmiştir.

Tablo 5. Optimizasyon sonucunda elde edilen faktör seviyeleri

Variable	Setting			
Yük (N)	30			
Soğutma Ortamı	Tuzlu Su			
Çalışma Ortamı	Yağlı			
Temperleme Sıcaklığı (°C)	208,732			
Response	Fit	SE Fit	95% CI	95% PI
Ağırlık Farkı (gr*1000)	0,00	1,20	(-2,68; 2,68)	(-6,05; 6,05)



Şekil 7. Optimizasyon Sonuçları

Regresyon ve Varyans Analizi Sonuçları:

Çoklu regresyon analizinde; deneyler sonucunda her bir parametrenin iki düzeyi için elde edilen 16 değer (2^4 tam faktöriyel) kullanılarak geriye doğru çıkarma metodu kullanılmıştır. Regresyon analizinde değişkenler arasındaki ilişkiyi fonksiyonel olarak açıklamak ve bu ilişkiyi bir modelle tanımlayabilmek amaçlanmaktadır.

İlk aşamada bütün ana parametreler, parametrelerin ikili etkileşimleri ve dördünün beraber neden olduğu etkileşim modele katılmış, $\alpha=0,10$ anlamlılık (güven) düzeyinde adım adım gerçekleştirilen analizde her bir faktör için belirlenen p olasılık değerlerine göre; ağırlık farkı üzerinde en etkili parametrenin çalışma ortamı olduğu ($p=0,000<0,1$), ikinci etkili faktörün yük olduğu ($p=0,007<0,1$), üçüncü etkili faktörün ise yük-çalışma ortamı ikili etkileşimi olduğu ($p=0,008<0,1$) tespit edilmiştir. Analizde en düşük öneme sahip faktörün soğutma ortamı ($p=0,222>0,1$) faktörü olduğu görülmektedir. Başlangıçta yeterli seviyede serbestlik derecesi elde edebilmek için analiz tarafından; yük-soğutma ortamı-temperleme sıcaklığı üçlü etkileşimi, soğutma ortamı-çalışma ortamı-temperleme sıcaklığı üçlü etkileşimi ve yük-soğutma ortamı-çalışma ortamı-temperleme sıcaklığı dördümlü etkileşimi modele dahil edilmemiştir. Faktörlerin ve etkileşimlerinin etki dereceleri varyans analizi ile incelenecektir. Kurulan modelin ağırlık farkındaki değişimi açıklama oranı (regresyon belirleme katsayısı) $R^2 = \%86,93$ (R^2 (düzeltilmiş)=%80,40) olarak gerçekleşmiştir. Regresyon analizi sonuçları Tablo 4’de sunulmuştur.

Tablo 6: Regresyon analizi sonuçları

	-----Step 1-----		-----Step 2-----	
	Coef	P	Coef	P
Constant	4,006		4,006	
Yük (N)	2,040	0,010	2,040	0,004
Soğutma Ortamı	0,794	0,105	0,794	0,075
Çalışma Ortamı	-3,856	0,002	-3,856	0,000
Temperleme Sıcaklığı (°C)	1,002	0,062	1,002	0,039
Yük (N)*Soğutma Ortamı	0,585	0,188	0,585	0,153
Yük (N)*Çalışma Ortamı	-2,006	0,010	-2,006	0,004
Yük (N)*Temperleme Sıcaklığı (°C)	0,669	0,148	0,669	0,115
Soğutma Ortamı*Çalışma Ortamı	-0,777	0,109	-0,777	0,080
Soğutma Ortamı*Temperleme Sıcaklığı (°C)	-0,294	0,457		
Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,994	0,063	-0,994	0,040
Yük (N)*Soğutma Ortamı*Çalışma Ortamı	-0,619	0,170	-0,619	0,136
Yük (N)*Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,710	0,131	-0,710	0,100
S		1,37850		1,33054

R-sq	98,75%	98,44%
R-sq(adj)	93,73%	94,16%
R-sq(pred)	64,32%	75,07%

	-----Step 3-----		-----Step 4-----	
	Coef	P	Coef	P
Constant	4,006		4,006	
Yük (N)	2,040	0,004	2,040	0,004
Soğutma Ortamı	0,794	0,108	0,794	0,122
Çalışma Ortamı	-3,856	0,000	-3,856	0,000
Temperleme Sıcaklığı (°C)	1,002	0,057	1,002	0,064
Yük (N)*Soğutma Ortamı	0,585	0,209		
Yük (N)*Çalışma Ortamı	-2,006	0,004	-2,006	0,004
Yük (N)*Temperleme Sıcaklığı (°C)	0,669	0,161	0,669	0,180
Soğutma Ortamı*Çalışma Ortamı	-0,777	0,114	-0,777	0,129
Soğutma Ortamı*Temperleme Sıcaklığı (°C)				
Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,994	0,058	-0,994	0,065
Yük (N)*Soğutma Ortamı*Çalışma Ortamı				
Yük (N)*Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,710	0,141	-0,710	0,159
S	1,62524		1,76496	
R-sq	97,09%		95,89%	
R-sq(adj)	91,28%		89,72%	
R-sq(pred)	70,24%		70,75%	

	-----Step 5-----		-----Step 6-----	
	Coef	P	Coef	P
Constant	4,006		4,006	
Yük (N)	2,040	0,004	2,040	0,004
Soğutma Ortamı	0,794	0,148	0,794	0,162
Çalışma Ortamı	-3,856	0,000	-3,856	0,000
Temperleme Sıcaklığı (°C)	1,002	0,080	1,002	0,087
Yük (N)*Soğutma Ortamı				
Yük (N)*Çalışma Ortamı	-2,006	0,005	-2,006	0,005
Yük (N)*Temperleme Sıcaklığı (°C)	0,669	0,214		
Soğutma Ortamı*Çalışma Ortamı	-0,777	0,156	-0,777	0,170
Soğutma Ortamı*Temperleme Sıcaklığı (°C)				
Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,994	0,082	-0,994	0,090
Yük (N)*Soğutma Ortamı*Çalışma Ortamı				
Yük (N)*Çalışma Ortamı*Temperleme Sıcaklığı (°C)				
S	1,95541		2,05916	
R-sq	94,11%		92,54%	

R-sq(adj)	87,38%	86,00%
R-sq(pred)	69,23%	70,14%

	-----Step 7-----		-----Step 8-----	
	Coef	P	Coef	P
Constant	4,006		4,006	
Yük (N)	2,040	0,005	2,040	0,007
Soğutma Ortamı	0,794	0,183	0,794	0,222
Çalışma Ortamı	-3,856	0,000	-3,856	0,000
Temperleme Sıcaklığı (°C)	1,002	0,102	1,002	0,131
Yük (N)*Soğutma Ortamı				
Yük (N)*Çalışma Ortamı	-2,006	0,005	-2,006	0,008
Yük (N)*Temperleme Sıcaklığı (°C)				
Soğutma Ortamı*Çalışma Ortamı				
Soğutma Ortamı*Temperleme Sıcaklığı (°C)				
Çalışma Ortamı*Temperleme Sıcaklığı (°C)	-0,994	0,104		
Yük (N)*Soğutma Ortamı*Çalışma Ortamı				
Yük (N)*Çalışma Ortamı*Temperleme Sıcaklığı (°C)				

S	2,20058	2,43687
R-sq	90,41%	86,93%
R-sq(adj)	84,02%	80,40%
R-sq(pred)	69,69%	66,55%

Varyans analizinde $\alpha=0,10$ anlamlılık düzeyinde sonuç değişkeni üzerine etkisi araştırılan faktörlerin modele katkılarının anlamlılığı araştırılır. Regresyon analizi ile modelde yer aldığı tespit edilen faktörlerin katkı oranları incelendiğinde en yüksek katkı değerinin %52,36 ile çalışma ortamı faktörüne ait olduğu, yük faktörünün katkı değerinin ise %14,65 olduğu, yük-çalışma ortamı ikili etkileşimine ait katkı değerinin ise %14,17 olduğu görülmektedir. Buradan yapılan diğer analiz sonuçlarını da destekleyici şekilde ağırlık farkı üzerinde en etkili faktörün çalışma ortamı faktörü olduğu sonucuna ulaşılabilir. Yük faktörü ikinci en önemli faktör olarak görülmektedir. Olasılık değeri yüksek olmasına rağmen modele dahil edilen faktörlerden; soğutma ortamı ($p=0,222>0,1$) faktörünün katkı değeri %2,22, temperleme sıcaklığı ($p=0,131>0,1$) faktörünün katkı değeri %3,54 olarak tespit edilmiştir. Varyans analizi sonuçları Tablo 6' te sunulmuştur.

Tablo 7. Varyans analizi sonuçları

Source	DF	Seq SS	Contribution	Adj SS	Adj MS	F-Value	P-Value
Model	5	395,04	86,93%	395,04	79,007	13,30	0,000
Linear	4	330,64	72,76%	330,64	82,659	13,92	0,000
Yük (N)	1	66,56	14,65%	66,56	66,558	11,21	0,007
Soğutma Ortamı	1	10,08	2,22%	10,08	10,081	1,70	0,222
Çalışma Ortamı	1	237,93	52,36%	237,93	237,931	40,07	0,000
Temperleme Sıcaklığı (°C)	1	16,07	3,54%	16,07	16,067	2,71	0,131
2-Way Interactions	1	64,40	14,17%	64,40	64,401	10,84	0,008
Yük (N)*Çalışma Ortamı	1	64,40	14,17%	64,40	64,401	10,84	0,008
Error	10	59,38	13,07%	59,38	5,938		
Total	15	454,42	100,00%				

Regresyon eşitliğinin katsayılarının belirlenmesi amacıyla t-testi uygulanmıştır. Modelde yer alan faktörlere ait etkiler burada görülmektedir. Deney tasarımı matrisinde kodlama yöntemi kullanılmadığından regresyon eşitliği katsayıları kodlanmamış olarak elde edilmiştir.

Tablo 8. T-testi sonuçları ve regresyon eşitliği katsayıları

Term	Effect	Coef	SE Coef	95% CI	T-Value	P-Value	VIF
Constant		4,006	0,609	(2,649; 5,364)	6,58	0,000	
Yük (N)	4,079	2,040	0,609	(0,682; 3,397)	3,35	0,007	1,00
Soğutma Ortamı	1,588	0,794	0,609	(-0,564; 2,151)	1,30	0,222	1,00
Çalışma Ortamı	-7,713	-3,856	0,609	(-5,214; -2,499)	-6,33	0,000	1,00
Temperleme Sıcaklığı (°C)	2,004	1,002	0,609	(-0,355; 2,360)	1,64	0,131	1,00
Yük (N)*Çalışma Ortamı	-4,013	-2,006	0,609	(-3,364; -0,649)	-3,29	0,008	1,00

Regresyon eşitliği:

$$\text{Ağırlık Farkı (gr*1000)} = -1,39 + 0,1020 \text{ Yük (N)} + 0,794 \text{ Soğutma Ortamı} - 0,85 \text{ Çalışma Ortamı} + 0,00668 \text{ Temperleme Sıcaklığı (°C)} - 0,1003 \text{ Yük (N)*Çalışma Ortamı}$$

Sonuçlar

Bu çalışmada, aşınma dayanımı değerinin en büyüklenmesinde etkili olabilecek değişkenler belirlenmiş, ardından yapılan tam faktöriyel deney tasarımı planına uygun olarak dört faktör ve ikişer düzey kullanılarak gerçekleştirilmiştir. Sonuçlar Minitab 18.0 programında analiz edilmiş ve elde edilen sonuçlar literatürle karşılaştırılmıştır. İş parçası olarak AISI 4140 ıslah çeliği kullanılmıştır.

1. $\alpha=0,10$ güven düzeyinde oluşturulan regresyon modelinin ağırlık farkındaki değişikliği açıklama oranı %80,40 olarak bulunmuştur.
2. Ağırlık farkı üzerinde en etkili parametre **çalışma ortamı** ana faktördür. **Yük** ağırlık farkı üzerinde ikinci öneme sahip ana faktördür.
3. Ağırlık farkı üzerinde üçüncü öneme sahip faktör ise **yük-çalışma ortamı** ikili faktör etkileşimidir.
4. Diğer faktörlerin; soğutma ortamı, yük-soğutma ortamı ikili etkileşimi, yük-temperleme sıcaklığı ikili etkileşimi, soğutma ortamı-çalışma ortamı ikili etkileşimi, soğutma ortamı-temperleme sıcaklığı ikili etkileşimi, çalışma ortamı-temperleme sıcaklığı ikili etkileşimi, yük-soğutma ortamı-çalışma ortamı üçlü etkileşimi, yük-çalışma ortamı-temperleme sıcaklığı üçlü etkileşiminin sonuç değişkeni üzerinde anlamlı etkileri yoktur.
5. Ağırlık farkı değerinin en iyi değerinin elde edilebileceği şartların tespiti için optimizasyon gerçekleştirilmiştir. Tespit edilen faktör seviyeleri ile (yük 30 N, tuzlu su soğutma ortamı, yağlı çalışma ortamı ve 208,73 °C temperleme sıcaklığı) ağırlık farkı değeri aşınmanın olmadığı en ideal durumu tanımlayan "0" olarak tespit edilmiştir.

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SOLID PARTICLE EROSION BEHAVIOR OF MUSSEL SHELL REINFORCED POLY (PHENYLENE SULFIDE) PPS

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Abstract: Poly(phenylene sulfide) (PPS) is a high-performance thermoplastic engineering polymer and it exhibits outstanding properties such as electrical insulation, dimensional and thermal stability, chemical resistance etc. In addition to this, PPS has a high degree of crystallinity and it exhibits good physical properties at supernal temperatures. Owing to these properties, PPS is widely used in electrical and electronic components, aeronautics and space industry, automobile industry and mechanical applications. These outstanding properties of PPS can be attributed to its chemical structure, composed of phenyl groups linked by a sulfur atom, which gives rigidity to the chain. Waste of mussel shells is a significant environmental problem on earth. These wastes could be evaluated as an economical loss. On the other hand mussel shell can be called as an economical filler material for PPS matrix which also gives a contribution to solve the environmental problem of this waste material. In order to understand the effects of waste mussel shells in polymeric material, It was added as a particles in PPS matrix at various weight ratios (0, 1, 3, 5, 10 wt %). Solid Particle erosion behaviour of samples were examined by universal solid particle test system. Solid particle erosion tests were applied at ambient temperature at two impingement angle (30° and 90°) with 80 mesh sized Al₂O₃ particles. Erodent particles were sprayed onto the samples with 3 bar pressure for 10 seconds. Erosion rate and wear volume of the samples were examined. Furthermore, surface characterisations of eroded surfaces were studied by non-contact laser profilometer and Scanning electron microscope. According to test results mussel shell reinforcement increases the solid particle resistance of PPS polymer, so mussel shell could be using as eco-friendly alternative filler material for PPS matrix composites.

Keywords: Poly(phenylene sulfide), mussel shell, Solid Particle Erosion, Roughness

Introduction

Polyphenylene sulfide (PPS) is a kind of semi crystalline structure thermoplastic polymer. Macromolecule structure of its backbone composes from phenyl rings and sulphur atoms [1-9]. PPS shows significant chemical and physical properties such as outstanding mechanical properties, high temperature and dimensional stability, high friction properties, high decomposition temperature, flame resistance, low water absorption, chemical and corrosion resistance etc. [1-6, 8]. Due to its superior properties it finds increasingly usage area for automotive, electric and electronic, aerospace, machinery, battery, telephone optical-fiber cable industries [1, 9-13].

Due to worldwide increasing shellfish cultivation and consumption of seafood, waste shellfish shells have become environmental problem. This pollution causes two situation, first situation is decomposition of organic parts. Result of decomposition NH₃ and H₂S and harmful hydrocarbon gases was produced. These gases have significant stink and toxicity and really hazardous for human health. Second situation is storage areas of waste shellfish shells become the propagation place of mices, flies and insects because storage places have moisture and waste water. Shellfish shells include substantially biominerals with a predominant of calcium carbonate (CaCO₃). Mussel shell is also a kind of crustacean and its Shell consist of %95 CaCO₃ and %5 organic materials and CaCO₃ is the most common used inorganic filler for polymer composites Last decades, biodegradable, ecofriendly particles and/or fibres have been used as reinforcement material for composite structures. Therefore usage of these bio based fillers brings many advantages such as low cost, low density, eco friendliness etc., bio based fillers replaces the universal fillers [14-19].

Aim of this study is to characterize mechanical, thermal and tribological properties of mussel shell filled PPS composite samples and investigate to usage of grinded mussel shell particles as filler instead of universal fillers.

Materials and Methods

Matrix material PPS was supplied from Ticona Company, Sulzbach, Germany and the brand name of matrix is Fortron®PPS 1200L. Mussel shells were supplied from Varollar Company

Firstly mussel shell was washed by pure water and dried in oven at 80°C. Dried shells was broken by Resh K200 crusher and ground by Resh PM100 grinder. Ground mussel shell particles dimensions of 25-100µm were

reinforced and melt mixed in PPS matrix with various weight ratios (1, 3, 5, 10 wt%) using twin screw extruder which is produced by DSM XPLORE Company. Prepared compounds were molded by DSM XPLORE injection machine. During the mixing the rotational speed of twin screws was 100 rpm and the temperature of melting was 305°C. The melt mixed compounds at 305°C were injected into the mold at temperature of 80°C.

Solid particle erosion behaviour of samples were investigated by universal test machine. All the samples were eroded by 80 mesh particle size Al₂O₃ particles at ambient temperature and 3 bar spray pressure during 10 seconds at 30° and 90° impingement angles.

Nanovea 3D Non-Contact Profilometer PS50 (Nanovea, 6 Morgan Ste 156, Irvine, CA, USA) was used for determination of the surface morphology and roughness parameters of worn samples. The non-contact laser profilometer has a leading edge optical pen that uses superior white light axial chromatism. The scanning process was applied in steps of 20 µm in both X and Y directions with 0.1 mm/s velocity. Mountain Software Version 6.2.7487 (Digital Surf) was used for evaluation of profile roughness and 3D surface topographies and calculation of eroded area volumes

SEM analysis is used to look into the morphologies of the wear debris and traces. after adhesive wear tests were applied, worn surfaces of composites were investigated. another purpose of SEM analysis is evaluating the matrix-fiber adhesion. to investigate this fracture surfaces of specimens were analyzed. In this study, JEOL JCM-6000 model scanning electron microscope was used to perform SEM analysis. the surfaces that are investigated, sputter coated with gold before analysis to provide conductivity.

Results and Discussion

Erosion rate is a method, used for calculation of eroded samples erosion resistance. This method depends on weight loss of eroded samples. Erosion rate of value of eroded samples are given in fig. 15. According to these results at 30° impingement angle increase of mussel shell rate in PPS decreases the erosion rate. On the other hand there are unusual results at 90° impingement angle. After solid particle erosion test, there is no weight loss at the eroded sample but on the contrary there is increase in the amount of mass. This final result shows us inadequacy of this method. Because in this method, embedded eroded particles are ignored and can't be found be found sensitive and correct results especially at right angle and close the right angles.

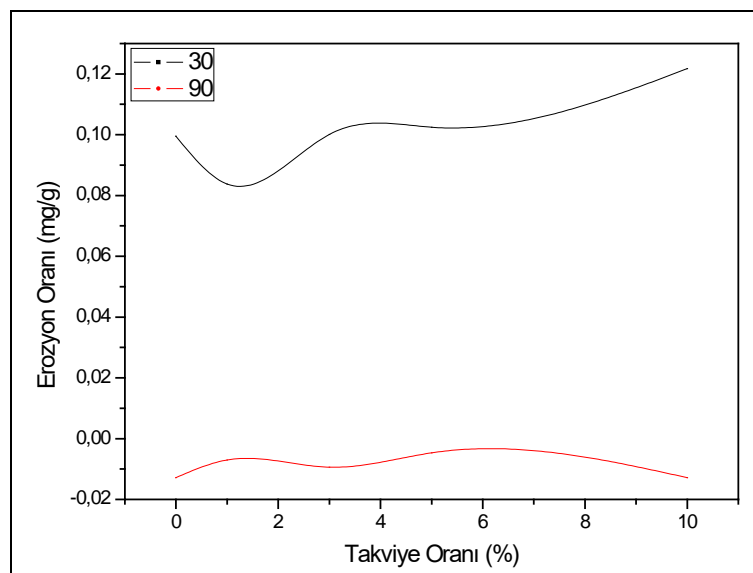


Figure 15.The use of aquatic conditions in the environment

Fig. 19 and fig. 20 shows the SEM photos of 10wt% mussel shell reinforced composite samples at 90° and 30° impingement angles. according to fig. 19 there are pounding traces, regional holes and embedded erodent particles can be seen clearly from SEM photos. On the fig. 20 tears, micro creep traces on surface will be seen fluently. Moreover some filler particles will be seen on the surface due to swept matrix around the particle. For this reason Eroded area volume of samples were calculated by optic profilometer for much more sensitive results. According to fig. 16, it appears to occur erosive wear at 90° impingement angle and fig. 17 is also clearly show us wear scars like a crater. Furthermore, samples more eroded at 30° impingement angle compared to 90°

impingement angle for all filler loading rates. While eroded area volume increases at 90° impingement angle, it decreases at 30° impingement angle by increase of mussel shell rate in polymer. This situation will be explain by return of wear mechanism from semi ductile to brittle with increase of mussel shell rate in composite.

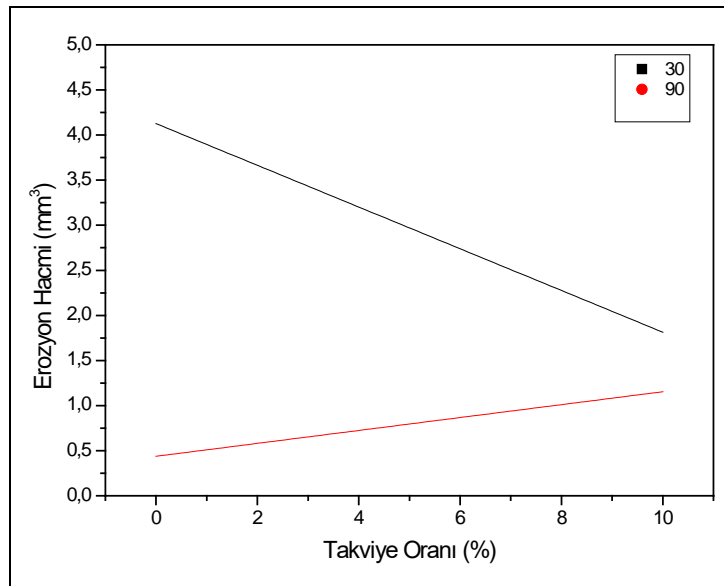


Figure 16. The use of aquatic conditions in the environment.

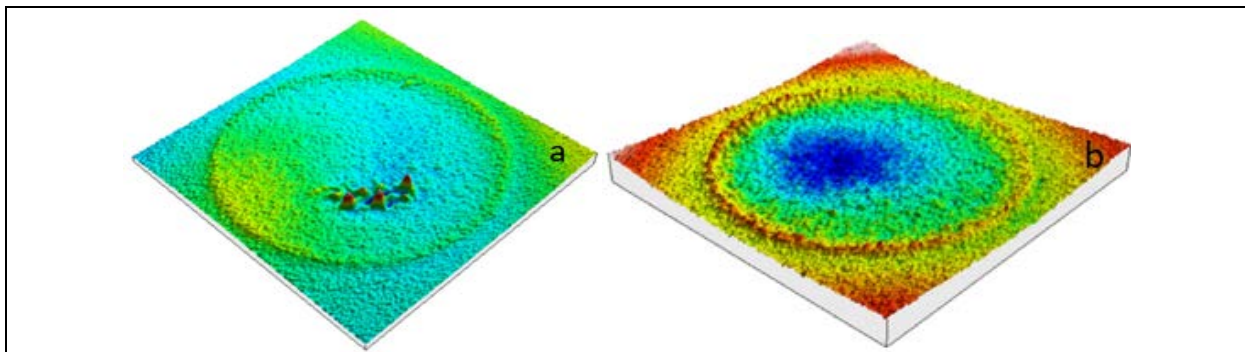


Figure 17. The use of aquatic conditions in the environment

Average coefficient friction value of eroded samples are given at fig. 18. According to these results particle impingement angle has no significant effect on average coefficient of friction value of pure PPS but surface roughness significantly increases at 30° impingement angle compared to 90° impingement angle for composite samples. Moreover, for all composite samples show lower surface roughness value compared to pure PPS at 90° impingement angle.

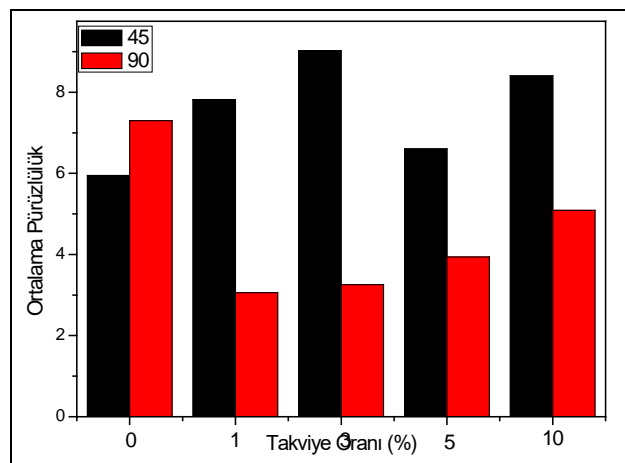


Figure 18: Average coefficient of friction value of eroded surface samples

Exacting investigation of eroded surfaces were made by scanning electron microscope (SEM) and SEM photos of eroded surfaces of 10 wt% mussel shell reinforced samples are given in fig. 19 and fig. 20. Beaten surfaces, macro cracks and embedded erosive particles are clearly seen at higher impingement angle in fig. 19. Big tears, macro cracks, plastic deformed matrix and peeled reinforcement particles are seen in fig. 20.

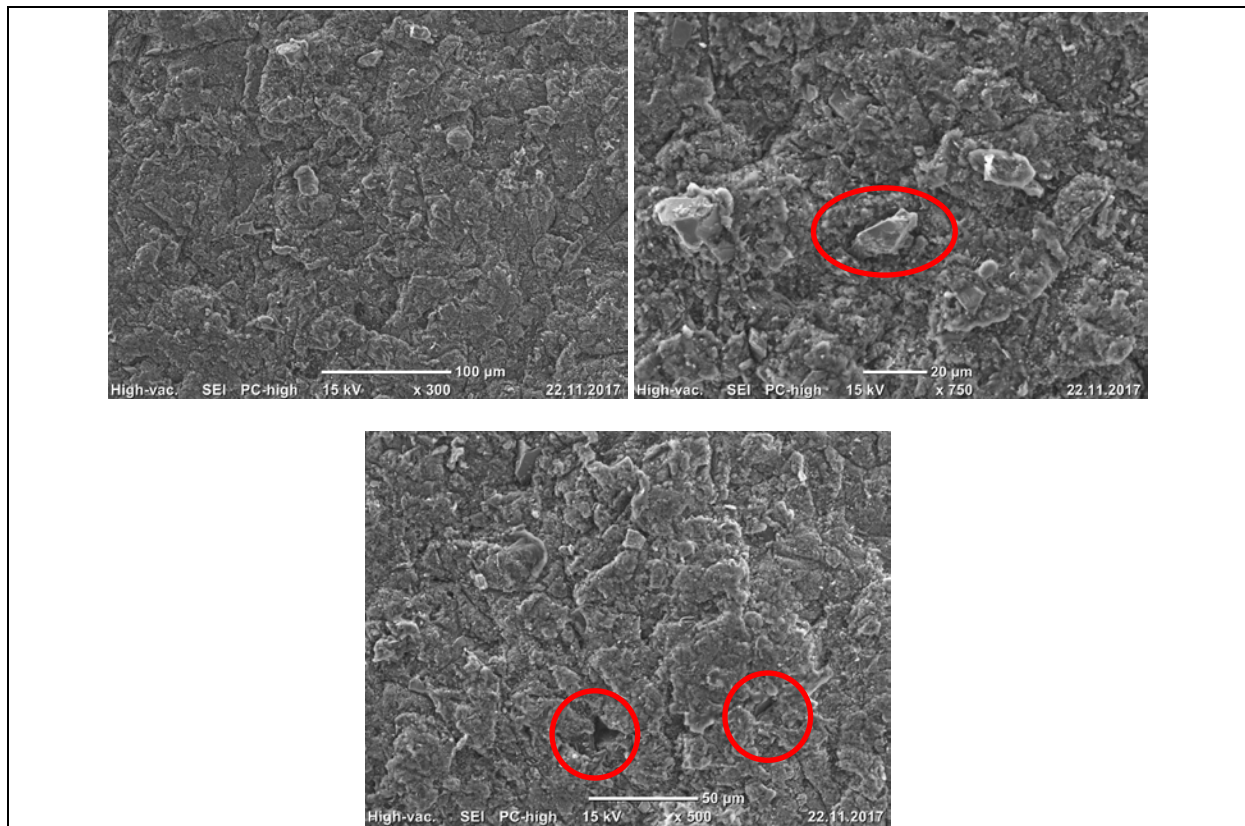
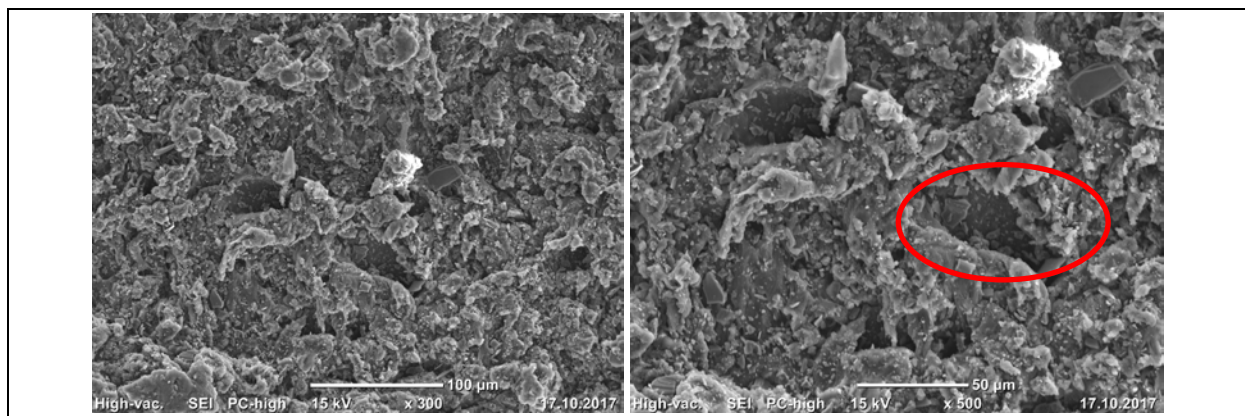


Figure 19 SEM photos of 10 wt% mussel shell reinforced composite samples which were eroded at 90° impingement angle



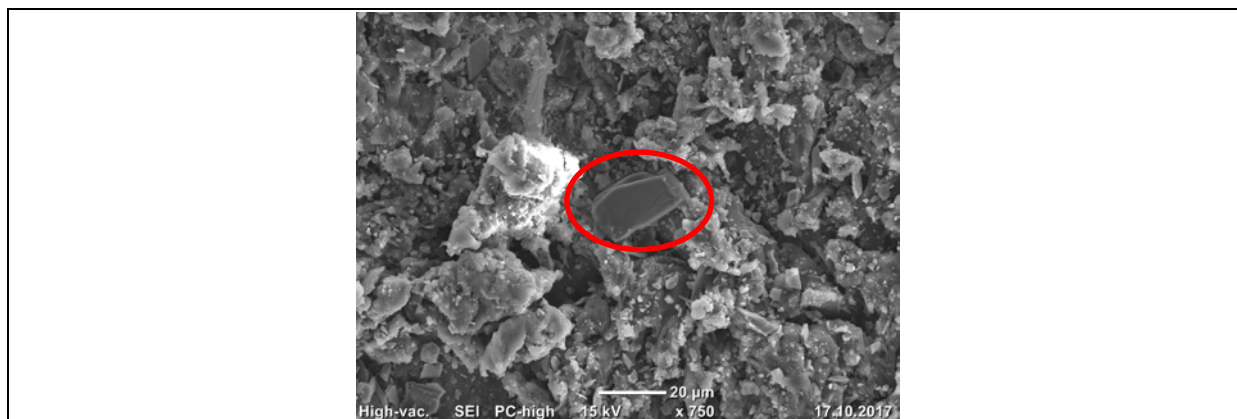


Fig. 20: SEM photos of 10 wt% mussel shell reinforced composite samples which were eroded at 30° impingement angle

Conclusion

According to erosion rate results; increase of mussel shell decrease the erosion resistance of PPS. However optic profilometer analyses show that results have failure. Erosion rate method ignore the plastic deformation and density differences between matrix and filler. These factors seen in optic profilometer photos and worn surface volumes were calculated by optic profilometer and it shows us, mussel shell reinforcement increases the solid particle erosion resistance of PPS. All the reinforcement rates samples were much more eroded at 30° impingement angle than 90° impingement angle and mussel shell reinforcement change the wear behavior of PPS from ductile to brittle. When the SEM photos investigated, tear traces and peeled reinforcing particles are seen at 30° impingement angle. Moreover beaten and embedded eroded particles on surface are seen at the 90° impingement angle. According to test results it is clearly seen that mussel shell particles could be used as a reinforcement material to manufacture low cost/high performance and erosion resistant PPS based products. Especially low impingement angle applicaions.

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SPATIAL DISTRIBUTION OF OCPs IN SOILS OF ISTANBUL

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Abstract: Persistent organic pollutants (POPs) are organic pollutants that are resistant to degradation. They are characterized by their low solubility in water and high solubility in oil, which accumulate in oil masses. When POPs are released into the environment, due to their resistant structure, they accumulate through the food chain in the fatty tissues of humans and animals. Consequently, they cause serious health problems. In addition, POPs can be transported by air flows at long distances and create a global environmental problem. OCPs (Organochlorine Pesticides) are among persistent organic pollutant group and they have the properties of semi-volatility. Due to their semi-volatile structure, they can be transported long distances and they are suitable for transportation in both vapor phase and adsorbed on the particles.

In this study, spatial distribution of OCP pollution levels in the soil of Istanbul in both Anatolian and European Continents were investigated. A total of 35 points were identified on both sides of Istanbul and the spatial state of the points was chosen to represent the urban and rural characteristics. According to the results, α -HCH and DDT compounds predominated during 7 months. Higher OCPs were identified in the west and south-west of Istanbul, Bosphorus, and along Marmara Sea shore.

Keywords: Persistent Organic Pollutants, Organochlorine Pesticide, Soil Distribution

Introduction

Persistent Organic Pollutants (POPs) tend to be highly mobile and transported long distances due to their semi-volatile nature (Yuan *et al.* 2014). POPs are organic compounds that are resistant to photolytic, chemical and biological degradation due to their physical and chemical properties, and can remain very long time after release (El-Shahawi *et al.* 2010). Due to the fact that they are resistant to all kinds of degradation, this feature leads them to accumulate in the human body through food chain (Chrysikou *et al.* 2008) and subsequently cause various diseases due to the carcinogenic and mutagenic properties of these pollutants (Rissato *et al.* 2006). This shows that the problem created by these pollutants is global. Therefore, taking provision at international level regarding the POPs, The Stockholm Convention has been signed by more than 100 countries to reduce and eliminate POP emissions, to protect human health and the environment (Kuzu 2016).

OCPs (organochlorine pesticides) are the semi-volatile organic compounds included in the group of POPs. OCPs have been widely used since the Second World War in order to develop the agro-industry, to obtain many crops and to combat insects that damage agricultural products. In addition to insects that damage agricultural crops, pests that carry infectious diseases must also be controlled. The most commonly used for these purposes are insecticides such as DDT (Dichlorodiphenyltrichloroethane), HCB (Hexachlorobenzene), HCH (hexachlorocyclohexane) (El-Shahawi *et al.* 2010). In general, OCPs are characterized by three main types: DDT analogues, benzene hexachloride, and cyclodiene compounds (Khan 1980). The living organisms accumulate OCPs in the fat tissue and cause the formation of immunological changes, mutagenic and teratogenic anomalies as a result of being subjected to various biological processes (Kuzu 2016). Except being used in Africa, South Asia, Central and South America to control insects that cause malaria and damage farming in some countries, nine species (aldrin, chlordan, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex and toxafen) are prohibited and restricted by the US EPA (US Environmental Protection Agency) and Stockholm Convention due to their carcinogenic and mutagenic effects (El-Shahawi *et al.* 2010).

The soil is a large reservoir for POPs (Yuan *et al.* 2014). In addition, OCPs compounds tend to accumulate in the soil due to their low solubility, semi-volatility and strong adsorption to organic matter in the ground (Chaves *et al.* 2013). Soil is also known as the secondary source of POPs. OCPs can accumulate in the soil for many years without deterioration. However, due to its semi-volatile nature, it can change phase into the air through evaporation. Because of these properties, it is very important to investigate the spatial distribution of pollutants such as OCPs determined in the soil. For this purpose, OCPs concentrations were determined in selected sampling periods including four seasons in the samples taken from the sampling sites placed in 35 sampling sites with different characteristics in the European and Anatolian sides of the Istanbul city and spatial distribution of OCPs were investigated.

Materials and Methods

Sampling Points and Work Schedule

The city of Istanbul is separated between Anatolian and European Continents by combining Black Sea and Marmara Sea via Bosphorus. It is located between $41^{\circ} 33'$ and $40^{\circ} 28'$ northern latitudes with east longitudes of $28^{\circ} 01'$ and $29^{\circ} 55'$ and covers a total area of 5,512 km². Covering 9.7% of the territory of Turkey, Istanbul is the most important province of the country in terms of living citizen population (15 millions)

A sampling plan has been prepared in order to determine the concentration and the spatial distribution of OCPs on Istanbul soil. In order to investigate the OCPs concentrations, samples were taken from 35 different points on both sides of Istanbul with urban and rural characteristics between 02. 2013 - 08. 2014 (Figure 1) and it was paid attention to be taken on a non-rainy day. Selected sampling points according to urban and rural characteristics are shown in Table 1.

Table 1. Characterization of Sampling Points

Station	District	Place	Characteristic
1	Kadikoy	Demirspor Facilities	Urban
2	Uskudar	Nakkastepe Center	Urban
3	Uskudar	Kandilli Center	Urban
4	Beykoz	Kavacik/Cavusbasi Road	Urban
5	Beykoz	Riva	Rural
6	Beykoz	Polonezkoy/Dere Social Facilities	Rural
7	Cekmekoy	Omerli/Center	Rural
8	Cekmekoy	Alemdag Exit	Urban
9	Cekmekoy	Omerli Dam	Rural
10	Pendik	Kurtkoy/SAW Airport	Urban
11	Tuzla	Tuzla Shipyard	Urban
12	Kartal	Aydos Forest	Rural
13	Kartal	Coastal Road	Urban
14	Maltepe	Idaltepe Transformer	Urban
15	Atasehir	Kayisdagi	Urban
16	Umraniye	IMES/Dudullu Org. Indus. Zone	Urban
17	Beykoz	Elmali Dam	Rural
18	Esenler	YTU Davutpasa Campus	Urban
19	Bagcilar	ISTOC	Urban
20	Basaksehir	Burc College	Urban
21	Basaksehir	Metal Industrial Estate	Urban
22	Kucukcekmece	Martyr Rafet Ucanus Park	Urban
23	Kucukcekmece	Social Facilities of Municipality	Urban
24	Avcilar	Ambarli	Urban
25	Buyukcekmece	Yurt Konserve Factory	Urban
26	Buyukcekmece	Ahmediye Villiage	Rural
27	Catalca	Hadimkoy	Urban
28	Arnavutkoy	Durusu Park	Rural
29	Arnavutkoy	Ihsaniye villiage	Rural
30	Eyup	Odayeri Sanitary Landfill	Rural
31	Eyup	Kemberburgaz	Urban
32	Eyup	Belgrad Forest	Rural
33	Sariyer	Yenikoy	Urban
34	Besiktas	YTU Yildiz Kampüsü	Urban
35	Fenertepe		Rural

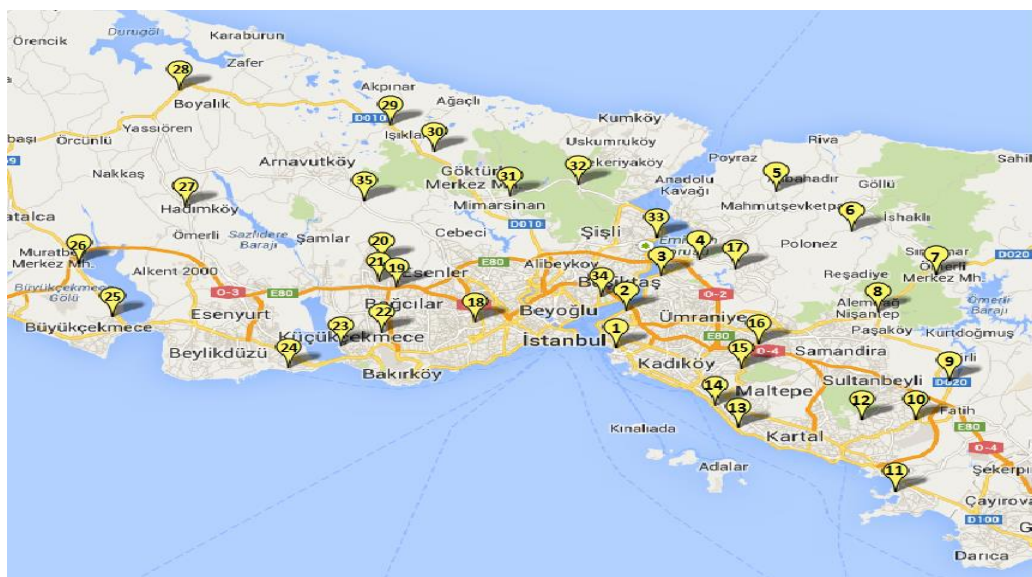


Figure 1. Sampling Points

Sample Collection

Samples were collected at different points around the sampling point to obtain a mixture of soil samples at each sampling point. Approximately 300 grams of soil samples were taken at a depth of (0 - 5) cm from the soil surface on a (3 x 3) m² area and the stones and plants were sifted with a 2 mm diameter sieve. The acquired soil samples were wrapped in aluminum foil, placed in airtight plastic bags and brought to the laboratory. The temperature probe was placed in the same (0 - 5 cm) depth as the sampling depth and the temperature values were taken. Meteorological parameters were recorded (temperature, wind speed and direction) at the time of sampling.

Sample Extraction

Ultrasonic extraction was applied to the samples placed in Teflon capped jars for 30 minutes by using a 20 ml acetone/hexane (ACE/HEX) extraction solution and 1 mL surrogate standard (tetra chloro m-xylene). This procedure was applied to same sample twice. After extraction, sample was filtered via a glass column with sodium sulphate to separate the solvent mixture from the solid phase and humidity. After this process, the sample volume was adjusted to 2 mL by Heidolph brand rotary evaporator at 60°C and followed by using nitrogen gas. For sample cleaning, a glass column, which 3 g of silicic acid, 2 g alumina and 3 g sodium sulphate were placed. Silicic acid and alumina was activated and deactivated as in Kuzu (2016). Before sample filtration, the column was cleaned by passing 20 mL DCM and 20 mL petroleum ether (PE), respectively. After the sample was filtered, 25 mL of DCM was used to collect OCPs fractions. Sample volumes were reduced to 1 mL under nitrogen gas.

The determination of OCPs was carried out on Perkin Elmer Clarus 500 brand gas chromatographic system with an electron capture detector (ECD). An HP-5MS column with an internal diameter of 0.25 mm, an inner thickness of 250 µm and a length of 30 m was used. The samples were injected into the carrier gas stream with a splitless mode. High purity helium gas at 1.2 ml/min flow was used as carrier gas and high purity nitrogen gas at 25 ml/min was used as make-up gas. The used temperature program was as in the following order: initially, oven temperature was held for 1 minute at 50°C, risen with 25°C / min rate to 200 ° C, risen to 300 ° C with 8 ° C/min rate and held for 5.5 minutes at 300°C. By this program, 20 OCP species alpha-HCH, beta-HCH, gamma-HCH, delta-HCH, heptachlor, aldrin, heptachlor-endo-epox, alpha-endosulfan, dieldrin, 4,4.DDE, endrin, beta-endosulfan, 4,4. DDD, endrin aldehyde, endosulfan sulfate, 4,4.DDT, endrin, ketone, methoxychlor were analyzed using GC-ECD.

Results and Discussion

In this study, the spatial distribution of OCPs in Istanbul soils was determined by using soil samples collected from 35 different stations with urban and rural characteristics, which are collected between February 2013 and August 2014. Each sampling campaign was conducted in sequential seasons. After sampling of 17 stations selected from the Anatolian side and 18 areas collected from the European side were selected as soil sampling points, the obtained results were evaluated as regional, monthly and seasonal.

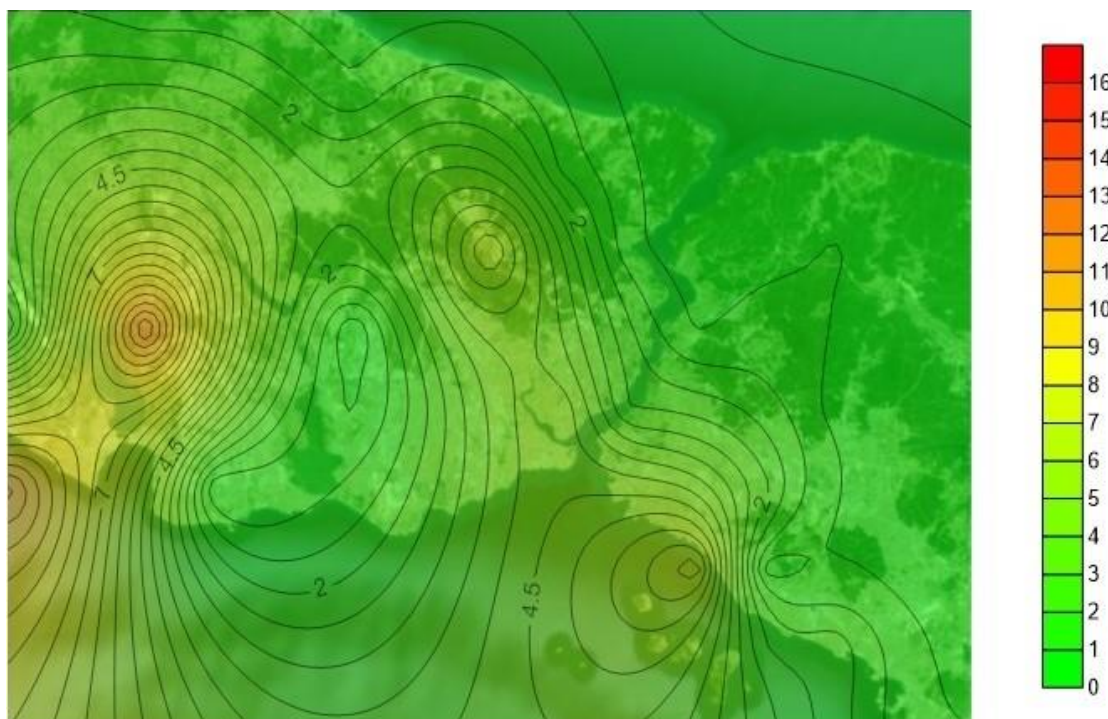


Figure 2. Spatial Distribution of OCPs for February 2013 (ng/g DW)

Figure 2 shows the spatial distribution of the OCP average concentrations obtained for February 2013 on the Istanbul soil. OCP concentrations were generally higher in the south-western regions of Istanbul and on the southern coast compared to other regions. The wind blew from the north according to meteorological data in February 2013. Western part of Istanbul is an industrial region, therefore it is estimated that there may be transport from other accumulating places. According to the results of OCP total concentrations, the highest value in the Anatolian side was observed as 6.5 ng/g DW in the Station 14 Maltepe (Idealtepe Transformer Side). On the European side, the highest value was obtained as 16 ng/g DW in Station 27 Catalca (Hadımko).

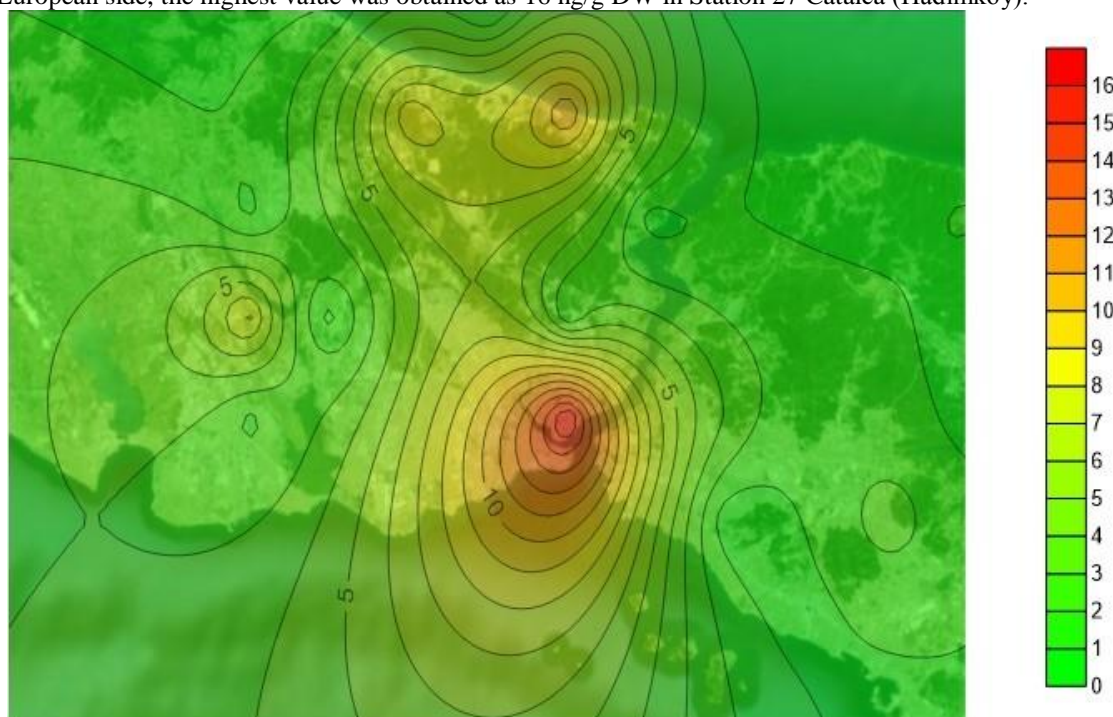


Figure 3 Spatial Distribution of OCPs for May 2013 (ng/g DW)

The highest total value of OCP observed in the Anatolian side was 12.5 ng/g DW in Station 1 Kadikoy region. In Europe, the maximum total value of OCP was obtained as 8 ng/g DW in Station 33 Sariyer (Yenikoy) region. The distribution of OCP concentrations in selected 35 different stations of Anatolia and Europe for May is given in Figure 3. In May, OCP were distributed in the southern part of the Bosphorus and in the northern part of

Istanbul and in the western regions. It also has distribution with its highest concentrations of the study.

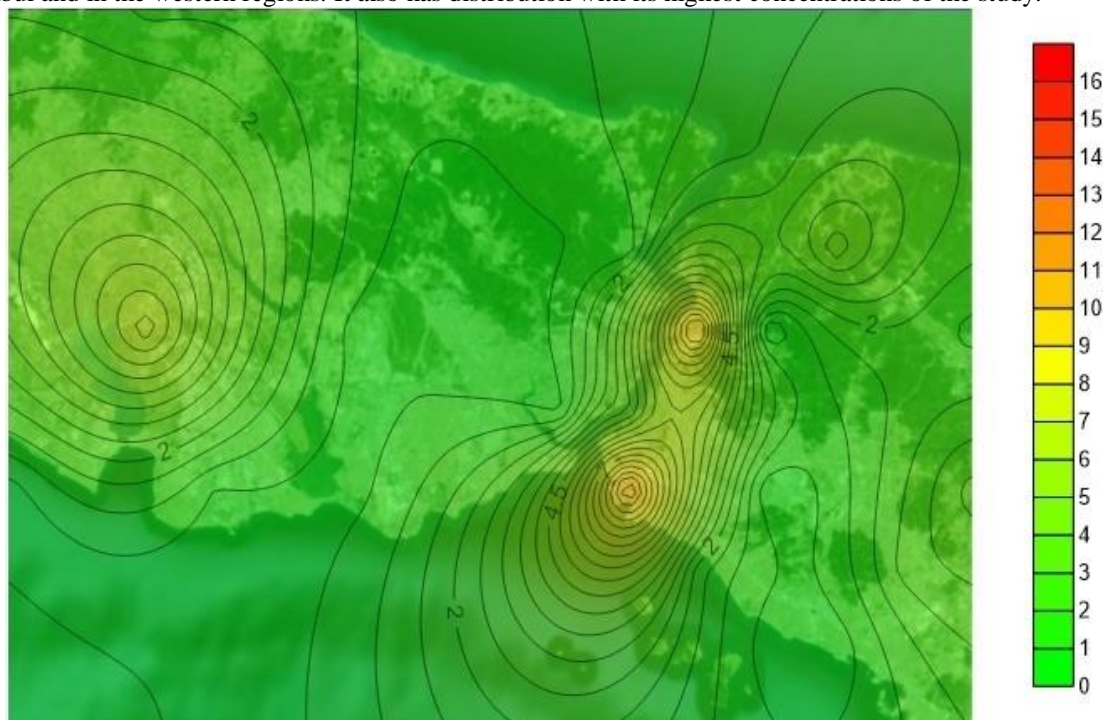


Figure 4 Spatial Distribution of OCPs for July 2013 (ng/g DW)

In July 2013, the highest total OCP concentrations were observed along the Bosphorus Strait. The concentrations ranged between 2 and 11 ng/g DW. On the European side 6 ng/g DW was found in Hadımköy. The distribution of total OCP concentrations obtained this month was shown in Figure 4. It can be said that the OCPs did not show much distribution this month because they are distributed only in low rate in the western parts of Istanbul.

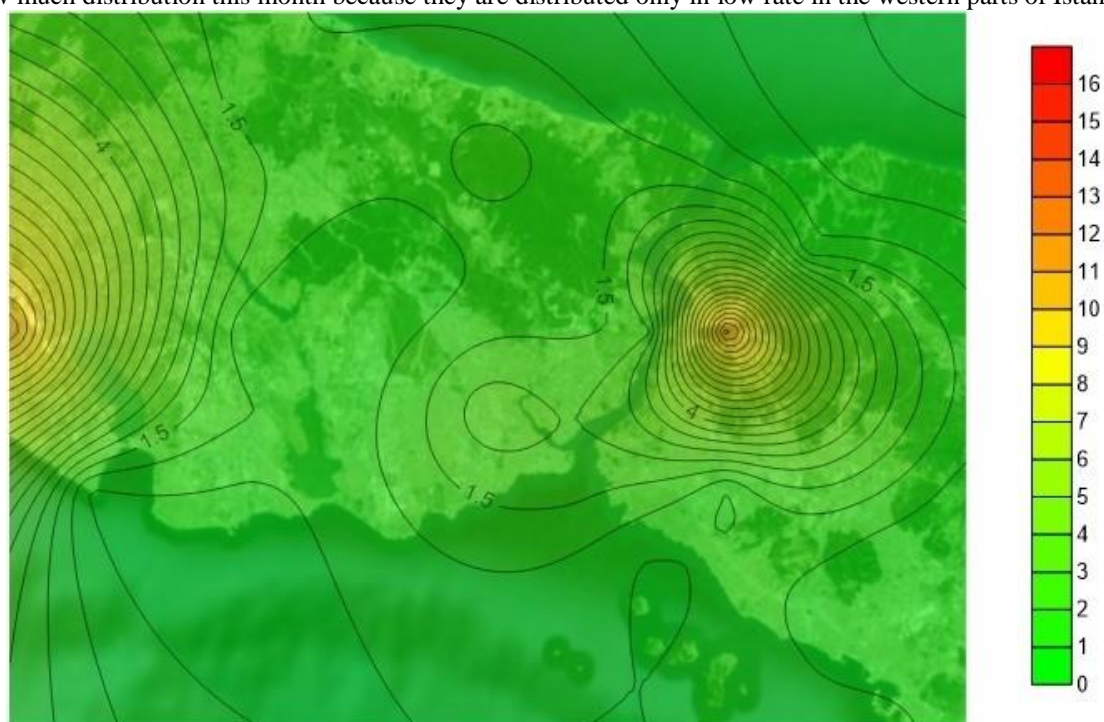


Figure 5 Spatial Distribution of OCPs for November 2013 (ng/g DW)

The spatial distribution of total concentrations of OCP in Istanbul soil in November 2013 is given in Figure 5. It was distributed in the western-southern regions in Europe side and in the western part near the Bosphorus in Anatolian side. The highest total OCP concentration in the Anatolian side is 11 ng/g DW and it was observed in Station 17 Beykoz (Elmalı Dam) region. The highest total OCP concentration value in the European side was found in Station 27 Catalca (Hadımköy) region.

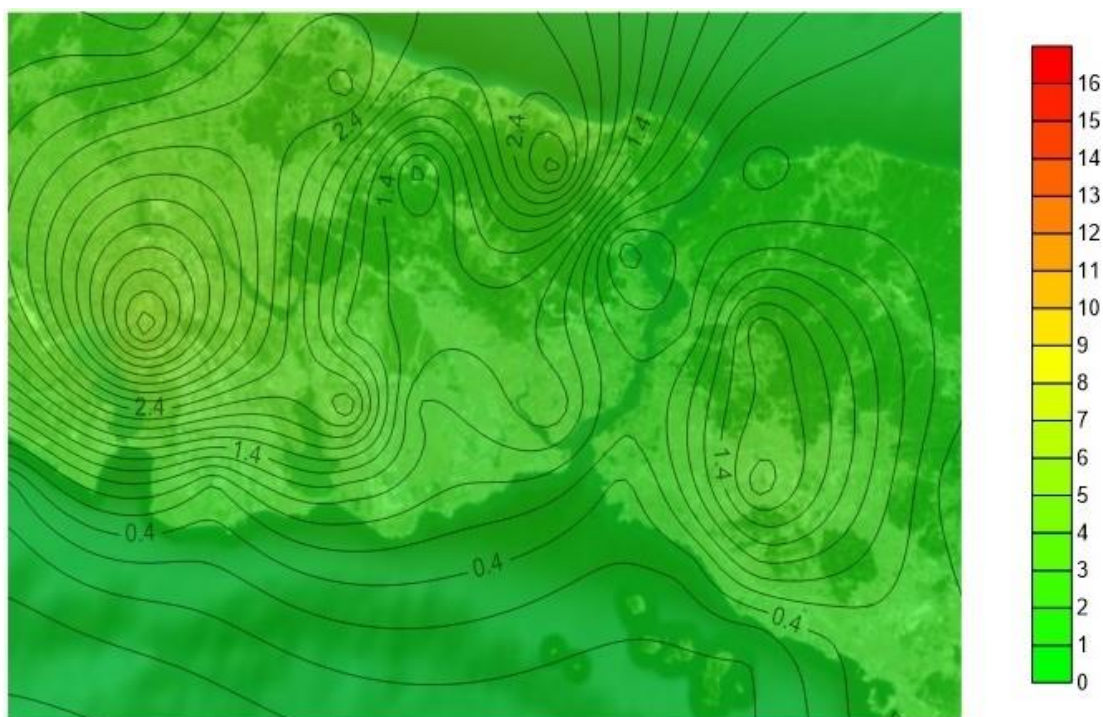


Figure 6 Spatial Distribution of OCPs in February 2014 (ng/g DW)

Spatial distribution of February 2014 did not exhibit much variation. The concentrations were below 3 ng/g DW. The highest concentration was observed in Hadımköy in the European side. The distribution of OCPs concentrations for February 2014 was plotted in Figure 6.

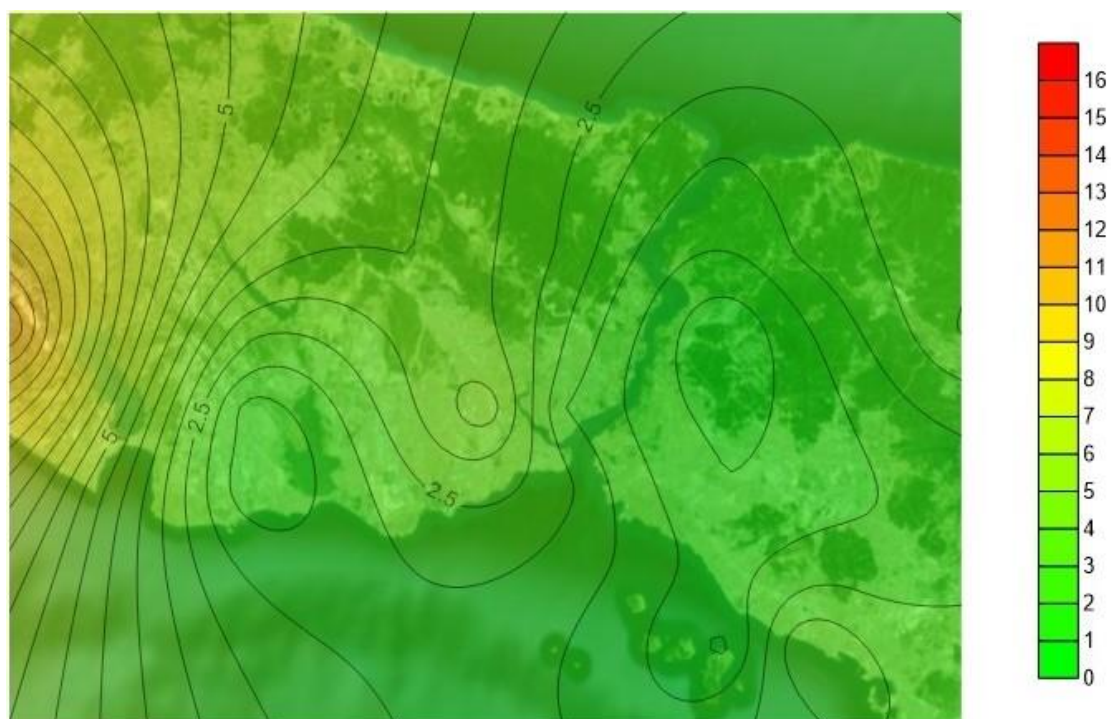


Figure 7 Spatial Distribution of OCPs in May 2014 (ng/g DW)

In May 2014, the highest OCP concentrations were observed to the west of Istanbul. The highest value was 10 ng/g DW. The spatial distribution is shown in Figure 7.

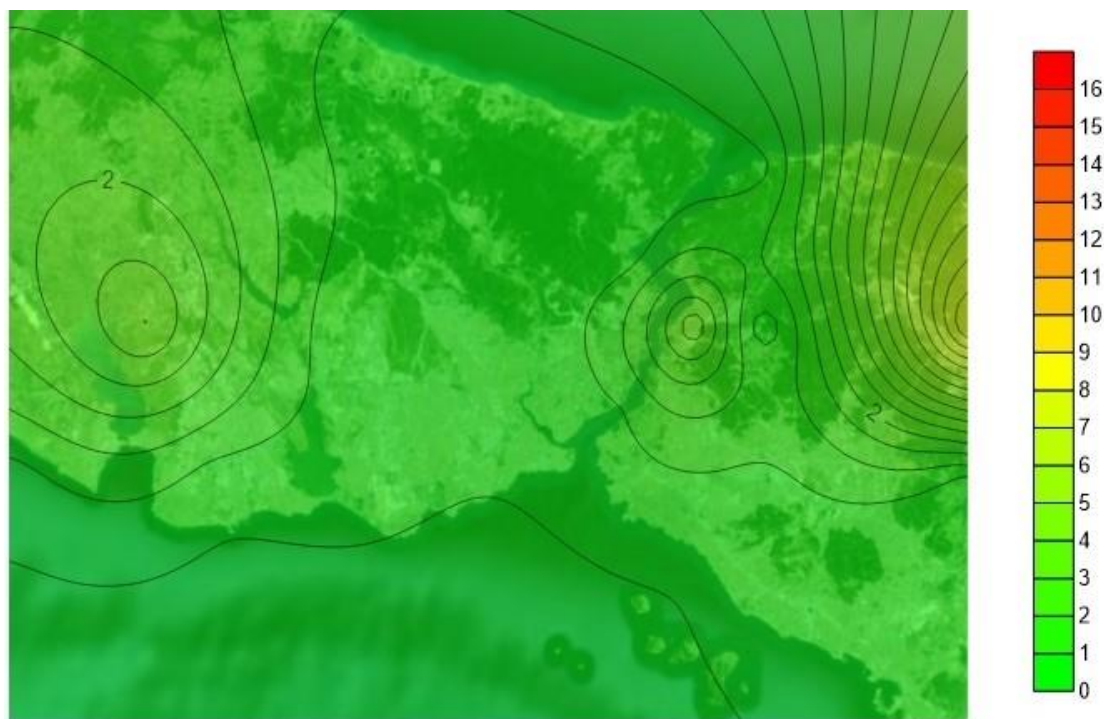


Figure 8. Spatial Distribution of OCPs in August 2014 (ng/g DW)

Apart from other sampling periods a different distribution was present in August 2014. It is shown in Figure 8. The highest total concentration in the Anatolian side was found in Cekmekoy (Omerli / Center) region with a concentration of 7 ng/g DW. On the European side, the highest concentration was indicated as the 3 ng/g DW in Station 27 area of Catalca (Hadimkoy). OCPs were distributed on the north-eastern side in August.

In 7-month-period soil samples, alpha-HCH and DDT were found to be higher than other species when each OCP species were examined. In addition, alpha-HCH showed high concentration in July (2013) and DDT in May (2013). Rissato *et al.* 2006 estimates that the alpha-HCH concentration in the soil is higher than the other HCH isomers, due to their higher Henry constant and vapor pressure values than other isomers of HCH. Thus, they involve more effectively in atmospheric transport.

Technical HCH contains α -HCH (67%), β -HCH (10%), γ -HCH (15%) and δ -HCH (8%) (Zhao *et al.* 2013). However, the technical HCH were not used since 1980 in Turkey. Only the use of lindane was available in some countries of Europe (Sofuoglu *et al.*, 2004). However, when the ratio of α -HCH and γ -HCH isomers is between 4 and 7, the main pollutant source was reported as to be technical HCH (Yeo *et al.* 2004). However, in this study the ratio of α -HCH and γ -HCH isomers was determined as 23.7.

The very low water solubility of DDT can be shown as the main reason for its high concentration due to its persistence and durability properties against degradation (Rissato *et al.* 2006). In a study conducted in Seoul, DDT half life can be determined from the DDE to DDT ratio. DDT shows that it has been used lately when this rate is low, and DDT does not provide any information about the recent release to environment when it is high (Yeo *et al.* 2004; Park *et al.* 2011). The DDE/DDT ratio, which is 0.1, indicates that DDT has not been released in recent times. Methoxychlor shows a change from 0.42 to 7.2 ng/g DW in average month concentrations, with a high concentration of 7.258 ng/g DW in May (2014). But in August (2014) it shows a dip with 0.42 ng/g DW concentration. The individual concentrations of each pesticide is presented in Table 2.

Table 2. Monthly average OCP specie concentrations

OCP species	February'13	May'13	July'13	November'13	February'14	May'14	August'14
alfa-HCH	5.44	4.14	7.988	9.51	3.489	6.12	7.872
beta-HCH	1.92	1.49	0	1.88	0	0	0
gama-HCH	0.233	0.344	0.294	0.16	0.272	0.378	0.194
delta-HCH	0.046	0.165	1.77	0.858	2.132	3.798	0.518
heptachlor	0.76	1.049	1.11	0.52	1.296	2.607	0.329
aldrin	1.21	1.344	1.42	2.647	2.33	5.74	0.657

heptachlor- endo-epox	0.477	1.075	0.62	0.738	0.801	2.17	0.291
alfa- endosulfan	0.063	0.257	0.246	0.184	0.439	1.09	0.121
dieldrin	0.21	0.596	0.602	0.76	5.036	1.069	0.309
4.4.DDE	0.82	0.797	0.203	0.309	2.623	0.861	0.092
endrin	0.22	0.509	0.831	0.86	0.748	1.374	0.221
beta- endosulfan	0.993	0.708	1.002	1.419	0.994	3.304	0.431
4.4.DDD	2.93	8.743	0.05	1.423	0.078	0.265	0.0438
endrin aldehyde	0.59	1.329	0.27	0.62	0.827	1.433	0.148
endosulfan sulfate	0.816	1.033	0.68	0.58	0.662	1.548	0.419
4.4.DDT	17.19	24.97	2.009	8.31	2.956	4.13	0.92
endrin ketone	0.629	1.56	1.312	0.586	2.023	3.89	0.498
methoxychlor	2.33	4.85	2.324	2.17	2.201	7.25	0.428

Conclusion

The spatial distribution and seasonal variation of OCPs have been investigated between February 2013 and August 2014 to evaluate the results of OCPs concentrations obtained from 35 stations of Anatolia and European site in Istanbul. Pollution maps were generated to visualize the spatial distribution. OCP concentrations varied every month and are mostly found in the western and southern western parts of the European side. The reason is that the agricultural areas are mostly in Edirne, where is the western neighbor of Istanbul. In general, it can be predicted that the distribution is often exposed to transport as it is varied every month and found near shore sides and the Bosphorus. α -HCH and DDT compounds predominated during the entire sampling. It was determined that the cause of the high α -HCH concentrations was not caused by the technical-HCH use. It has been predicted that both HCH and DDT are still in high concentration in environment due to their previous intensive use, chemical and physical properties, resistance to photolytic and biodegradation. When the average concentrations of total OCPs were evaluated, higher concentrations were observed in rural areas than urban areas.

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SPORADİK VE DİFFÜS DANDRUFFLU HASTALARIN *DEMODEX* AKAR (ACARI: DEMODICIDAE) POZİTİFLİĞİ VE YOĞUNLUĞU BAKIMINDAN KARŞILAŞTIRILMASI: BİR ÖN ÇALIŞMA

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Özet: Oküler dandruff, kronik blefaritin en yaygın ancak çoğunlukla göz ardı edilen nedenlerinden biri olduğu tahmin edilmektedir. Öyle ki, oftalmologların klinik uygulamalarda karşılaştıkları hastaların yaklaşık 1/3'ünü oluşturmaktadır. Mikroskopik muayene ile doğrulanmış oküler dandrufflu demodikozun ve kirpiklerde görülen *Demodex* akarların (Acari: Demodicidae); blefarit, konjunktivit, meibom bezi disfonksiyonu ve keratit ile ilişkili olduğu ve oküler yüzey inflamasyonu ile güçlü korelasyon gösterdiği görülmüştür. Bu çalışmada, sporadik dandruff (SD) ve diffüz dandruff (DD) hastalar *Demodex* spp. pozitifliği ve yoğunluğu bakımından karşılaştırıldı. Çalışma sonucunda SD'li hastaların %82.7'sinin, DD'li hastaların ise tamamının *Demodex* spp. pozitif olduğu tespit edildi. SD'li hastalardan toplam 1094 (ortalama 13.51), DD'li hastalardan toplam 5393 (ortalama 61.28) *Demodex* spp. bireyi izole edildi. SD ve DD'li hastalar arasında *Demodex* akar pozitifliği ve yoğunluğu ile ilgili farklılıklar istatistiksel açıdan anlamlı bulundu. Bu yönde elde edilen bulgular *Demodex* akarların dandruff oluşmasında etkili olduğu ve *Demodex* akar sayısındaki artışın hastalığın şiddetini artırdığı fikrini desteklemektedir. Çalışma kapsamında, dandrufflu hastaların klinik değerlendirme ve tedavi sürecinde *Demodex* akarların göz önünde bulundurulmasının faydalı olabileceği düşünüldü.

Anahtar kelimeler: Blefarit, dandruff, *Demodex*, enfestasyon, kirpik, parazit

Giriş

Demodex akarlar (Acari), Trombidiformes takımının Demodicidae familyasına ait mikroskopik eklembacaklı organizmalardır. Sadece memelilerde parazitlenen ve 100 dolayında türle temsil edilen *Demodex* cinsi akarların insanların kıl folikülleri ve meibomian bezlerinde yaşayan *Demodex folliculorum* ve *D. brevis* olmak üzere iki türü tanımlanmıştır (Tilki vd., 2017a,b). Diğerine göre daha uzun opistozomaya sahip olan *D. folliculorum*, kıl foliküllerinde tek veya gruplar halinde yaşarken (Şekil 1), nispeten kısa opistozomaya sahip olan *D. brevis* sebace bezlerde ve yakın yerlerde genelde tek olarak yaşamaktadır. *D. folliculorum* keliserleri ile hücre zarını delip foliküler epitel hücrelerinin içeriği ile *D. brevis* ise benzer şekilde sebaceoz bezlerin salgılarıyla ve epitel hücreleri ile beslenmektedir (Ayca, 2008; Aktaş, 2009; Fırat vd., 2010; Zhao vd., 2011; Tilki vd., 2017a).

İnsanlarda *Demodex* enfestasyonunun en sık olduğu yerler alın, yanaklar, burun, çene ve nazolabiyal bölge olup, nadiren boyun, kaş, saçlı deri, kulak, göğüs, sırt, meme, kalça ve genital organlar gibi vücudun değişik bölgelerine de yerleşebilmektedirler. Bu hayvanların rozase, akne vulgaris, perioral dermatit, seboreik dermatit ve blefarit gibi çeşitli hastalıklarının patogenezinde rol oynadıkları düşünülmektedir (Unat vd., 1995; Özçelik, 1997; Yazar vd., 2012). *Demodex* akarların insanlarda nadiren bir reaksiyon meydana getirdiği kabul edilmektedir. Bazı kaynaklarda bu hayvanların fırsatçı patojen oldukları belirtilmektedir (Türk vd., 2007).

Göz hekimlerinin klinikte sıklıkla karşılaştığı ve kronik blefaritin (göz kapağı iltihabı) belirtilerinden biri kabul edilen silindirik dandruff kirpiklerde meydana gelen kepeklenme olarak tanımlanmaktadır. Silindirik dandruffun 2 tipi vardır: Kepeklenen kirpik sayısı 10'dan az ise sporadik dandruff (SD), 10 ve daha fazla ise diffüz dandruff (DD) (Gao vd., 2005; Bitton, 2015). *Demodex* akarların üyeleri ile kirpik diplerinde yaptığı küçük aşınmalar kirpiklerde epitelyal hiperplazi (epitel hücre sayısının artması) ve reaktif hiperkeratinizasyon (keratin birikimi)

meydana getirerek silindirik dandruff oluşmasına neden olmaktadır (Gao vd., 2005; Liu vd., 2010; Cheng vd., 2015).

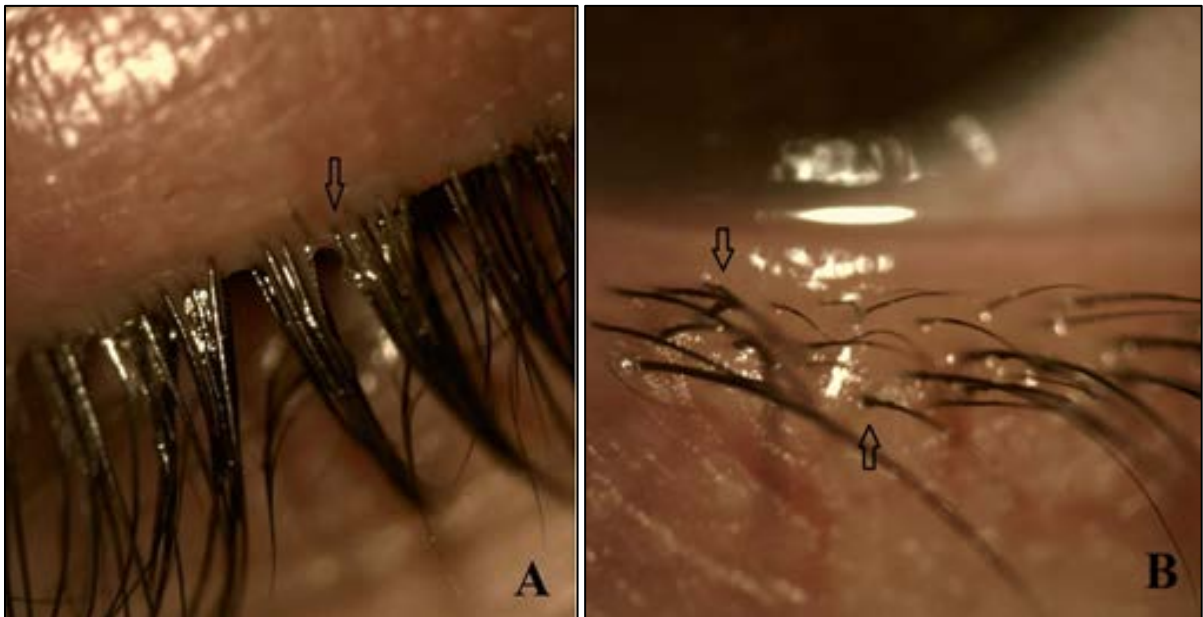
Silindirik dandruffun birçok araştırmacı tarafından *Demodex* enfestasyonu için klinik bir belirti olduğu değerlendirilmektedir. Bu çalışma SD ve DD'li hastaların *Demodex* spp. pozitifliği ve yoğunluğu bakımından karşılaştırılması amacıyla yapılmıştır. Çalışmanın *Demodex* akarların oftalmolojik hastalıklarla olan ilişkisinin ortaya konmasına katkı sağlaması beklenebilir.



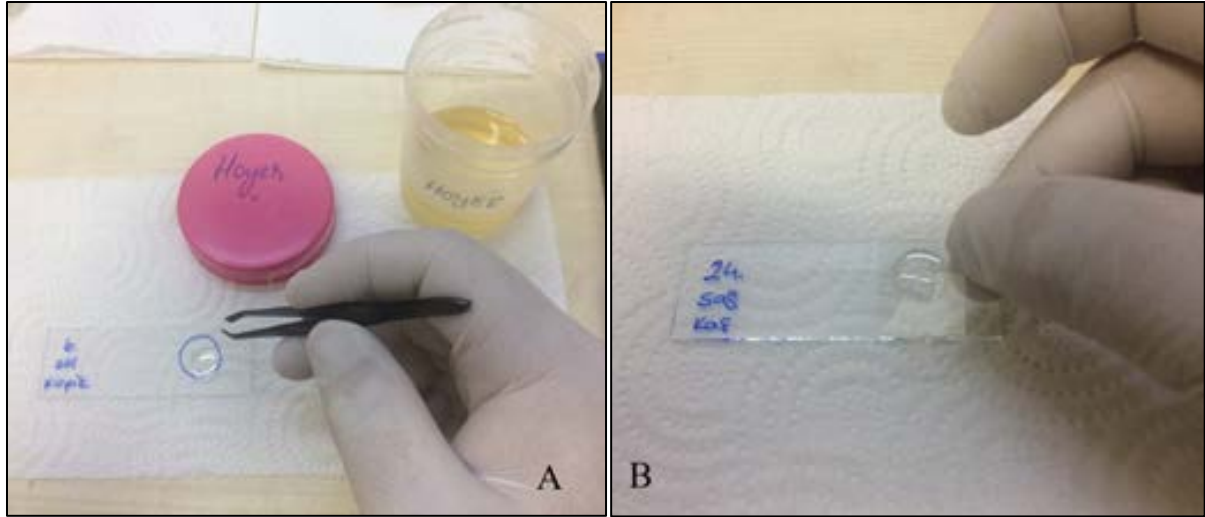
Şekil 1: *Demodex folliculorum* (dişi).

Materyal Ve Yöntem

Çalışma için Erzincan Binali Yıldırım Üniversitesi Klinik Araştırmalar Etik Kurulundan onay alındı. Çalışmaya klinik muayene ile kirpiklerinde silindirik dandruff tespit edilen 98'i SD'li, 88'i DD'li olmak üzere toplam 186 hasta dâhil edildi. Tüm hastaların sağ ve sol gözlerinin alt ve üst kapaklarından (Şekil 2) 2'şer adet (toplam 8 adet) kirpik örneği epilasyon ile alındı. Kirpik örnekleri Hoyer ortamında preparat haline getirilerek (Şekil 3) ışık mikroskopunda farklı büyütmelemlerle *Demodex* akar varlığı ve sayısı bakımından incelendi. Kirpik örneklerinin en az 1 tanesinde *Demodex* akarların larva, nimf veya erginine rastlanılan hastalar *Demodex* bakımından pozitif kabul edildi. Ortalama *Demodex* akar sayısı, toplam akar sayısının *Demodex* pozitif hasta sayısına bölünmesi ile hesaplandı. Verilerin istatistiksel değerlendirmesi SPSS 23.0 paket programı kullanılarak yapıldı. Hasta gruplarının *Demodex* spp. pozitifliği bakımından karşılaştırılmasında Ki kare testi, *Demodex* spp. yoğunluğu bakımından karşılaştırılmasında Mann-Whitney U testi kullanıldı. P değerinin 0.05'den küçük olması durumunda istatistiksel olarak anlamlı kabul edildi.



Şekil 2: Dandrufflu kirpiklerin belirlenmesi. A) Üst göz kapağı, B) Alt göz kapağı.



Şekil 3: Preparat hazırlama. A) Kirpiklerin Hoyer ortamına bırakılması, B) Lamelin kapatılması.

Bulgular ve Tartışma

Çalışmaya 98 SD'li (63 kadın, 35 erkek, ortalama yaş 55.4) ve 88 DD'li hasta (47 kadın, 41 erkek, ortalama yaş 64.3) dahil edildi (Tablo 1).

Tablo 1: Çalışmaya katılan bireylerin yaş ve cinsiyet özellikleri.

	SDH (n: 98)	DDH (n: 88)	Tüm Hastalar (n: 186)
Yaş (yıl)			
Ortalama \pm SS	55.4 \pm 13.6	64.3 \pm 12.2	59.64 \pm 13.7
Ortanca (min-mak)	57 (17- 89)	63 (34 – 87)	61 (17 – 89)
Cinsiyet			
Kadın	63/98 (%64.3)	47/88 (%53.4)	110/186 (%59.1)
Erkek	35/98 (%35.7)	41/88 (%46.6)	76/186 (%40.9)

SDH: Sporadik dandrufflu hastalar; DDH: Diffüs dandrufflu hastalar; SS: standart sapma; min: minimum; mak: maksimum.

Çalışmada sporadik dandrufflu hastaların %82.7'sinin, diffüs dandrufflu hastaların tamamının *Demodex* spp. pozitif olduğu tespit edildi. SD'li hastalardan toplam 1094 (ortalama 13.51), DD'li hastalardan toplam 5393 (ortalama 61.28) *Demodex* spp. bireyi izole edildi. SD ve DD'li hastalar arasında *Demodex* akar pozitifliği ve yoğunluğu bakımından istatistiki olarak anlamlı farklılıklar tespit edildi (Tablo 2). Çalışmada DD'li hastaların *Demodex* spp ile daha fazla enfeste olduğu ve *Demodex* spp. yoğunluğunun DD'li hastalarda SD'li hastalardan yaklaşık 5 kat daha fazla olduğu tespit edildi. Çalışmada bu yönde elde edilen bulgular *Demodex* akarların üyeleri ile kirpik diplerinde yaptığı mikroabrazyonların silindirik dandruff oluşmasına neden olduğu fikrini desteklemektedir. Ayrıca çalışmada *D. folliculorum*'un *D. brevis*'den daha yaygın ve yoğun olduğu tespit edildi. Bu durum *D. brevis*'in kıl foliküllerinin daha derinlerinde (meibomian bezlerde) yaşaması, *D. folliculorum*'un ise kıl foliküllerinin dışa bakan kısmında yaşaması ve dolayısıyla daha kolay izole edilebilir olmasından kaynaklanabilir. Yapılan diğer çalışmalar çalışmada bu yönde elde edilen bulgularımızı desteklemektedir (Zhao vd., 2012; Wesolowska vd., 2014; Zeytun vd., 2017; Tilki vd., 2017a).

Tablo 2: Sporadik ve diffüs dandrufflu hastalarda *Demodex* pozitifliği ve yoğunluğu.

	Silindirik Dandrufflu Hastalar (n: 186)		
	SDH (n: 98)	DDH (n: 88)	p
Akar pozitifliği			
<i>D. folliculorum</i>	81/98 (%82.7)	87/88 (%98.9)	< 0.001 ^a
<i>D. brevis</i>	11/98 (%11.2)	25/88 (%28.4)	0.003
<i>Demodex</i> spp.	81/98 (%82.7)	88/88 (%100)	< 0.001 ^a

Akar yoğunluğu ^c

Ortalama			
<i>D. folliculorum</i>	13.11	61.21	< 0.001 ^b
<i>D. brevis</i>	2.91	2.72	0.003
<i>Demodex</i> spp.	13.51	61.28	< 0.001 ^b
Toplam			
<i>D. folliculorum</i>	1062	5325	< 0.001 ^b
<i>D. brevis</i>	32	68	0.003
<i>Demodex</i> spp.	1094	5393	< 0.001 ^b

SDH: Sporadik dandrufflu hastalar; DDH: Diffüz dandrufflu hastalar; a: Ki-kare testi; b: Mann-Whitney U testi; c: Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.

Oküler dandruff, kronik blefarit bulunan göz hastalarının %74'ünün en yaygın fakat çoğunlukla göz ardı edilen nedeni olduğu tahmin edilmektedir. Öyle ki, oftalmologların ve göz hastalıkları uzmanlarının klinik uygulamalarında görülen hastaların % 37'sini oluşturur ve yaşlı nüfusta daha yüksek insidansa sahiptir. Ayrıca, mikroskopik muayene ile doğrulanmış oküler dandrufflu demodikozun ve epilasyon ile alınmış göz kirpiklerinde görülen *Demodex*'in, blefarit, konjunktivit, meibom bezi disfonksiyonu ve keratit ile ilişkili olduğu oküler yüzey inflamasyonu ile güçlü korelasyon gösterdiği görülmüştür (Gao vd., 2005; Tighe vd., 2013; Luo vd., 2017). Dolayısı ile silindirik dandrufflu hastalarda *Demodex* akarların göz ardı edilmemesi ve parazit saptandığında antiparaziter tedavi başlanması uygun olacağı düşünüldü.

Halen devam etmekte olan bir araştırmanın ön bulgularının paylaşıldığı bu çalışmanın ileriki evrelerinde, katılımcıların kaş ve diğer yüz bölgelerindeki *Demodex* pozitifliği ve yoğunluğu ile bu verilerin oküler semptom şiddetleri, yaş, cinsiyet, medeni durum gibi farklı değişkenler açısından ilişkilendirilerek değerlendirilmesi ve sağlıklı bireyler ile karşılaştırılması planlanmaktadır. Bu şekilde olgunlaştırılacak olan çalışmayla, *Demodex* akarların oftalmolojik hastalıklarla olan ilişkisinin ortaya konmasına katkı sağlanması muhtemel olacaktır.

Teşekkür

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STRATEGY TO STRENGTHEN THE SOCIAL RESPONSIBILITY OF S&T : FOCUSED ON THE 4TH S&T BASIC PLAN

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Abstract

The philosophy of the role of science and technology is well organized in the EU. The EU suggests Responsible Research and Innovation (RRI) as a philosophy that science and technology innovation should pursue. The concept of RRI was presented at Horizon 2020, the 8th Framework Program(2014-2022), which presented science and innovation as tools for a better society, not just as a tool for economic growth.

In this regard, we analyzed how the role of S&T is defined through the analysis of the 4th Science and Technology Basic Plan newly established in the Republic of Korea this year. For reference, the S&T Basic Plan is the highest S&T related plan established by relevant ministries in accordance with the 『Framework Act on Science and Technology』, related to mid and long term policy goals, direction, strategy, and important issues related to science and technology development in Korea. Compared with the basic plans of the past, one of the most important features of the 4th Basic Plan is to expand the policy target to 'people'. The scope of policy has been extended to the quality of life, and it has expanded to the strategic level of the field that was covered only in the level of technology development from the past basic plan. Also, in the detailed task of the Basic Plan, we strengthened the social role of S&T by expanding the participation of the people throughout the R&D process, and specifically reinforced the role of R&D in the problems closely related to the life of the people.

Now, in the process of policy making, it is necessary to change the perception of the people to a 'subjective role to participate in S&T' rather than 'passive enjoyment of S&T'. In addition, as they have long thought about the concept of RRI in the EU and reflected it in the EU framework, we also believe that it is time to establish the basic philosophy such as 'social responsibility of S&T innovation' that penetrates all plans and policies related to S&T..

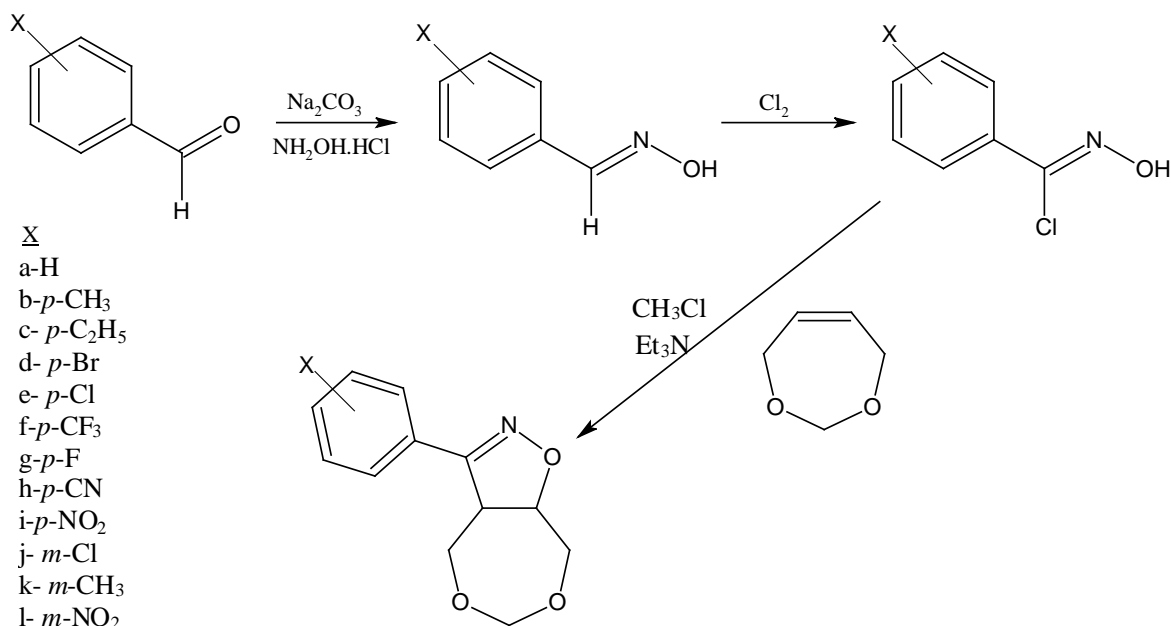
SUBSTITUENT EFFECT STUDY ON EXPERIMENTAL ^{13}C NMR CHEMICAL SHIFTS OF 3-(SUBSTITUTED PHENYL)-3a,4,8,8a-TETRAHYDRO-[1,3]DIOXEPINO[5,6-*D*] [1,2] ISOXAZOLE DERIVATIVES

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Abstract

Twelve novel 3-(substituted phenyl)-3a,4,8,8a-tetrahydro-[1,3]dioxepino[5,6-*d*] [1,2] isoxazole derivatives were synthesized in the present study. Studied compounds were obtained by the 1,3-dipolar cycloaddition reaction of the nitrile oxide to 4,7-dihydro-2*H*-1,3-dioxepine compound. 1,3-dipolar cycloaddition reactions to construct five membered heterocycles are both powerful tools for assembling organic molecules [1]. These isoxazole derivatives were characterized by IR, ^1H NMR, ^{13}C NMR and elemental analyses. ^{13}C NMR spectra of studied molecules were measured in Deuteriochloroform (CDCl_3). The correlation analysis for the substituent-induced chemical shift (SCS) with Hammett substituent constant (σ), and Swain-Lupton substituent parameters (*F*, *R*) were performed using SSP (single substituent parameter), and DSP (dual substituent parameter) methods, as well as single and multiple regression analysis. From the result of regression analysis, the effect of substituent on the ^{13}C NMR chemical shifts was interpreted according to the literature [2-4].



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Sustainable Chemical Process Industries

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Abstract. The harmonizing communal, environmental and financial purposes in firms' growth have produced a rising consciousness on the maintainable strategy. Many investigation studies had been dedicated to extending existing methods to arrest the purposes to provide continuity. Catalogue administration, creation plan, controller for producing, creation repossession, and contrary logistics have focused more attention in the literature.

Key words: chemical engineering, chemical process industries, equipment

Introduction

By the consequence of the rising environmental agreement budgets and conservational principles, significant consideration on manufacturing processes has been made on diminishing the environmental impression of procedure plan and expansion (Nikolopoulou & Lerapetirou, 2012; Bisschops at all., 1997).

Sirola (1998) stated that the efficient way of corresponding communal, environmental and commercial purposes in corporations' maintainable expansion has produced a rising consciousness on maintainable plan and scheduling of source sequences. He also expressed that the research studies have been created an extending current approach to arrest a wider series of commercial performs. The grouping of environmental administration and supply chain management in a unique context has lately directed to a new department (Nikolopoulou & Lerapetirou, 2012).

Monolithic catalysts

The main material of the monolithic substrates using for catalytic submissions are (non)metallic forms creating a traditional narrow canal of organised cross-sectional profiles (Stankiewicz & Moulijn, 2000; Adris and Grace, 1997). To control enough penetrability and improve the efficient structures, Stankiewicz and Moulijn (2000) proposed that the internal surfaces of the monolith stations are enclosed with a tinny coat of pelage. They stressed that the most significant structures of the monoliths are next subjects;

- low pressure drops,
- high catalytic efficiency,
- exceptionally good performance.

Rotating devices

Stankiewicz and Moulijn (2000) noted that an interesting example for rotating devices was given by Boodhoo, Jachuck, and Ramshaw (1997). High heat-transfer constants are reachable in the rotating disk reactor in the parts (Figure 2). They stated that the unit primarily is planned at rapid liquid replies with huge heat action, as polymerizations; In spinning disk reactor, a very thin layer of liquid transfers. In the very short residence times, heat is powerfully transferred from the retorting liquid at heat-transfer numbers.

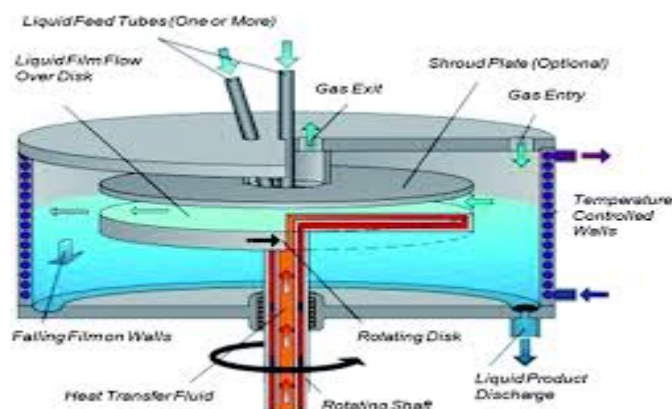


Figure 2. The spinning-disk reactor. (https://www.google.com/search?q=The+spinning-disk+reactor&rlz=1C1CHZL_trTR721TR721)

Membrane Reactors

The membrane could show many roles in the reactor systems. That could be applied for discriminating departure of the reply crops providing a positive equilibrium shift (Tsotsis at all., 1992). They also expressed that it could be used for a measured dispersed food of the retorting types to rise product. Additionally, the membrane could apply departure of catalyst elements from reply crops (Stankiewicz and Moulijn 2000; Falconer at all., 1995). Moreover, the membrane can incorporate catalytic material, mean that the membrane flattering a extremely discerning reply organization. Finally, we can say that the works about catalytic membrane reactors is very power.

Multifunctional reactors combine reaction and phase transition. They also integrate reaction and heat transfer (Stankiewicz and Moulijn 2000; Jansen, Klaassen, and Feron, 1995). According to Stankiewicz and Moulijn (2000) research team, reactive extrusion is a good example for such a combination.

Hybrid Separations

According to Poddar, Majumdar, and Sirkar, (1996), many of the developments in hybrid separation sector contain mixing of membranes with other methods. It uses as a penetrable blockade between the gas and liquid flats. The Poddar research group stayed that by applying fiber membrane units, big transmission zones could be constructed in compressed elements. Furthermore, fascination membranes make independent action of gas- and liquid current levels (Stankiewicz and Moulijn, 2000).

Foster, Burgoyne, and Vahdati, (1998) noted that membrane concentration mainly contains of transporting a volatile module of a liquid stream over a permeable membrane. They determined the benefits of membrane condensation;

- full refusal, macro elements,
- the membrane than lower operating pressure across,
- less membrane fouling,
- minor functioning infections than in vaporization.

Several promising methods don't include in the 3 classes that it was analysed. Many of them are recognized and have been applied in different sectors.

Result

There are many research studies that conducted on the membrane reactors. Moreover, no big scale manufacturing presentations have been noted practically up to now. According to Uhde, Sundmacher and Hoffmann (1996), the main purpose for this situation is the comparatively much worth of membrane parts. They also stayed that other factors that low permeability, mechanical fragileness have efficient position. We hope that new advances in the sector of material engineering would transform the negative situation.

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SYNTHESIS AND CHARACTERIZATION OF HYDROXYAPATITE FROM CLAM SEASHELL

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Abstract: Hydroxyapatite, $(\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2)$ is the major inorganic component of natural bones and widely used as hard tissue repair and biomedical substitutions. Seashell, mainly consist of calcium carbonate, is one of the natural resources of hydroxyapatite (HA). In the present study, an attempt is made to convert calcium carbonate of seashell to hydroxyapatite. For this purpose, milled and calcined seashells are reacted with phosphoric acid using a precipitation method to maintain fine and pure hydroxyapatite with a Ca/P molar ratio of 1.67. Obtained powders in each synthesis steps are characterized using Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Energy dispersive spectra (EDS) and X-ray diffraction (XRD) analysis with Rietveld refinement. According to characterization results, nanosized and high purity HA powders are obtained from seashell as a natural resource using facile and low-cost precipitation method.

Keywords: Seashell, Hydroxyapatite (HA), Acid-base synthesis

Introduction

Calcium carbonate and phosphates are the prime raw materials for fabrication of HydroxyApatite (HA), which has been widely used grafts for bone repair or substitution using hydrothermal, precipitation and hydrolysis and solid-state method [1-3]. Natural materials such as cuttlefish bones [4], snail shell [3], corals [5], oyster shell [6], animal bones [7] are the attractive sources to produce calcium phosphate ceramics. Amongst the other calcium phosphate ceramics such as β -tricalcium phosphate, biphasic calcium phosphate; hydroxyapatite is the most studied biomaterials due to their bioactivity, and similarity in composition with bone and perfect osteoconductivity [8]. Different methods have been applied to produce HA materials like chemical precipitation, sol-gel, solid-state method and combustion synthesis [9-11]. A number of methods can be used to precipitate HA: (a) acid-base, (b) calcium acetate, (c) metathesis methods [12]. The acid-base method is a facile, low-cost precipitation method which involves a neutralization reaction between lime and phosphoric acid at a high pH value (> 9.5). This method is also suitable to conversion of the natural materials to biocompatible HA powders. The stoichiometry (Ca/P ratio) and composition of HA powders can be controlled by using the acid-base precipitation method. Besides, this method provides to produce the high quality HA powders considering purity of precursor materials, pH and calcination temperature and duration of mechano-chemical operation [8, 12]. For example, the effects of attrition milling and ball milling to obtain nano-sized HA powders using acid-base method from egg-shell have been studied comparatively by Gergely et al [13] who reported nanosized and homogenous HA powders were obtained by attrition milling. Another comparative study to conversion of HA from eggshell and seashell was reported by Lee et al. [14]. The extracted HA powders, obtained via acid-base method and subsequent calcination temperature of 900 °C, were evaluated in bone regeneration. In the present work, we use biowaste seashells as calcium sources to synthesize high purity of HA powders using acid-base method. During the synthesis, mechanical milling is used to obtain homogeneous solution of seashells before the reaction with phosphoric acid and the molar ratio of Ca/P (1.67) was kept constant. Different from the Lee et al [14] work, the calcination temperature and milling durations were chosen as 1000 °C and 8h at 300 rpm, respectively, which affect the quality of HA powders. The structures of the HA powders were characterized by X-ray diffraction combined with quantitative phase analysis, scanning electron microscopy/EDS analysis and infrared spectroscopy.

Materials and Methods

Seashells (clam shell) were collected from Black sea beaches as biowaste product and they were washed with distilled water to remove the sand and other dirtiness from their surfaces. The cleaned shells were dried in oven at 100 °C for 1 days. Then dried shells were milled in distilled water with 4-mm ZrO₂ balls at 300 rpm for 8h using a planetary mill (Fritsch Pulverisette 6). We use the ceramic jar with a ball-to-powder ratio of 10:1 during milling experiments. Milled shell powders were dried again in the oven at 100 °C to evaporate the water. The milled powders were calcined at 1000 °C under open atmosphere. HA powders were synthesized from milled and calcined seashell powders using acid-base method described first in the Wei et al. paper [12]. 5 g of milled and oven-dried shells were dissolved in 200 ml DI water using magnetic stirrer. Then liquid H₃PO₄ (Merck 85% purity) was added slowly (2 ml/min) to obtain pH value above 10. The solution was aged at 40 °C for 48h [15]. After that, HA precipitates were collected using centrifugation at 1000 rpm. During this stage HA powders were washed with three times to remove the excess acid to obtain clean powder. The obtained HA precipitates were oven dried at 100 °C and second calcination process at 1000 °C was applied to the HA powders. FTIR analysis of the powders was carried out by using Shimadzu FTIR spectrometer and results were recorded in mid-infrared range with wave number from 400 cm⁻¹ to 4500 cm⁻¹. The phase compositions of each powder were evaluated using XRD investigations conducted in a Rigaku Powder Diffractometer with CuK α (1.54060 Å) radiation in the 2 θ range of 20-70° with 0.02° steps at a rate of 2°/min. The morphology of powders was characterized using a scanning electron microscope (Zeiss Evo) equipped with an energy dispersive spectrometer (EDS, Bruker).

Results and Discussion

FTIR spectroscopic analysis

FTIR spectroscopic analyses were performed to yield detailed information on the chemical bonding structure of synthesized HA powders and calcined seashell powder samples. Figure 1 shows FT-IR spectrum of calcined powders from sea shell.

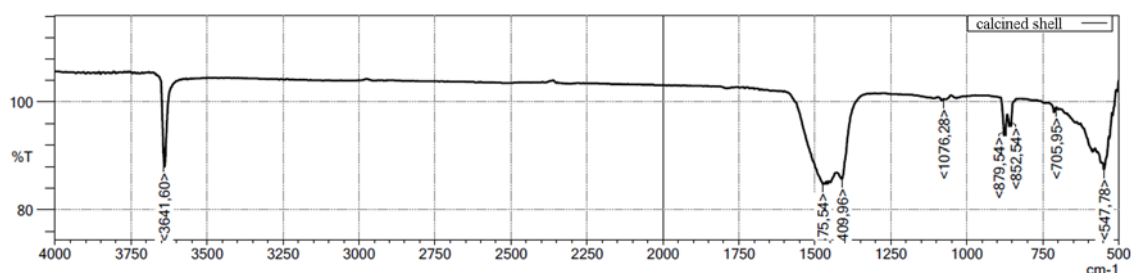


Figure 1. FTIR spectrum calcined seashell powder.

Figure 1 shows the FTIR spectrum from calcined seashell powder. The transmittance bands in FTIR spectrum of calcined seashell powders show a number of peaks in the mid-IR region; strong bands at around 3641 cm⁻¹, 1475 cm⁻¹ with a shoulder of 1409 cm⁻¹, a sharp band at around 547 cm⁻¹ and weak peaks at around 1076 cm⁻¹, 879 cm⁻¹ and 705 cm⁻¹. In addition, The FTIR spectra belonging to calcined seashell demonstrated that all organic matters and proteins are removed from seashell by calcination and the bands associated with the amide groups (1250, 1560 and 1650 cm⁻¹) are observed. The strong peak observed at around 3641 cm⁻¹ is corresponding to O-H bond [16]. The peak at 547 cm⁻¹ is due to the stretching vibrations of phosphate group [17]. The peaks which appear at 1475 cm⁻¹, 1409 cm⁻¹ and 879 cm⁻¹ are associated with the carbonate group.

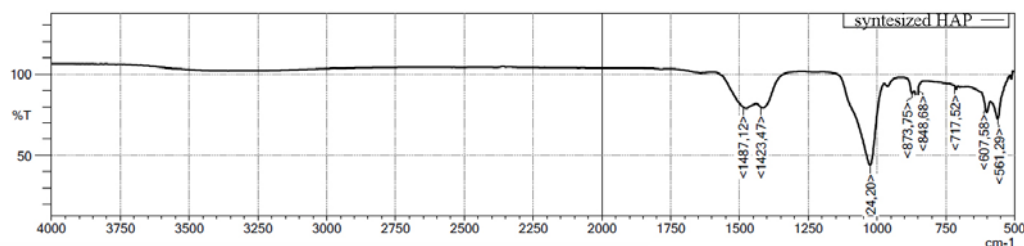


Figure 2. FTIR spectrum synthesized HAP.

The FTIR spectra from synthesized HA powders (Fig. 2) is quite different from the that of calcined seashell given Fig. 1. In this figure, the bands appear at around 1487 cm⁻¹, 1423 cm⁻¹, 1024 cm⁻¹, 873 cm⁻¹, 848 cm⁻¹, 717 cm⁻¹,

607 cm^{-1} and 561 cm^{-1} wavelengths. The strong peak at 1024 cm^{-1} is associated with the P-O asymmetric stretching of HA powders. The bands corresponded to OH^- group are disappeared in Fig. 2 after synthesis. The peaks in the range of 560-608 cm^{-1} are assigned to asymmetric deformation of O-P-O vibrations in bending modes. The bands at 873 cm^{-1} and 848 cm^{-1} originate from CO_3^{2-} ions which are commonly observed in both synthetic and natural HA as impurity [8].

XRD Analysis

Rietveld method was crucial in determining the phase identity and estimating weight fraction. In this study, we use the HighScore Plus XRD software to identify the composition (wt.%) of crystalline phases. Typical XRD analysis from seashell is shown in Figure 3. This figure also displays the Rietveld fit based on a phase constitution of calcite (Hexagonal Bravais lattice, card no. 98-015-8257) and aragonite (Orthorhombic Bravais lattice, card no. 98-001-5194). According to Rietveld refinement, seashell contains mainly 96.8% calcite and 3.2 % aragonite phases.

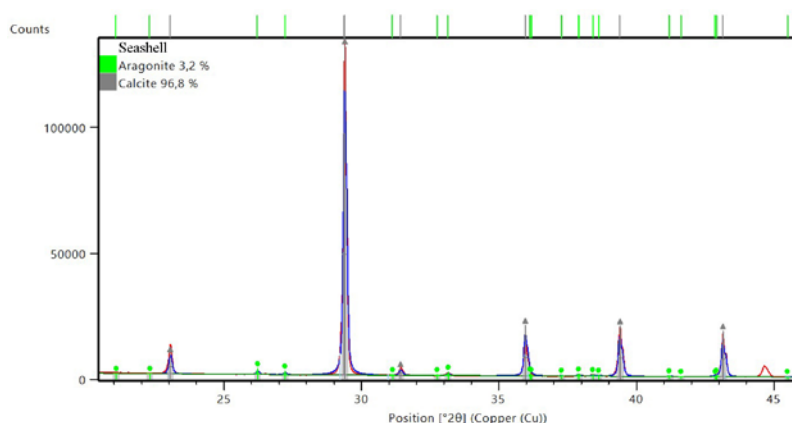


Figure 3. XRD analysis of seashell

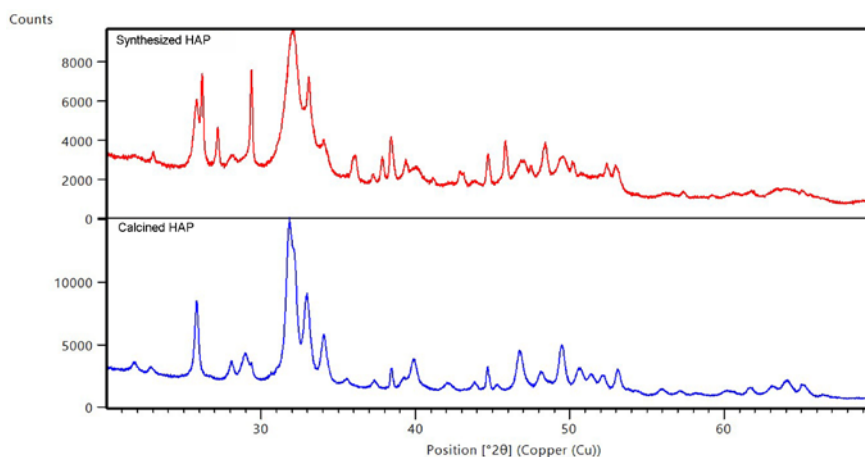


Figure 4. XRD patterns of synthesized HAP and calcined HAP (synthesized) at 1000 °C/1h.

XRD phase analysis of HA powders are given in Figure 4. It is shown that the main phases are Apatite (card no. 98-026-1063) for both synthesized and calcined (synthesized) HA powders. The calcined HA powders exhibit well crystallized sharp peaks of characteristic HA powders as compared to synthesized ones. Similar XRD analysis result was reported for HA powders synthesized from garden snail using chemical precipitation method with ammonia solution [3].

Figure 5 shows the rietveld refinement results of calcined HA powders. According to reitveld refinement, a quantitative phase amount of Apatite phase was determined as 99.6 wt.% and CaO phase (card no. 98-026-1847) also exists in a small amount (0.04 wt.%).

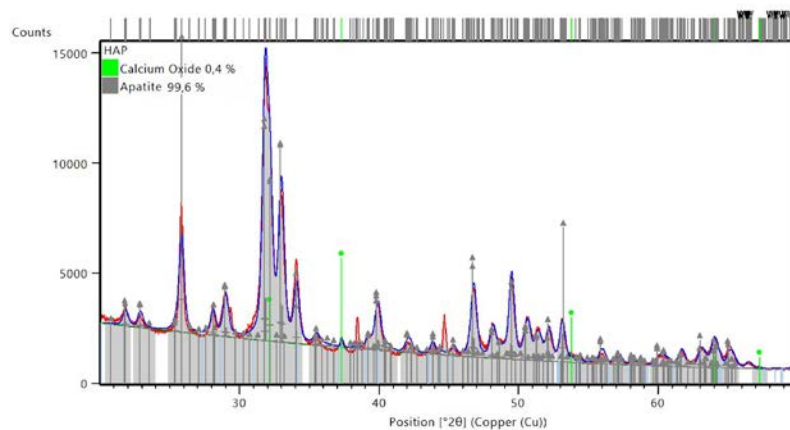


Figure 5. Rietveld refinement result of synthesized and calcined HA powders.

SEM investigations

The morphology of milled and calcined shell powders are given in Fig. 6 (a) and (b), respectively. Milling at 300 rpm for 8h resulted in small grains consist of CaCO_3 crystallites. High magnification image as an inset in Fig. 6a, indicates that the rectangular shaped CaCO_3 polycrystals are present in micron size. Coagulated grains with smooth surfaces were observed after calcination at 1000 °C.

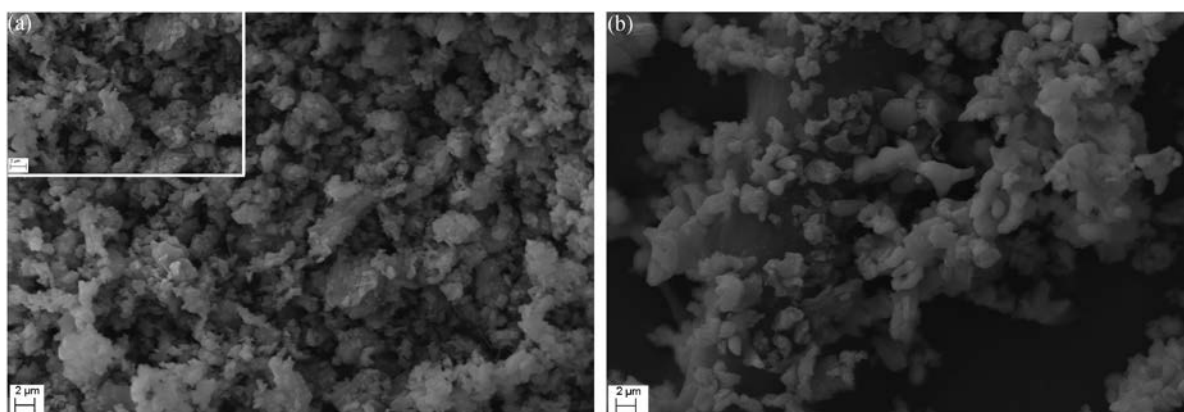


Figure 6. SEM images of shell powders (a) milled at 8h, (b) calcined at 1000 °C

Figure 7 gives SEM images of synthesized and calcined (at 1000 °C) HA powders with corresponding EDS analysis taken from calcined HA powders. Both samples given in Fig. 7 show that the HA nanoparticles are self-agglomerated into micro-meter sized crystals with wide range of particle size distributions. The morphology of powders were predominantly spherical. There is an apparent lack of cohesion between the individual particles within the loosely dense agglomerates. The EDS analysis was used to determine the composition of calcined HA powders and EDS data were collected from the whole area given in Fig. 7b. The results revealed that Ca, P and O are the main elements within the inspection field and it confirms the presence of HA crystals.

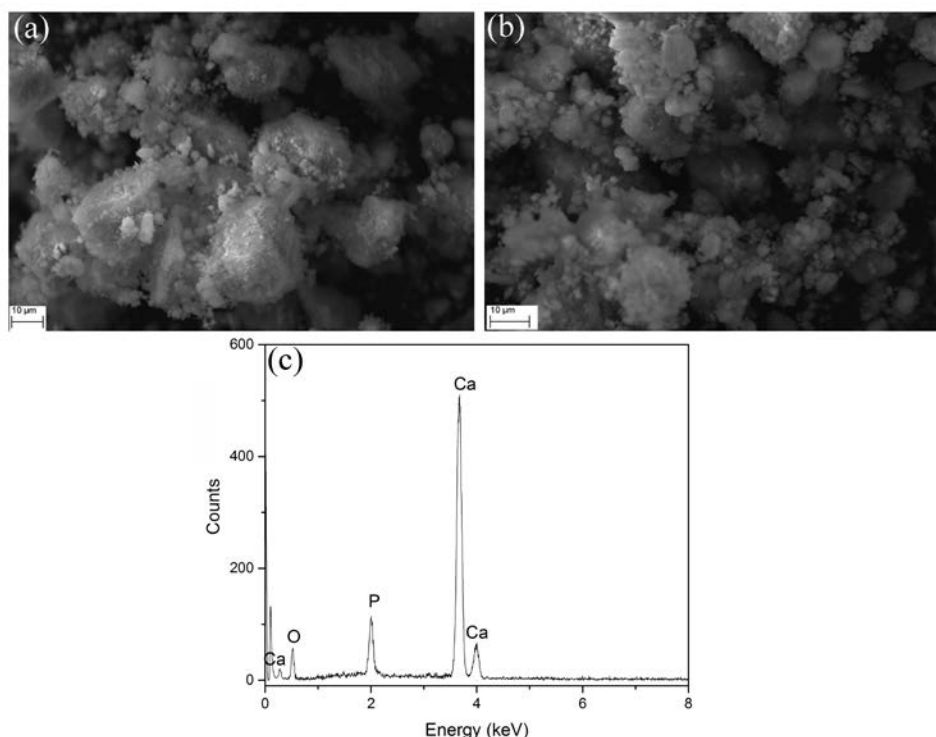


Figure 7. SEM images of HA powders (a) synthesized, (b) calcined at 1000 °C and (c) corresponding EDS analysis taken from calcined HA powders.

Conclusion

In the present study, HA powders were prepared using biowaste clam shells by acid-base method and subsequent calcination at 1000 °C. XRD studies and quantitative phase analysis confirmed that clam seashells consisted of mainly 96.8% calcite and 3.2 % aragonite phases. Rietveld refinement results showed that synthesized and calcined HA powders were obtained in high (99.6 wt.%) purity. Likewise, a small amount of impurity phase (0.4 wt.%) was observed by XRD analysis due to presence of unreacted CaO. The presence of apatite and calcium oxide phases, which contain Ca, O, P elements, were also confirmed by EDS analysis. On the basis of SEM investigations, spherical shaped and nanosized HA powders were obtained and individual HA particles were loosely packed.

Acknowledgements

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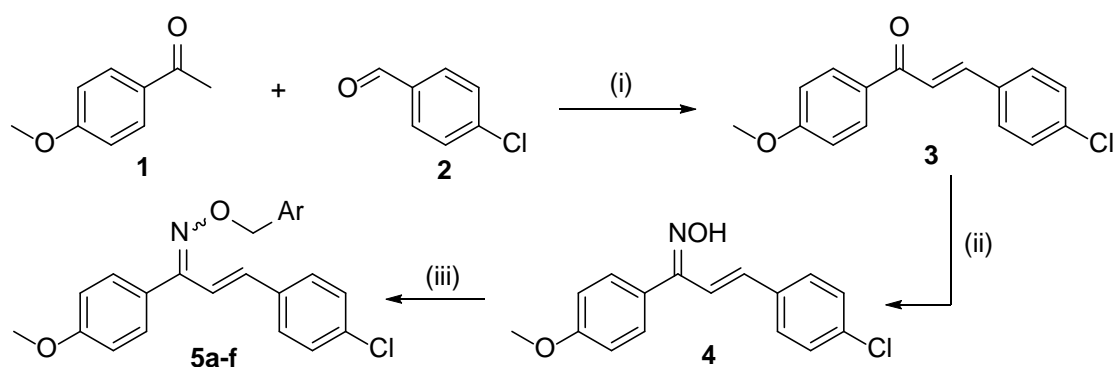
SYNTHESIS OF SOME NOVEL 3-(4-CHLOROPHENYL)-1-(4-METHOXYPHENYL)PROP-2-EN-1-ONE O-BENZYL OXIMES: AN EXPERIMENTAL AND COMPUTATIONAL STUDY

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Abstract

In this study it was aimed to synthesize some novel 3-(4-chlorophenyl)-1-(4-methoxyphenyl)prop-2-en-1-one O-benzyl oxime derivatives. For this purpose, in the first step, 4-chloro-4'-methoxychalcone has been synthesized from 4-methoxyacetophenone and 4-chlorobenzaldehyde. In the second step the chalcone was converted to 4-chloro-4'-methoxychalcone oxime. In the third step, 4-chloro-4'-methoxychalcone oxime was reacted with various arylhalides to form oxime ethers. The reaction pathway is given in Fig.1.



(i) NaOH, EtOH/H₂O (ii) NH₂OH.HCl, pyridine (iii) t-BuOK, THF, ArCH₂X

Fig.1: Reaction pathway.

In the second part of the study, some DFT calculations have been performed on the investigated molecules. Geometry optimizations, vibrational analysis, molecular electrostatic potential maps, frontier molecular orbital calculations, determination of some global reactivity descriptors and NMR calculations have been performed. In the computational part, calculations have been performed at DFT B3LYP level of theory using various basis sets including 6-31G(d), 6-31G(d,p), 6-311G(d,p) and 6-311+G(2d,p) basis sets. NMR calculations have been performed using both CSGT and GIAO methods. Results show that there is a good agreement between experimental and computational data.

Keywords: chalcone, chalcone oxime, oxime ether, computational chemistry, DFT.

SYNTHESIS OF SOME NOVEL 4-CHLORO-1',6'-DIHYDRO-[1,1':3',1''-TERPHENYL]-5'(2'H)-ONE O-BENZYL OXIMES: AN EXPERIMENTAL AND COMPUTATIONAL STUDY

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Abstract

In this study it was aimed to synthesize some novel 4-chloro-1',6'-dihydro-[1,1':3',1''-terphenyl]-5'(2'H)-one O-benzyl oxime derivatives. For this purpose, in the first step, 4-chlorochalcone has been synthesized from acetophenone and 4-chlorobenzaldehyde. In the second step the chalcone was reacted with ethyl acetoacetate and the product was converted to 4-chloro-1',6'-dihydro-[1,1':3',1''-terphenyl]-5'(2'H)-one at the third step. In the fourth step, 4-chloro-1',6'-dihydro-[1,1':3',1''-terphenyl]-5'(2'H)-one was converted to oxime via the reaction of the ketone with hydroxylaminehydrochloride. At the last step oxime was reacted with various arylhalides to form oxime ethers. The reaction pathway is given in Fig.1.

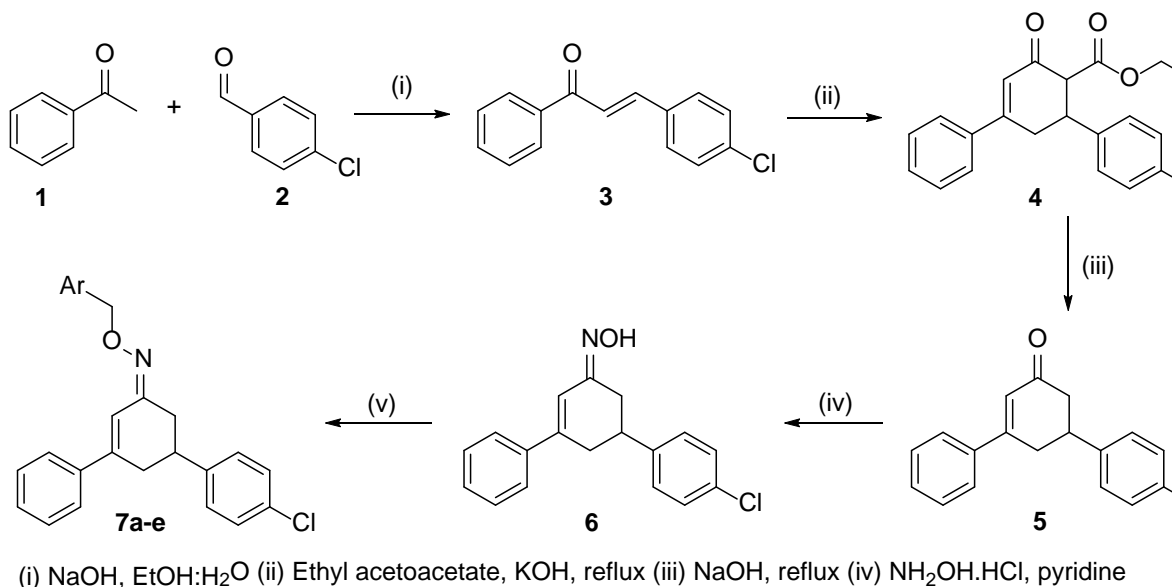


Fig.1: Reaction pathway.

In the second part of the study, some DFT calculations have been performed on the investigated molecules. Geometry optimizations, vibrational analysis, molecular electrostatic potential maps, frontier molecular orbital calculations, determination of some global reactivity descriptors and NMR calculations have been performed. In the computational part, calculations have been performed at DFT B3LYP level of theory using various basis sets including 6-31G(d), 6-31G(d,p), 6-311G(d,p) and 6-311+G(2d,p) basis sets. NMR calculations have been performed using both CSGT and GIAO methods. The results show that there is good agreement between experimental and computationally obtained data.

Keywords: 3,5-diphenylcyclohexenone, oxime, oxime ether, computational chemistry, DFT

TEACHING ABOUT MEDICINAL PLANTS IN MEDICAL SCHOOLS

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Running title: Medicinal plants in medical schools

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Abstract

The treatment of diseases through the use of medicinal plants and their derivatives is the oldest proven therapy in the world. Its use is widespread worldwide and is based on the belief that the natural origin of the products represents a decreased risk when compared to allopathic medicine, however, it has already been shown that these medications may be responsible for serious adverse effects. This is why it is important that this subject be taught in medical schools.

Materials and Methods: A cross-sectional study was conducted through the use of a questionnaire with the objective of describing the level of knowledge that medical school students had regarding certain general aspects, uses and risk posed by medicinal plants. With the intention of collecting the opinions of students in the different academic levels, and different medical schools, an online questionnaire platform was used.

Results: 230 responses were obtained from medical students in different grades and medical schools. Observations showed that little was known about uses and risks of medicinal plants, despite these observations, the students expressed a great interest in studying the therapeutic uses of medicinal plants.

Conclusion: plants, without a doubt, possess a great potential to be used in medicine given that they are an excellent option for the exploration and discovery of new drugs. It is thus convenient to implement their teaching into medical school curriculums in regard to their potential therapeutic mechanisms, adverse reactions and interactions.

Keywords: Phytotherapy; Medical education; Phytopharmaceutical.

Introduction

The treatment of diseases through the use of medicinal plants and their derivatives is one of the most used and most ancient therapeutic practices in the world, due to many different factors, their use started as an empirical and traditional method, given that it was the only alternative available for the relief of symptoms or the management of disease. Despite technological advances in the pharmaceutical industry, medicinal plants are still amongst the most used therapeutic alternatives chosen by patients.¹

Since 1978, the World Health Organization (WHO) has defined the term “Medicinal Plant” as,²: A species of plant which contains chemical compounds that, when consumed or when they enter into contact with the human being, are able to act on certain metabolic processes in the organism, thus producing a therapeutic effect.

The use of herbal medicinal products has been accelerating in developed as well as developing countries around the world. The World Health Organization estimates that 80% of the population in developing countries use herbal medicinal products as their primary source for treating and managing different diseases. This growing demand could be influenced by the assumed inherent safety associated with natural medicinal products, an idea which has grown in popularity over the past couple of years and which has promoted an increased interest for medicinal products around the world and also a growing interest in their potential use for developing new medicinal products.^{2,3,4}

In regards to the current knowledge of herbal medicinal products, the outlook is not so favorable, according to a study by Romero Cerecero O and Tortoriello García J., which evaluated the acceptance and knowledge of herbal medicinal products amongst doctors and healthcare experts. The study was carried out in primary care institutions within the Mexican Institute of Social Security (IMSS), and the results showed that 68.8% of doctors accepted herbal medicinal products. An analysis was also carried out to gauge the depth of knowledge that doctors had in regards to phytopharmaceutical products and, according to the results, the level of knowledge amongst doctors at the primary care level is deficient.⁵⁻⁷

Material and Methods

A descriptive cross-sectional study was conducted in medical students of different academic degrees from public and private schools in the state of Jalisco, Mexico. The sample size was non-probabilistic at the researcher's convenience, and the observation time ranged from April to May of 2018.

With the intention of capturing information from different medical students from public and private schools, and from the different academic degrees, an online survey platform was used to assess the level of knowledge about medicinal plants, as well as knowledge about the application of medicinal plants in a clinical setting and information in regards to efficacy, safety, contraindications and interactions.

Results

We obtained 230 completed surveys from medical students in both public and private schools (39% and 61% respectively). The academic degrees showing the highest participation in the survey were 1st and 2nd year medical students comprising 42% of the total number of respondents. According to the questions gauging knowledge about medicinal plants, 78% of students from both public and private schools demonstrated a low level of knowledge, given that they were not able to identify therapeutic applications or risks associated with their use. One important fact to take note of is that more than 70% of respondents demonstrated an eagerness or desire to learn more about the use of medicinal plants. Table 1 lists some of the herbal remedies or medicinal plants that most students or their families used according to the results of the survey, in addition, some general characteristics of each product are shown.

Discussion

The importance of taking measures to teach about the use of phytopharmaceutical products in medical school could be justified in the fact that an erroneous medical prescription could generate therapeutic inefficiency and could even play a role in the development of serious adverse reactions that, in many cases, could have been foreseen through the use of adequate knowledge of the substances being prescribed. The current curriculums of medical school students and graduates, however, does not currently contemplate the area of phytotherapy or the willingness that most patients have in using or trying herbal medicines. This lack of foresight could thus contribute to the development of unforeseen drug-herb interactions that could potentially cause adverse reactions or therapeutic ineffectiveness given that the joint administration of herbal medicinal products and allopathic products could produce variations in the magnitude of their individual therapeutic effects.^{2-7,9,10}

Interactions, similar to those produced between two or more drugs, can be produced by pharmacokinetic mechanisms, if they affect processes of absorption, distribution, metabolism and excretion or pharmacodynamics mechanisms, if they affect the result of their pharmacological action via additive, synergistic or antagonistic effects between allopathic medicines and medicinal plants. This is all in addition to their capacity to cause adverse effects, above all, if inappropriate doses are administered or if the wrong medicinal plant is used. Even medicinal plants can produce adverse reactions depending on the mechanism of action of the product or hypersensitivity of the individual to a specific compound.^{8,11,12}

We should consider the in-depth study of medicinal plants due to the fact that the consumption of these products is currently high and is increasing on a daily basis. We currently know that substances of plant origin do not lack biological effects but these properties are poorly studied and understood. There is a lack of post-marketing surveillance programs currently in place, thus, the incidence and characteristics of the adverse effects they produce are unknown. However, it is exactly due to this evidence of the risk of toxicity associated with a wide variety of these products that has been emerging in recent years, why it is necessary to implement exhaustive programs for the surveillance of these kinds of products.^{13,14}

Conclusion:

We know the importance of addressing issues related to the use of phytopharmaceutical products given that the general population has a high affinity for their use because they can have similar therapeutic effects to those of conventional medicinal products and also because of the popular belief that, due to their natural origin, they cause fewer adverse effects. Unfortunately, these common misconceptions put the public at an increased risk of herb-drug interactions, potential adverse events and therapeutic ineffectiveness.

Plants, without a doubt, possess a great potential to be used in medicine given that they are an excellent option for the exploration and discovery of new drugs. It is thus convenient to implement their teaching into medical school curriculums in regard to their potential therapeutic mechanisms, adverse reactions and interactions.

Table 1. Therapeutic Characteristics and Common Interactions of Medicinal Plants

Scientific Name	Common Name	Therapeutic Effects	Interactions
<i>Allium sativum</i> ¹⁵	Garlic	-Antioxidant effect. -Effects on the levels of lipids and serum lipoproteins. - Effect on blood pressure and vascular endothelium. -Anti-microbial effect.	It can intensify the effects of anticoagulants, such as heparin or warfarin, and platelet antiaggregants, which could favor predispose to the appearance of hemorrhages.
<i>Uncaria tomentosa</i> ¹⁶	Cat's Claw	-Anti-inflammatory effect. -Antiviral effect.	It has been proven that H2 antihistamines, antacids and proton pump inhibitors decrease the absorption of cat's claw alkaloids, thus reducing their pharmacological action. On the other hand, it has also been found that the alcohol extract of <i>Uncaria tomentosa</i> causes a potent inhibition of the in vitro activity of cytochrome P450, which suggests the need for studies regarding the interaction of these extracts with the metabolism of drugs.
<i>Moringa oleifera</i> ¹⁷	Moringa	-Anti-inflammatory. -Antidiabetic -Antihypertensive.	Chronic co-administration of Moringa and Sitagliptin showed a progressive decrease in the effect of sitagliptin.
<i>Ibervillea sonora</i> ¹⁸	Wareki or Cowpie Plant	-Hypoglycemic. -Antibiotic -Antirheumatic	It can potentiate the effect of insulin and antidiabetic agents via synergism.
<i>Hypericum perforatum</i> ¹⁹	Saint Johns Wort	-antidepressant	Co-administration with theophylline, warfarin, olanzapine, clomipramine and imipramine can cause a decrease in product plasma concentrations with a consequent decrease in its therapeutic effect.
<i>Ginkgo biloba</i> ²¹	Ginkgo	-Management of Dementia	This product could increase the risk of bleeding if used simultaneously with garlic, warfarin and aspirin.
<i>Zingiber officinale</i> ^{10,20}	Ginger	-Antiinflammatory -Antioxidant	Interacts with anticoagulants and antiplatelet agents.

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The Design Process in the Construction Industry

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Abstract. The construction sector is of strategic importance to the European Union as it delivers the buildings needed by the rest of the economy and society. It represents more than about 12% of Europe Gross Domestic Products (GDP) and more than 52% of fixed capital formation. So, we can say that the construction sector is the largest economic activity and it is the biggest industrial employer in Europe. The building sector employs directly almost 22 million people. In this paper, we present some results of a research project which contain managing the strategy process in house constructing.

Keywords: strategy process, process management, constructing strategy

Introduction

Construction is a basic factor for the implementation of the Single Market and for other construction relevant sectors as environment, energy and a little water. The presentation of the strategy procedure in the constructing commerce has an excessive effect on the achievement of the connected subprocesses in building plans and on the level of the last creation (Formoso at all, 2013; Kocaman at all, 2017). According to the many researchers, the management of the strategy process has little attention in spite of its big effect.

Formoso at all, (2013) stayed which unfortunate strategy has a power effect on the point of competence throughout the construction phase. According to them, a big proportion of faults in constructing rise over activities in strategy phases. They underlined that, the growing complication of contemporary constructing in an inexpensive market-place has meaningfully enlarged the compression for refining the presentation of the strategy procedure in the sense of time and superiority level in recent years. For this research determination, they give an example that there is a coincide with the strategy and the construction stages to reduce project period and rise the elasticity of creation strategy (Formoso at all, 2013; Cornick 1991; Powell and Newland, 1994)

The researches have been completed on the organization of the strategy procedure relatively little despite its importance in the sector in relative to the investigation time and effort addressed to construction management (Formoso at all, 2013; Koskela et al. 1997). According to Austin et al. (1994), only a minor price of the strategy procedure linked to the construction costs because of its correct position for the presentation of building studies.

In this sector, it is a well-known reality that constructing strategy is a very problematic procedure to manage it during to procedure. Formoso at all (2013) determined that constructing strategy contains a lot of choices, usually with many interdependencies, below an extremely indeterminate situation at the working conditions (Formoso at all, & Markus and Arch (1973). Each category of professional personnel, for example, project directors, mechanical engineers has a different background, principles, education and education types.

We can give some examples for the main problems in strategy management such as weak statement, little satisfactory certification, underprovided knowledge, unstable source apportionment, wrong decisions and little harmonization among sub departments.

The Design Process

The constructing strategy procedure is a series of steps that builder follow to come up with a solution to a problem. Many times, the solution involves strategizing a product that meets certain criteria or accomplishes a certain task.

The constructing strategy procedure is different from the Steps of the Scientific Method. If a project involves making observations and doing experiments, so, it is needed to follow the Scientific Method. If the project involves strategizing, building, and testing something, it is needed to follow the Constructing Strategy Procedure. The steps of the engineering strategy procedure are an enlarged version of the steps of the constructing strategy procedure (EDP, www.sciencebuddies.org/science-fair-projects/engineering-strategy-procedure/engineering-strategy-procedure-steps). The steps of the engineering strategy procedure are to:

- ✓ Define the Problem
- ✓ Do Background Research
- ✓ Specify Requirements
- ✓ Brainstorm Solutions
- ✓ Choose the Best Solution
- ✓ Do Development Work
- ✓ Build a Prototype
- ✓ Test and Re- strategy

Creative Procedure

Creativity has become a requisite skill for builders and a part of their basic training. However, there are many ways to implement builder's creativity and innovation procedure according to different epistemological approaches. Contrasting philosophies, positivist and constructivist

worldviews, determine different strategy reasoning models and business strategies (Lubart, 2018; Liem, 2014; Formoso et al., 2013). According to Simon (1973), positivism means to a scientific and structured method focusing on identifying the causes influencing outcomes. It is an analytical, problem-centered approach that leads to a sequential procedure in which creativity takes center stage. His research contributed to shape this sequential engineering procedure based on three major steps (Lubart, 2018):

- ✓ problem setting,
- ✓ problem solving (creativity),
- ✓ evaluation of solutions.

This approach gave rise to many sequential strategy practices, like the General Strategy Theory (Yoshikawa, 1985; Tomiyama et al., 2009 and Simon, 1973) and industrial engineering procedures organized as a series of stages and gates (Lubart, 2018; Aoussat et al., 2000 and Pahl et al., 2007; Cross 1994; Liem, 2014).

For creative procedure, several models of strategy are presented in the literature. In Markus and Arch (1973)' model, it is given four key actions in strategy: analysis, synthesis, evaluation and dissemination (figure 1).

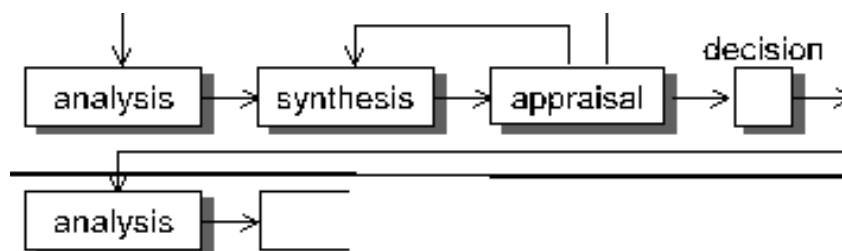


Figure 1: A creative procedure for construction strategy (Markus and Arch 1973)

Result

In this paper, we focused on the results of a research project which contain managing the strategy procedure in house constructing. Its content has a universal strategy for emerging strategy activities, containing the content of the core actions, their special associations and the tasks of persons. Finally we say that, it is probable to advance a more detailed examination on the real content and effect of the actions in the constructing strategy to reach the modern strategies of our modern world.

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THE EFFECT OF FIBERBOARD MODIFICATION ON COATING ADHESION STRENGTH

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Abstract: The aim of this study was to determine the adhesion strength of polyvinyl chloride (PVC) and Eastern beech (*Fagus orientalis* L.) veneers glued onto specially produced fiberboards with urea-formaldehyde (UF), polyvinyl acetate (PVAc) and polyurethane (PU) adhesives. Inorganic fillers including rock salt (NaCl), calcite (CaCO₃), borax pentahydrate (Na₂B₄O₇·5H₂O) and talc (3MgO 4SiO₂ H₂O) were added at the ratios of 3, 6 and 9% to the specially produced fiberboard mixtures. The adhesion strength of the samples was determined according to the principles of the TS EN 311 standard. In the scope of the study, scanning electron microscopy (SEM) was employed to determine the structural morphology at the bonding interface of the veneers and the specially produced fiberboards. According to the results of the study, the veneer adhesion strength was reduced by the inorganic fillers used in different ratios in the fiberboard modification. The highest adhesion strength was obtained with Eastern beech veneer applied using UF adhesive on the control samples. It was concluded that UF and PVAc adhesives were not appropriate for bonding PVC veneers.

Keywords: Medium density fiberboard (MDF), inorganic fillers, polyvinyl chloride (PVC), wood veneer, wood adhesives

Introduction

In some places the use of wood-based board products instead of solid wood materials has been necessitated in response to the decline of world forests and reduced availability of solid wood material. These products may help in solving the problem of the increasing consumption of forest products per capita along with rising prices (Akkılınç, 1998; Güller, 2001; Çamlıbel, 2012). By exploring the use of forest wastes and certain plant stalks and fibers and especially with the utilization of synthetic adhesives, researchers in the field were able to fabricate wood-based boards which exhibited the features of wood, but which did not function like wood. As a result, this led to the production of engineered wood board products such as chipboard, fiberboard, oriented strand board, etc. (Berkel, 1970; Güller, 2001; Kilic, 2006).

In recent years, the use of unutilized agricultural wastes as raw materials in the production of engineered wood board has gained great importance (Atchison, 1993; Rowell, 1996; Youngquist et al., 1994; Youngquist et al., 1997; Youngquist, 1999; Ntalos and Grigoriou, 2002; Batalla et al., 2005; Fowler et al., 2006; Çamlıbel, 2012). However, agro-based fibers are not as technologically suitable as wood fibers in the production of fiberboard (Halvarsson et al., 2005; Lee et al., 2006). Therefore, in order to reduce the amount of continuously accumulating lignocellulosic raw materials, inorganic materials are currently being used along with agricultural wastes in the production of engineered wood products. Generally, these industrial raw materials include minerals such as kaolin, calcite, titanium dioxide and talc which are selected for use as both fillers and coating minerals (Erkan and Malayoğlu, 2001).

Wood-based boards on their own are not suitable for furniture production from the esthetic point of view and they have no significant standing in the furniture and decoration industry. In order to use wood-based boards in this area, it is necessary to cover them with various veneers in order to strengthen the physical and mechanical properties of the board surfaces and edges according to their intended usage, to reduce formaldehyde emissions, and to provide a decorative and natural appearance. For these reasons, wood-based board surfaces are coated with various surface covering materials such as artificial resin laminate (PVC), high-gloss acrylic and wood veneers, according to the venue and purpose of their use (Budakçı, 2008). These veneers are bonded to the various surfaces (chipboard, fiberboard, plywood, etc.) using different adhesives. In all cases it is essential that the veneer bonds well to the surface onto which it is applied. However, sometimes irregular adhesion, fluctuations, swelling and other undesirable failures occur due to structural differences in the materials and in the adhesives used as well as to pressing and user errors (Budakçı, 2010).

Studies on the subject have determined that the adhesives used in the surface coating process must be compatible with both the board and the bonded material. Depending on the area of use and production speed, polyvinyl acetate (PVAc) and hot melt adhesives can be employed (Johns and Gillespie, 1980). A number of factors are reportedly linked to the use of adhesives in the bonding of wood products including differences in the surface wetting ability, penetration, reaction, polymerization, porosity, pH, moisture levels, extractive substances, chemical interactions, free surface energy, surface area and in the adhesives as well as in the surfaces of the wood products that come in contact with the adhesive (radial, tangential, and longitudinal) (Rowell, 1996; Mahlberg et al., 1998; Winfiel et al., 2001). By measuring the tensile strength perpendicular to the surface and the bond quality, it became clear that in order to increase the tensile strength perpendicular to the surface, the board surfaces should be covered with veneers (Özdemir, 1996). In order to achieve the high adhesion strength required for veneer applications, it was recommended that: (1) contact adhesive should not be used when bonding veneers to fiberboard or plywood board surfaces unless absolutely necessary, (2) PVAc or UF adhesives should be selected, and (3) these adhesives should be applied economically (150 g/ m²) in order to reduce their use in unnecessary quantities (Budakçı, 2010). It was reported in a different study that the veneer type did not have any effect on the adhesion strength and that when the veneers had peeled away from the surface of the specimens, the peeling had generally occurred from within the board layers (Nemli, 2000; Kılıç, 2006).

With this perspective, the purpose of the study was to produce special modified fiberboards by adding different proportions (3, 6 and 9%) of inorganic fillers (calcite, rock salt, borax pentahydrate and talc) and to apply polyvinyl chloride (PVC) and Oriental beech (*Fagus orientalis* L.) veneers using urea-formaldehyde (UF), polyvinyl acetate (PVAc) and polyurethane (PU) adhesives. Within the scope of the study, the morphology of the bonding interface between the specially produced fiberboards and the veneers was examined via cross-section images taken with a scanning electron microscope (SEM).

Materials and Methods

Production of special fiberboard

In this study, the normal conditions of the production line remained the same, the only change being that the Dr. Çamlıbel's formulation for the mixing ratios of inorganic filler minerals was used in the production of the medium-density, 18-mm thick fiberboards. A flow diagram of the process applied in the board production is shown in Figure 1 (Çamlıbel, 2012).

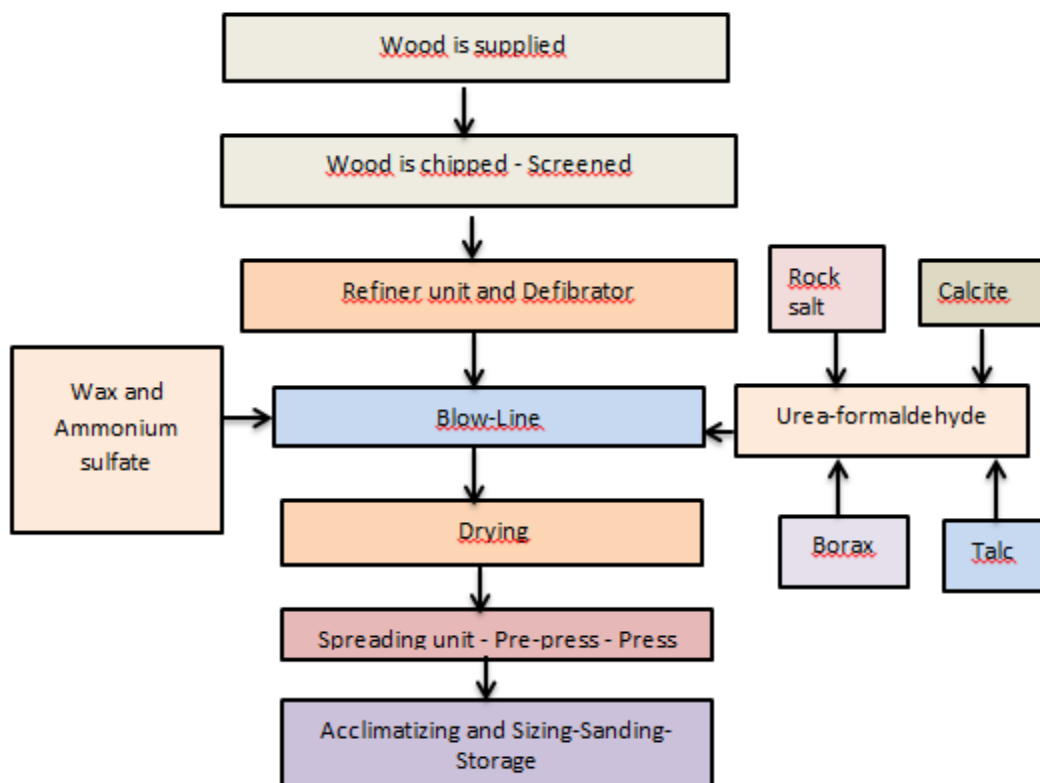


Figure 1. Fiberboard production process flow chart (Çamlıbel, 2012)

For the study, Eastern beech (*Fagus orientalis* L.), oak (*Quercus robur* L) and scots pine (*Pinus sylvestris* L) procured from local (Bolu and Düzce) forest enterprises were selected as the raw wood materials. The raw wood materials were packed in the chipper, and then the mixture of 70% deciduous and 30% coniferous wood chips were screened in a mechanical sieve and the suberization of the chips was carried out in the refiner unit at 180 °C under 7-7.5 bar steam pressure for 4-5 min. The suberized chips were then fiberized in the defibrator. Prior to fibrelation, liquid paraffin was administered to the subarized chips. Ammonium sulfate and urea-formaldehyde were added to the pulverized fiber in the blow line at the defibrator outlet. Filler minerals, rock salt (NaCl), calcite (CaCO₃) borax pentahydrate (Na₂B₄O₇·5H₂O) and Talc (3MgO 4SiO₂ H₂O), at ratios of 3, 6 and 9%, according to the production formulation, were prepared in a separate tank. The solution of inorganic filler minerals was mixed with the urea-formaldehyde glue and added to the pulverized fiber from the blow line. The fibers containing the inorganic filler minerals with the mixture of chemicals and urea-formaldehyde entered the drying line above the blow line and were dried to 8 - 12% humidity. The production formulations composed of the inorganic filler mineral admixture solution mixed with the lignocellulosic materials are shown in Table 1, while Table 2 shows which additives were used in the production formulations.

Table 1. Inorganic filler minerals used in fiberboard production (Çamlıbel, 2012)

Board Type	Product Type	Biomass	Glue	Hardener	Hydrophobic Substance	Inorganic Filler Minerals	Ratio (%)
1	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	---	0
2	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Rock salt	3
3	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Rock salt	6
4	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Rock salt	9
5	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Calcite	3
6	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Calcite	6
7	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Calcite	9
8	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Borax pentahydrate	3
9	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Borax pentahydrate	6
10	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Borax pentahydrate	9
11	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Talc	3
12	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Talc	6
13	MDF	Lignocellulosic	Urea-Formaldehyde	Ammonium sulfate	Wax	Talc	9

Table 2. Mixture ratios of special production fiberboards (Çamlıbel, 2012)

Formulation Ratios					
Board Type	Board Type	Board Type	Board Type	Industrial Fiber (%)	Inorganic Added Minerals (%)
R ₁₀₀ N ₀	R ₁₀₀ C ₀	R ₁₀₀ T ₀	R ₁₀₀ B ₀	100	0
R ₉₇ N ₃	R ₉₇ C ₃	R ₉₇ T ₃	R ₉₇ B ₃	97	3
R ₉₄ N ₆	R ₉₄ C ₆	R ₉₄ T ₆	R ₉₄ B ₆	94	6
R ₉₁ N ₉	R ₉₁ C ₉	R ₉₁ T ₉	R ₉₁ B ₉	91	9

R: Wood (coniferous + non-coniferous) consumed per one m³ board; **N:**Rock salt, **C:**Calcite, **T:**Talc, **B:** Borax pentahydrate;
N, C, T, B: Inorganic filler minerals consumed per one m³ board

The fibers with the inorganic mineral additives were mechanically spread out to dry in a homogeneous manner to form the fiber paste mats. The mats were formed into boards at 190 °C and 32-34 kg/cm² for 275 s in a multi-layered press. After the sizing process, the boards were left to stand for five days to acclimatize. At the end of this process, the upper and lower surfaces of the boards were sanded using 40, 80 and 120 grit sand paper, respectively.

Veneers

The veneers chosen for the fiberboards were milled 0.6 mm thick Eastern beech (*Fagus orientalis* L.) veneer and 0.7 mm thick polyvinyl chloride (PVC) veneer, both of which were produced in Turkey, where they are widely used in the furniture and decoration industry.

Preparation of test samples

The fiberboards modified with inorganic fillers and the veneer materials were cut to a size of 650×250 mm and conditioned in an acclimatization chamber at 20 ± 2 °C and $65\% \pm 5$ relative humidity until reaching a constant weight (TS EN 311, 2005). The conditioned fiberboards and surface veneers were then bonded in accordance with the manufacturer's recommendations using Denlaks polyvinyl acetate (PVAc) laminate adhesive, Genfor 7055 urea-formaldehyde (UF) and Kleiberit 706.1 Reactive-Hotmelt polyurethane (PU) adhesives having varying features. The bonding conditions of the samples and technical properties of the adhesives are shown in Table 3.

Table 3. Bonding conditions of the samples and technical properties of the adhesives

QUALITY INFORMATION	Urea-Formaldehyde (UF)		Polyvinyl Acetate (PVAc)		Polyurethane (PU)	
Adhesive brand	Genfor 7055		Denlaks laminate adhesive		Kleiberit 706.1 Reactive-Hotmelt	
Application method	Hot press		Hot press		Continuous press with pressure roller	
Veneer	PVC	Beech	PVC	Beech	PVC	Beech
Pressing time (min)	10	2	10	5	continuous	continuous
Pressing temp. (°C)	60	110	60	110	130	130
Pressing pressure (N/mm ²)	0.48	0.48	0.48	0.48	1.2	1.2
Amnt. of glue applied (± 10 g/m ²)	150	150	150	150	80	80
Application viscosity (cP)	1880	1880	587	587	9000	9000
Application density (g/cm ³)	1.22	1.22	1.1-1.2	1.1-1.2	1.1	1.1
pH value	5.55	5.55	6.73	6.73	-	-
Solid matter ratio (%)	52.58	52.58	46.48	46.48	100	100
Glue temperature (°C)	20	20	20	20	130	130

In the bonding process, the appropriate amount of adhesive was applied in such a way as not to exceed ± 10 g/m² by controlling the weight on an analytical balance (0.01 g precision). In the adhesive application process, a different application device was used for each adhesive type. The UF was applied with a roller glue machine and for the PVAc adhesive, hand-held glue rollers were used. The PU was applied in a glue line for flat lamination. The adhesives were applied only to the fiberboard surfaces. Multi-layer hydraulic presses were used in bonding processes performed with the PVAc and UF adhesives, and continuous presses were used with the PU.

The pressed fiberboard slabs were left to stand for three weeks under laboratory conditions out of direct sunlight and air circulation. Subsequently, the cut parts were grouped and measured as $120 \times 120 \pm 0.1$ mm (TS EN 311, 2005). According to $5 \times 3 \times 2 \times 3 \times 5$ test patterns, 450 specimens were prepared as five board types, three modification ratios, two veneer types and five of three different types of adhesives. In order to obtain a smooth adhesion on the veneer surface prior to the adhesion strength test, sanding with 80 grit followed by 120 grit sand paper was carried out. Before the test, the dust was cleaned from the sanded surfaces with a soft bristle brush and high-pressure air. Afterwards, the samples were conditioned in the acclimatization cabin at 20 ± 2 °C and $65\% \pm 5$ relative humidity until reaching constant weight in order to eliminate moisture differences during the bonding and preparation phases (TS EN 311, 2005).

An epoxy adhesive (150 ± 10 g / m²) was applied to the bottom surface of a 35.7 mm diameter test cylinder and it was fixed to the center of the samples using a mold. When performing these operations, care was taken that an average pressure of 0.15 N / mm² was applied perpendicular to the surface of the board. The specimens were left in this mold for at least 24 h (Budakçı, 2008; TS EN 311, 2005). The specimens with the cylinders fixed to the surface were removed from the clamping die and then were cut around the test cylinder through the thickness of the veneer (to the carrier surface) with the aid of the cutter seen in Figure 2 (Budakçı, 2008; TS EN 311, 2005).

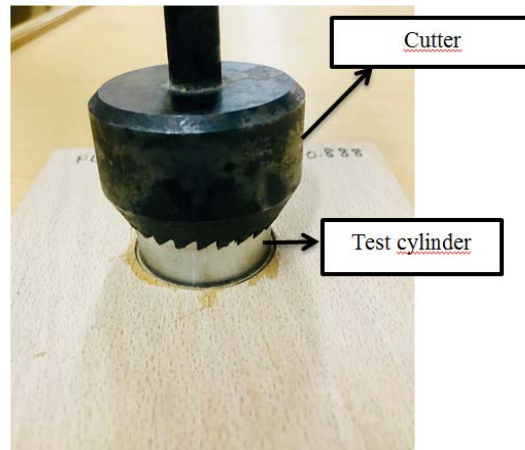


Figure 2. Cutting around the test cylinder into the bonded sample and carrier surface

Adhesion strength test

Adhesion strength tests of the samples prepared according to TS EN 311 (2005) were carried out in the Düzce University Wood Industry Engineering Laboratory using a UTEST 7012 model 50 kN universal test machine. The test specimens were placed on the test device with the tensile strength set at 1 m/min with a constant speed for 60 + 30 s (TS EN 311, 2005).

The veneer adhesion strength was calculated by applying the following equations to the breaking forces obtained from the experiments.

$$SS = F / A \quad \text{N/mm}^2 \quad (1)$$

Where:

SS = Adhesion strength (N/mm²)

F = Greatest force (N)

A = Area of bond surface (1000 mm²) (TS EN 311, 2005).

Scanning electron microscopy (SEM)

In order to determine the effect of board type, modification ratio, veneer type and adhesive type on the adhesion performance, images were taken via SEM of the fiberboard and veneer interface and measurements were made on the dry adhesive film layer. In order to obtain clearer images for this purpose, 5 × 5 × 5 mm samples in groups of twelve were coated with gold metal using the Denton Vacuum Desk V. The coated specimens were placed on the FEI Quanta FEG 250 SEM in such a way that measurements were taken from the section edge. Microscopic images were taken using the high-vacuum method.

Statistical analysis

For the statistical evaluations, the MSTATC package program was used. Multivariate analysis (ANOVA) tests revealed the effects of board type, modification ratio, veneer type and adhesive type factors on adhesion strength and the mutual interactions of these factors. The Duncan test and the least significant difference (LSD) critical values were used to make comparisons and the factors that caused the differences were examined.

Results and Discussion

The ANOVA results for the veneer adhesion strength measurements of the fiberboards modified with inorganic fillers are given in Table 4.

Table 4. Variance analysis (ANOVA) results for adhesion strength

Factor	Degree of Freedom	Sum of Squares	Average Square	F Value	Level of significance ($P \leq 0.05$)
Board Type (A)	4	26.549	6.637	671.3899	0.0000*
Modification Rate (B)	2	2.114	1.057	106.9417	0.0000*
Interaction (AB)	8	5.344	0.668	67.5772	0.0000*
Veneer Type (C)	1	72.842	72.842	7368.4114	0.0000*
Interaction (AC)	4	5.124	1.281	129.5855	0.0000*
Interaction (BC)	2	0.622	0.311	31.4585	0.0000*
Interaction (ABC)	8	2.382	0.298	30.1156	0.0000*
Adhesive Type (D)	2	38.565	19.282	1950.5397	0.0000*
Interaction (AD)	8	3.395	0.424	42.9266	0.0000*
Interaction (BD)	4	1.124	0.281	28.4257	0.0000*
Interaction (ABD)	16	1.565	0.098	9.8933	0.0000*
Interaction (CD)	2	111.066	55.533	5617.5200	0.0000*
Interaction (ACD)	8	25.714	3.214	325.1414	0.0000*
Interaction (BCD)	4	1.155	0.289	29.2178	0.0000*
Interaction (ABCD)	16	1.475	0.092	9.3279	0.0000*
Error	360	3.559	0.010		
Total	449	302.596			

* Significant

The interactions of factors such as board type, modification ratio, veneer type, and adhesive type were significant ($P \leq 0.05$) on the adhesion strength of the veneers bonded with different adhesives on the boards modified at different ratios. The Duncan test results for the board types using the LSD critical value are given in Table 5 and SEM images of these are shown in Figures 3 and 4.

Table 5. Duncan test comparison results for the board types (N/mm²)

Board Type									
Rock Salt		Calcite		Borax Pentahydrate		Talc		Control	
\bar{x}	HG	\bar{x}	HG	\bar{x}	HG	\bar{x}	HG	\bar{x}	HG
0.722	E	1.031	B	0.772	D	0.8626	C	1.394	A*
LSD \pm 0.02932									

\bar{x} : Arithmetic mean, **HG**: Homogeneity group, * Highest adhesion strength value.

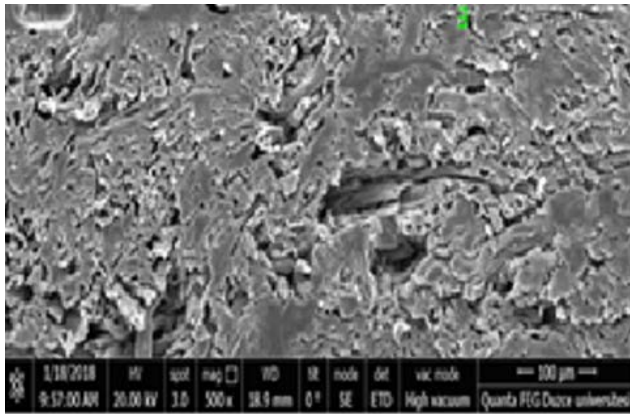


Figure 3. Control (no additive) sample

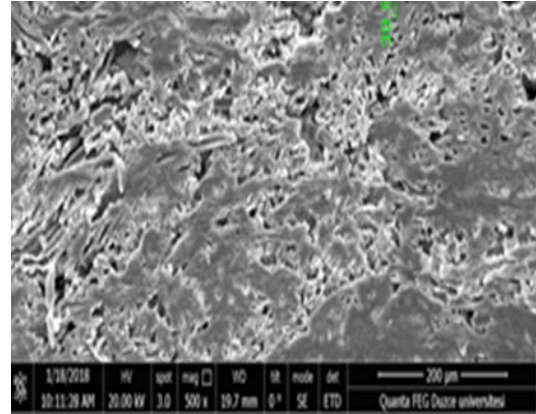


Figure 4. Sample with rock salt added

According to the table for the type of board, the highest adhesion strength was obtained in the untreated control samples and the lowest in the board type modified with rock salt. In the study, inorganic material modification made to the fiberboard had a lowering effect on veneer adhesion strength. This may have been due to the fact that the inorganic minerals serving as fillers in the board composition caused a reduction in board cohesion. In the literature, internal cohesion resistances of the carrier surfaces and the veneer adhesive surfaces have been reported in tests performed to determine the adhesion performance of veneers. In adhesion tests, it has been noted that breaks usually occur not in the adhesion layer, but from within the inner layers of the boards (Nemli, 2000; Kılıç, 2006).

The Duncan test results for the modification ratios are given in Table 6, and their SEM images are shown in Figures 5 and 6.

Table 6. Duncan test comparison results for the modification ratios (N/mm²)

Modification Ratio					
3%		6%		9%	
\bar{x}	HG	\bar{x}	HG	\bar{x}	HG
1.052	A*	0.923	B	0.894	C
LSD \pm 0.02271					

\bar{x} : Arithmetic mean, **HG**: Homogeneity group, * Highest adhesion strength value.

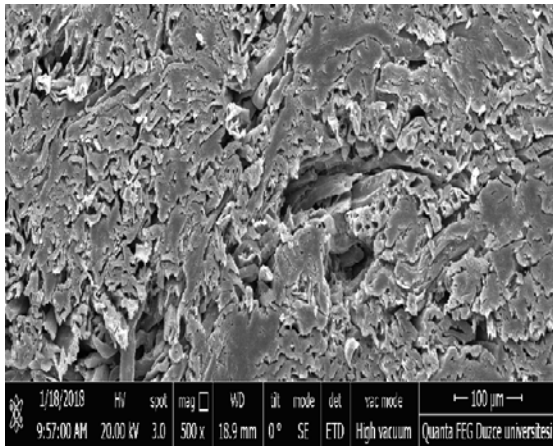


Figure 5. Sample with 3% Modification.

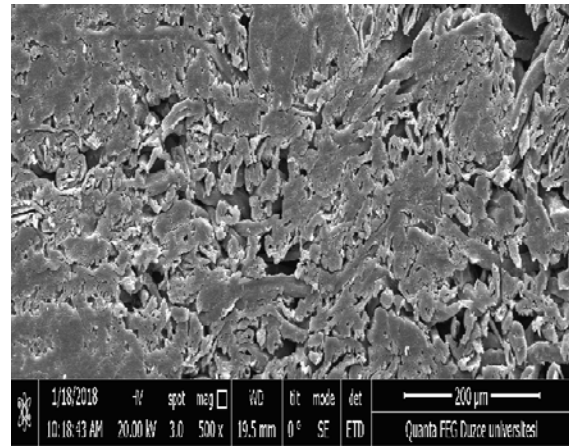


Figure 6. Sample with 9% modification

According to the table, the highest adhesion strength was observed at the ratio of 3% modification and the lowest at the 9% modification ratio. Depending on the modification ratio, as the internal cohesion of the inorganic fillers used in the modification of the fiberboards decreased, there was a parallel decrease in the adhesion strength. It has been reported in the literature that inorganic filler minerals used at 3% have little effect on the inter-fiber bonds between the fiber spaces and therefore, the experimental results gave values close to those of the control board (Çamlıbel, 2012). When the SEM images of the boards with the low modification ratio are examined, the adhesive can be seen in place between the board fibers, thus creating mechanical adhesion. Increasing the proportion of fillers prevented the formation of mechanical adhesion, and this was thought to have reduced the adhesion of the veneer.

The Duncan test results for the comparison of the veneer types are given in Table 7 and SEM images of these are shown in Figures 7 and 8.

Table 7. Duncan test comparison results of veneer type (N/mm²)

Veneer Type			
Beech		PVC	
\bar{x}	HG	\bar{x}	HG
1.359	A*	0.554	B
LSD \pm 0.01854			

\bar{x} : Arithmetic mean, **HG**: Homogeneity group, * Highest adhesion strength value.

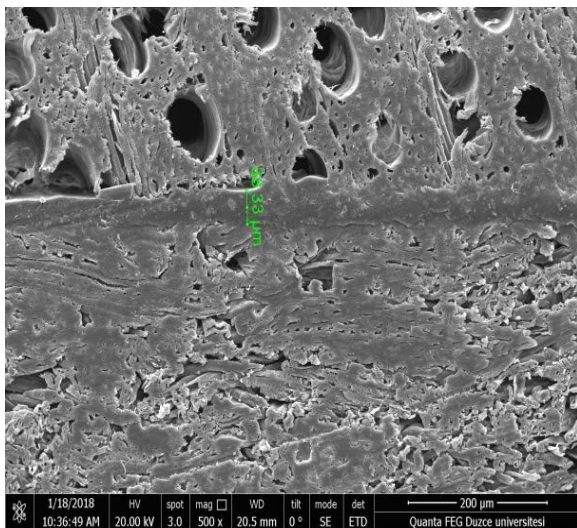


Figure 7. Sample with beech veneer



Figure 8. Sample with PVC veneer

Accordingly, the adhesion strength was determined to be the highest with the beech veneer, and the lowest with the PVC veneer. It may be that the high adhesion strength of the beech veneer was due to its porous structure and

that the adhesives formed a mechanical adhesion by filling these pores. In the literature it is stated that the bonding of wood material with glues varies because of differences in surface wetting ability, penetration, reaction, polymerization, porosity, pH, moisture levels, extractive substances, chemical interactions, free surface energy, surface area and in the adhesive contact with the wood surface (Rowell, 1996; Mahlberg et al., 1998; Winfiel et al., 2001).

The Duncan test comparison results for adhesive type are shown in Table 8, and their SEM images are shown in Figures 9 and 10.

Table 8. Duncan test comparison results for adhesive types (N/mm²)

Adhesive Type					
UF		PVAc		PU	
\bar{x}	HG	\bar{x}	HG	\bar{x}	HG
0.809	B	0.694	C	1.365	A*
LSD \pm 0.02271					

\bar{x} : Arithmetic mean, **HG**: Homogeneity group, * Highest adhesion strength value.

UF: Urea-formaldehyde, **PVAc**: Polyvinyl acetate, **PU**: Polyurethane

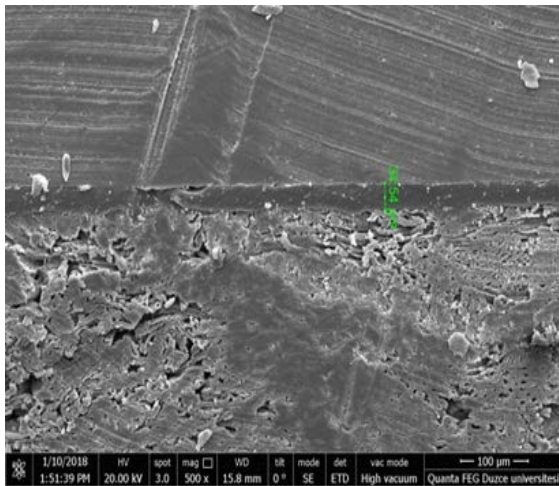


Figure 9. Sample bonded with PU adhesive.



Figure 10. Sample bonded with PVAc adhesive

According to the table, the highest adhesion strength was obtained with PU and the lowest with PVAc adhesive. In the literature, it has been stated that the glues used in veneering processes must be of a quality compatible with both the board and the glued material (Johns and Gillespie, 1980). The PU adhesives were found to be compatible in all types of bonding used in the study, while the PVAc and UF were incompatible in the bonding of the PVC veneers in particular.

Results of the Duncan comparison test to determine the mutual interactions of the adhesive variety factors and the board type, modification ratio and veneer type are given in Table 9 and their SEM images are shown in Figures 11 and 12.

Table 9. Duncan comparison results for board type, modification ratio, veneer type and adhesive type interactions

FACTOR ABCD**		Beech						PVC					
		UF		PVAc		PU		UF		PVAc		PU	
		\bar{x}	HG	\bar{x}	HG	\bar{x}	HG	\bar{x}	HG	\bar{x}	HG	\bar{x}	HG
Rock Salt	3%	1.806	DE	1.352	LM	1.446	IJKL	0.000	/	0.000	/	1.869	D
	6%	0.803	Y	0.769	Y	0.599	Z	0.000	/	0.000	/	0.828	XY
	9%	0.943	UVWY	0.826	XY	0.846	WXY	0.000	/	0.000	/	0.873	VWXY
Calcite	3%	1.738	DEF	1.146	PQRS	1.385	JKLM	0.000	/	0.000	/	1.814	DE
	6%	1.456	IJKL	1.285	MNOP	1.250	MNOPQ	0.000	/	0.000	/	1.880	D
	9%	1.798	DE	1.502	HIJK	1.701	EFG	0.000	/	0.000	/	1.612	FGH
Borax	3%	1.001	TUV	0.953	UVWX	0.878	VWXY	0.000	/	0.000	/	1.836	DE

Pentahydrate	6%	1.145	PQRS	1.246	MNOPQ	0.368	[0.000	/	0.000	/	1.525	HIJ
	9%	1.296	MNO	1.368	KLM	1.101	RST	0.000	/	0.000	/	1.189	OPQR
Talc	3%	1.465	IJKL	1.551	HI	1.361	KLM	0.000	/	0.000	/	1.591	GHI
	6%	1.201	NOPQR	1.284	MNOP	1.336	LMN	0.000	/	0.000	/	1.454	IJKL
	9%	1.140	PQRS	1.026	STU	0.991	TUVW	0.000	/	0.000	/	1.126	QRST
Control		2.828	A*	2.171	C	0.919	UVWX	0.000	/	0.000	/	2.447	B
LSD \pm 0.1244													

\bar{x} : Arithmetic mean, **HG**: Homogeneity group, * Highest adhesion strength value.

** **PVC**: Polyvinyl chloride **A**: Board type, **B**: Modification ratio, **C**: Veneer type, **D**: Adhesive type, **UF**: Urea-formaldehyde, **PVAc**: Polyvinyl acetate, **PU**: Polyurethane

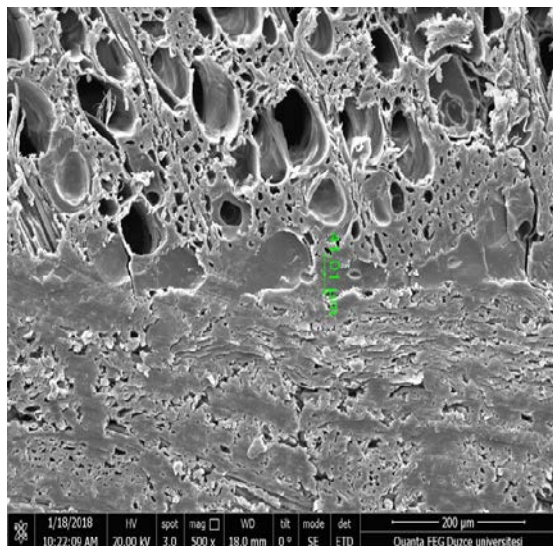


Figure 11. Control sample: beech veneer bonded with UF adhesive



Figure 12. Control sample: PCV veneer bonded with PVAc adhesive

According to the table, the highest adhesion strength was obtained in the unmodified control samples covered with beech veneer using UF adhesive. The lowest adhesion strength was detected in the PVC veneer boards with bonding attempts using UF and PVAc. In the study, the desired adhesion was not obtained on the surfaces of all PVC veneer fiberboards, especially with the UF and PVAc adhesives. This was thought to be caused by the incompatibility of the adhesives used in the PVC bonding. It has been reported in different studies that the use of UF and PVAc is in the forefront in the adhesion of veneers in terms of adhesion strength (Vick, 1999; Budakçı, 2010). In this study, however, PU adhesive gave better results in the bonding of the veneers to fiberboards modified with inorganic fillers.

In the study, the adhesion of PU-bonded beech veneer provided a weaker adhesion than with the UF adhesive. This is thought to be due to the inadequate amount of PU adhesive applied per square meter (80 g/m²). The SEM images show that possibly the beech veneer and fiberboard surfaces absorbed the PU adhesive bilaterally so that a sufficient adhesive layer could not be formed at the PU adhesive interface, and this may have reduced adhesion performance. In the literature, it is stated that if the adhesive completely fills the pores of the wood material so that an adhesive layer does not form between the two parts and the formation of this layer is weakened, the adhesion phenomenon is weakened (Kızıllırmak, 2004). When the SEM images are examined, it can be seen that the beech veneer has a porous structure which increased the adhesion surface area, thus forming a mechanical adhesion by neatly incorporating this UF-bonded material. In addition, the fiberboard control samples unmodified with any inorganic filler material allowed the UF adhesive to form a perfect adhesive layer between the board surface and the veneer.

The SEM images of the boards with a low modification ratio showed that the adhesive had settled between the board fibers and created mechanical adhesion. Increasing the proportion of fillers was thought to have reduced the veneer adhesion strength since it prevented the formation of mechanical adhesion.

Conclusion

According to the results of this research, it was determined that fiberboard variety, modification ratio, adhesive type and veneer type were effective on the bonding of fiberboards modified with inorganic fillers to beech and

PVC veneers using PU, PVAc and UF adhesives. According to the study, the modification using inorganics fillers in fiberboard production reduced the veneer adhesion strength. Moreover, as the amount of inorganic filler increased, the veneer adhesion strength of the board linearly decreased.

In the study, successful results were obtained when the surfaces of the fiberboard modified with inorganic filler were covered with beech veneer, while PVAc and UF adhesives were found to be incompatible in bonding PVC veneer in particular. In this context, the use of PU adhesive on the surfaces of the fiberboard used for PVC veneer is recommended.

As a result of the study, it is also recommended that no modification be made with rock salt as an inorganic filler for fiberboard to be bonded to various veneers, and mineral additions of more than a 3% calcite or talc are not recommended. If high adhesion strength is required for veneered surfaces, it is advisable to use UF adhesive in the bonding of natural wood veneers, as it is economical and easily applied, while PU adhesive is recommended for the bonding of PVC veneers

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The Effect to Chemical Species

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Abstract. Every science department is working on certain objects or entities. Studying with about objects in a constant way requires a notion of character which is special for the science area. Researchers usually use a certain notion without further reflection not to be contradiction in terms. chemists have many classificatory problems about the concepts and materials. To solve the problems, highly efforts are necessary to organize millions of materials today and most of them vague with the unclothed eyes.

The character matter is also an ontological subject. But, this subject need be stay different position from the epistemological approach. This is necessary to achieve of the chemical documentation problem. We clearly stay that chemical documentation presume a concept of species character for the real determination of materials. This presume is also necessary when a new species is found or produced to establish the character of the species with its characteristic possessions. The aim of this study is the impact of old-time arrangement on chemical classes character. For this reason, we focused on how species character was defined and determined in this period.

Key words: chemical species, a notion of identify, classification of materials

Introduction

From old to today, ontological matters emerge in the vanguard of technical research, such as the well-known ontological complications of quantum mechanics (Schummer, 2002). With the same perspective we can say that theorists of knowledge have much focused on the quantum matters, every classificatory knowledge is more interested in ontological matters than pure physical subjects. Schummer stayed that a lot of critical affairs in the history of chemistry are direct connected with the character matters of materials. His interesting example is the alchemical quest for production costly metals such as gold. According to this argument, non-natural gold cannot be the same as natural gold for ontological details; the empirical possessions are the same, but natural materials are strictly different. Ritter and Bergstrom (2001) gave a reference for a non-empirical impression of factual character that they found provision in the interpretation of Aristotales' distinction between natural things and artifacts, Dobs and Siegfried (1968) stayed that the idea of species character being past to epistemological requests must not be static once forever. Because, the idea has renewed sometimes in the history of chemistry. Dobs and Siegfried stressed that it is not near ontology in the usual perspective but about the ontological defiance of chemists.

Species character in classical chemistry

Merton (1957) and Hooykaas (1958) first formulated and applied the classical approach to material character. He determined material character with composition linked the determination tentative analysis and tentative synthesis. Merton didn't care about the philosophical fundamentals for the of material documentation. Composition had to be formulated in terms of simple materials with the starting point of tentative synthesis. Later, Merton approach was reformulated by Bergman. Then, the next chemists defined tentative standard procedures for fundamental analysis of all kind of materials.

The number of chemical possessions of materials is unlimited (Sener at all, 2010; Schummer, 1997). He stayed that if we extend the official set and reflect all chemical possessions as basic possessions, there are extremely many possessions to be processed: "two models belong to the same chemical material, if all of their basic possessions are the similar. If there is only a solitary basic property in which they change from each other they belong to different chemical species". This mean that nobody can reach the inference on a understandably complete basis that two models actually belong to the similar chemical material, since it is practically impossible to define extremely many possessions. Shummer concluded that "all character claims in chemistry are necessarily only provisional".

If chemists say, "material character" in the metaphysical or in the chemical sense, they usually linked this idea to 'pure materials' (Brock, 1992). Brock stayed that there is little recognized about the history of the most essential chemical idea. And, he added that "we have good details to trust that the standard methods for cleansing liquids and things remained roughly the similar at least since the 18th century. In this period, some chemists constantly used "solubility and mineral form" or "hot point" as succeeding possessions of the elements (Ewing and Laitinen, 1997). They expressed that we may accept that our idea of cleanliness was already well traditional in 18th century, since there was no way to express the idea of material cleanliness. Ewing and Laitinen underlined that this approach remained basically the same until the middle of 20th century, some chemists characterized, and fixed the character of new chemical materials in the first half of 20th century.

The classical chemistry has the following categories (Schummer, 2002):

- description of preparation from starting materials including yield,
- results of fundamental analysis including empirical formula,
- boiling point including pressure,

According to Schummer, all these possessions doesn't satisfy to fix chemical species character in a certain way.

The chemical construction model is the central position of entering the microcosm of molecules and atomic construction (Schummer, 2002). He argued that the problem of chemical species character in the realm of organic chemistry had caused serious problems. Schummer detailed this situation as that since there are several characteristic possessions in which chemical things can differ from each other, one must determine and compare many possessions of two models in order to prove their material character. The mean of above difficulty is all character claims in chemistry founded on a set of characteristic possessions are not sustained.

The matter of material character has also an important social event that has been the power for solutions. The production of new materials is the key role to the progress of chemistry for a chemist, since he is also the producer of new kinds of material components. Brock (1992) stayed that every researcher used to with the history and sociology of importance in knowledge knows how important rules and knowledge are necessary for the progress of knowledge. He added that, priority claims to new materials also play a central role for patent systems, and thus need a power basis for legal matters. Also, it should be easy to check whether a certain species is a new one or not.

The Effect of Classification

Chemical construction model was largely founded on chemical possessions and axioms. From a scientific view, chemical possessions differ from physical possessions in that they make relations between chemical materials, between reaction materials and reaction products linked by chemical changes (Taylor, 1986).

According to Taylor, all chemical knowledge comes from a connected construction in which every material is linked to every extra material by direct or indirect connections. In such a connection, the character of each material pair with its connected location determined by its characteristic relations to other materials. Taylor also stayed that classical chemical construction model reproduces that connection on a theoretical and sophisticated level, such that the relations between materials pair with relations between chemical constructions. Another words, we can say that if the identities of chemical materials are determined by relations with each other, then chemical materials are relational parts of the system.

Laszlo (1998) suggested chemists and historians of twentieth century chemistry are powerfully challenged by the giant volume of scientific study released in the past 100 years: "we have now a hundred times more chemists, chemical papers, chemical materials, etc. than at the beginning of the century". He also stayed that historians of knowledge need to refer to primary sources that are likely to be in some sense characteristic of the subject under study: "In contradiction of the background of some 3 million chemists and more than 700,000 chemical journals a year today, every selection is running the risk of being arbitrary". Therefore, historians of this century's chemistry are forced to focus on particular events and slim scientific themes, if they want to apply old-style methods in a different and original way.

The special methods provide physical possessions, mainly electromagnetic possessions, on various high levels (Bair, 1993). He underlined the point that unlike chemical possessions, the physical possessions do not determine relationships between changed chemical tools. It is possible that the logical difference between chemical and physical possessions may appear to researchers. According to Bair, the interesting relation of equipment in chemistry is an interesting relation of physical possessions which species character has been altered and reformed to the new possessions.

Result

Chemical classification is much more complex and allows deriving more differentiated concepts than the classification made before. Also, the change turns out to be many new ontological and conceptual problems that most chemists are probably not aware of this generation. Additionally, there is a lack of well-defined character criteria for the new quasi-molecular species due to the term 'molecular construction'. If there is not a selected criterion for species character of the constructions, chemical species classification would be failure. We know that spectroscopic instrumentation does not provide such criteria. So, it is a tool that is going to challenge chemists to move on their ontological approaches.

We observed that classical chemistry gave up metaphysical principles and applied tentative possessions as basic for determining the character of chemical materials. Because of that concept of species character applied on an infinite set of basic possessions, material documentation by comparing possessions of models was conditional

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THE INVESTIGATION OF EFFECTS OF POLYESTER RESINS AND TENSILE ADDITIVES ON ABRASIVE WEAR OF GLASS FIBER REINFORCED POLYESTER COMPOSITES

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Abstract: Composite materials are made by combining two or more materials which have very different properties. The biggest advantages of composite materials are light and strong. The fiber reinforced polymer (FRP) composite material consists of a polymer and a reinforcing material. Polymeric materials are commonly reinforced with synthetic fibers such as glass and carbon. Synthetic fibers are very strong but brittle and it will break if bent sharply. The polymer matrix holds the synthetic fibers together and also protects them from damage. The glass fiber reinforced polyester (GFRP) composites are used with different polyester resins and tensile additives. The aim of this study is investigation of effects of different polyester resins and tensile additives on abrasive wear properties of GFRP. In this experimental study, orthophthalic and isophthalic polyester resins were used as polymer matrix material in GFRP composite samples. The polystyrene, polyvinyl acetate and plasticizers were used as thermoplastic tensile additive in GFRP composite samples. GFRP samples were produced by hot-compression molding at 140°C, 150bar for 3min. Abrasion tests were done to determine wear properties of samples. The wear rate values of samples were calculated according to test results. The Barcol hardness values of samples and densities of samples were measured.

Keywords: Glass Fiber, Polyester Resins, Tensile Additives, Abrasive Wear.

Introduction

A composite material is made by combining two or more materials which have different physical or chemical properties. The biggest advantages of modern composite materials are light and strong. Composite materials have flexibility design property because of molding into complex shapes. Composite materials are commonly used because of their evident features such as low density, high fatigue endurance, easy to machine, high toughness, non-corrosive and cost. The composite material is classified as “matrix” or “reinforcement”.

When additional strength is needed, polymer materials can be reinforced. The combination of polymer and reinforcement material can produce stronger materials. The fiber reinforced composites were successfully used for years for all engineering applications. The fiber reinforced polymer (FRP) composite material consists of polymer matrix resin such as polyester, isopolyester, vinyl ester, epoxy, phenolic and synthetic fiber reinforcement material such as glass, carbon, aramid (Sathishkumar et al., 2014). Synthetic fibers are very strong but brittle and it will break if bent sharply. The polymer matrix holds the synthetic fibers together and also protects them from damage. Polyesters are also generally used as matrix materials, particularly with glass fiber reinforcement. Polyesters are economic materials and have resistance to environmental and chemical effects. It has high dimensional stability and low moisture absorption (Pihtili and Tosun, 2002). Glass and carbon fibers are used as reinforcements because of their low expansion rate and high flexural modulus (Mata et al., 2009).

The fiber reinforced polymer (FRP) composite may also contain fillers and additives. These materials modify and improve properties of product. Filler materials are usually the inefficient materials which are used in composite materials to decrease material costs, to improve mechanical properties and to improve process ability. The different filler materials such as polymethylmetacrilat (PMMA), glass beads (GB) and glass sand (GS) are used in glass fiber reinforced polyester (GFRP) composites. The glass fiber reinforced polyester (GFRP) composites are used with different polyester resins such as orthophthalic and isophthalic polyester resins and thermoplastic tensile additives such as polystyrene, polyvinyl acetate and plasticizers.

The wear means erosion or displacement of a material from its initial shape. Abrasive wear is a phenomenon in which the sliding surfaces are been frictional contact. Abrasive wear occurs because of hard particles between contacting surfaces. These hard particles may be commercial abrasives such as silicon carbide and aluminum oxide, or naturally occurring contaminates like dust particles and sand. Abrasive wear occurs when a rough and hard surface slides across a surface that is relatively softer.

In tribological applications, the composite materials were subjected to different conditions such as sliding and rolling against other materials. Load, sliding distance and speed are considered for determining the tribological

behaviors of materials. The composite materials have been used for many tribological applications such as bearing, gears and wheels (Sathishkumar et al., 2014). Many studies on the wear mechanism of GFRP composites have been carried out in literature. There are only few works about effects of different polyester resins and tensile additives on abrasive wear properties of GFRP. Pihtili (2009) investigated effects of resin content on wear of woven roving glass fibre–epoxy resin and glass fibre–polyester resin composite materials. He obtained that glass fibre–epoxy resin composites usually represented higher strength and minimum wear when compared with glass fibre–polyester resin composite materials. Pihtili and Tosun (2002) researched wear behavior of glass-fibre-reinforced composite and plain polyester resin under various loads, speeds and sliding distances. They determined that wear resistance of fibreglass-reinforced composite samples was much more than plain polyester. Chand et al. (2000) investigated short glass fiber reinforced polyester composites with and without filler at abrasive wear conditions. They expressed that glass fibers provided better wear resistance and high weight fraction of glass fiber in the composite material showed less wear loss as compared to composite material containing less glass fibers. They concluded that higher GF content had less wear loss. Shibata et al. (2014) researched the tribological behavior of Polyamide 66 (PA66) resin composites containing rice bran ceramics (RBC) particles and glass beads (GB) under dry condition. They expressed that PA66/GB composites showed low friction and low wear compared with pure PA66. Khoun et al. (2011) investigated effect of polyvinyl acetate (low-profile additive) on thermo-mechanical properties of glass fiber-reinforced unsaturated polyester composites. They observed a significant reduction of the flexural and shear properties with the addition of polyvinyl acetate. They observed that the polyvinyl acetate reduced thermo-mechanical properties of composites.

In this study, orthophthalic and isophthalic polyester resins were used as polymer matrix material in GFRP composite samples. The polystyrene (PS), polyvinyl acetate (PVA) and plasticizers were used as thermoplastic tensile additive in GFRP composite samples. The aim of this study is investigation of effects of different polyester resins and tensile additives on abrasive wear properties of GFRP.

Materials and Methods

Tested materials

The chemical compositions and densities of GFRP samples using in experimental study are given in Table 1 and 2.

Table 1: Chemical compositions of GFRP samples.

Sample	Chemical concentrations of samples
S1	20wt.% isophthalic polyester + 8wt.% plasticizers tensile additive + 18wt.% glass fiber
S2	20wt.% orthophthalic polyester + 8wt.% plasticizers tensile additive + 18wt.% glass fiber
S3	20wt.% orthophthalic polyester + 8wt.% polystyrene tensile additive + 11wt.% glass fiber + 5wt.% glass beads
S4	20wt.% orthophthalic polyester + 8wt.% polyvinyl acetate tensile additive + 11wt.% glass fiber + 5wt.% glass beads
S5	20wt.% orthophthalic polyester + 8wt.% plasticizers tensile additive + 11wt.% glass fiber + 5wt.% glass beads

Table 2: The density of samples.

Sample	Density (g/cm ³)
S1	1,63
S2	1,70
S3	1,67
S4	1,63
S5	1,65

The resin is an important ingredient in composites. There are two classes of resins which are thermoplastics and thermosets. The thermoplastic resin remains as solid at room temperature. It melts when heated. As it doesn't cure permanently, it is undesired for structural application. Contrariwise, the thermosetting resin will cure permanently at elevated temperatures. This property makes the thermoset resin composites very creditable for structural applications. The most common resins used in composite materials are unsaturated polyesters, epoxies and vinyl esters (Saleh, 2012). The unsaturated polyester amounts to about 75% of all polyester resins used in the world. Unsaturated polyester (UP) resins are used commonly in composites materials because of their good mechanical properties and low cost. It can also be filled, reinforced and pigmented. There are two main unsaturated polyester

resins used in composites: orthophthalic and isophthalic polyester resins. Orthophthalic polyester resin is a standard and economic resin which makes products with high rigidity and low heat resistance. Isophthalic polyester resin is the preferred matrix material for the manufacturing of the composite laminates in marine applications because of its superior water resistance (Ibrahim et al., 2012). The resistance against to temperature and mechanical properties of isophthalic polyester resin is more than orthophthalic polyester resins. The orthophthalic polyesters are environmentally sensitive and have limited mechanical properties (Saleh, 2012).

There are molding problems in unsaturated polyester (UP) resins applications which are poor surface appearance, warpage of molded parts, internal cracks and notable depression on the surface opposite thick sections. A surface finish is needed for outer body panel applications. The volumetric shrinkage of polyester resin can lead to surface defects such as wavy surfaces or fiber patterns. In order to compensate for high volumetric shrinkage (contraction) of polyester resin, the tensile additives are usually added to polyester resin system before cure. The tensile additives are usually thermoplastic-based additives such as polyvinyl acetate, poly methyl-methacrylate, plasticizers, polyurethane and polystyrene (Khoun et al., 2011). Plasticizers are used in facilitating flow and regulating flow mechanics. Plasticizers also give flexibility to polyester material.

Testing procedures

In sample preparation, GFRP samples were produced by hot-compression molding technique at 140°C, 150bar for 3min. The used glass fibers in samples have 13µm diameter and 12mm length. Samples were produced by Sami Tongün Glass Fiber Polyester Products, Kocaeli/Turkey for experimental studies. The samples were cut from the plate for wear tests. The abrasive wear properties of samples were carried out using DIN Abrasion Resistance Tester according to ASTM D5963. In abrasion tester, the sample was pushed down against to rotating drum with a certain force (5N) and the rotating drum was covered with an alumina sand paper (#60 grid) (Fig. 1). The diameter of drum was 150mm and rotated at 40rpm. The sliding distance was 40m in each wear test. Each sample was tested at least three times. The weight loss and wear rate values of samples were calculated according to test results. Hardness values of samples were measured with Zwick Barcol Tester. Before and after the tests, the samples were weighed with Precisa 125A precision balance (±0.0001g). After the test, the wear tracks were examined by Leica optical microscope to recognize the type of wear. Nanovea PS50 non contact laser profilometer was used to investigate surface topography of tested samples. 3D surface waviness of sample was determined with profilometer. All tests are carried out at a constant room temperature (20±2°C) and humidity (40±5%).

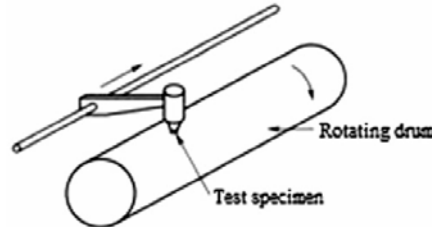


Figure 1. The schematic drawing of abrasive wear mechanism.

Results and Discussion

The weight of samples are measured before and after wear tests. The weight losses of samples are calculated. The wear rate values are calculated in the literature mostly for use in comparative studies. The weight loss of tested sample was converted to the wear rate using the density of sample.

The wear rate can be calculated by the following equation. (Almeida et al., 2009):

$$W = \frac{\Delta M}{\rho \cdot L \cdot F_N} \quad [1]$$

Here, “W” is wear rate (m³/N.m), “ΔM” is weight loss (g), “ρ” is density (g/m³), “L” is sliding distance (40m) and “F_N” is load (5N).

Figure 2 shows wear rate values of samples. When the abrasive wear behaviors of GFRP samples containing orthophthalic and isophthalic polyester resins are investigated, the wear resistance of the sample which contains orthophthalic polyester resin is higher than the sample which contains isophthalic polyester resin. Although orthophthalic polyester resins have limited mechanical properties, the wear resistance of it is high (Saleh, 2012).

When the abrasive wear behaviors of GFRP samples containing polystyrene, polyvinyl acetate and plasticizers are investigated, the wear resistance of the sample which contains polystyrene is higher than other samples which contain polyvinyl acetate and plasticizers. The use of polystyrene as tensile additive in GFRP composite materials improves wear resistance. Tribological performance of polymeric material can be improved significantly by the incorporation of additives. The polystyrene additives have a good interfacial action and can enhance the anti-wear behaviors of non-filled GFRP composite. The sample which contains polyvinyl acetate tensile additive was the most worn sample in tested samples.

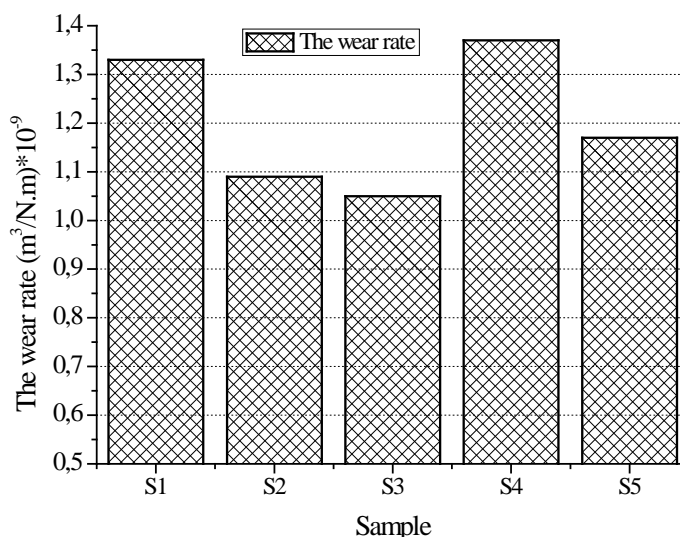


Figure 2. The wear rate values of samples.

The hardness values of samples are given in Table 3. In this table, it is seen that the sample with polystyrene tensile additive is the softest material in the tested samples.

Table 3: The hardness of samples.

Sample	Hardness (Barcol)
S1	85
S2	85
S3	70
S4	85
S5	85

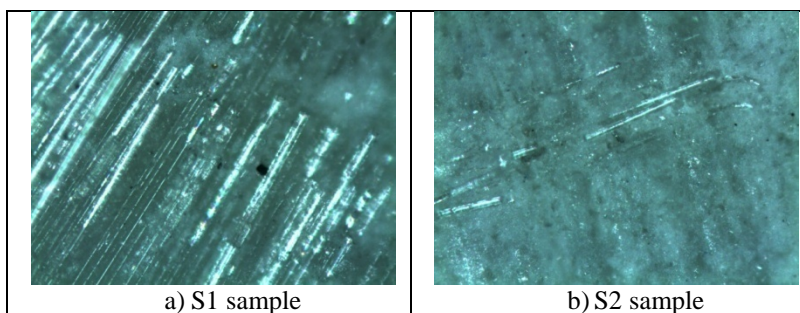


Figure 3. The wear surfaces of samples contained orthophthalic and isophthalic polyester resins (100x)
Fig.3 shows the wear surfaces of samples contained orthophthalic and isophthalic polyester resins. In Fig. 3.a, the deep wear tracks are showed in the more abraded S1 sample with isophthalic polyester resin. Fig.4 shows the wear surfaces of samples contained polystyrene, polyvinyl acetate and plasticizers tensile additive. In this figure, wear scars and craters were observed.

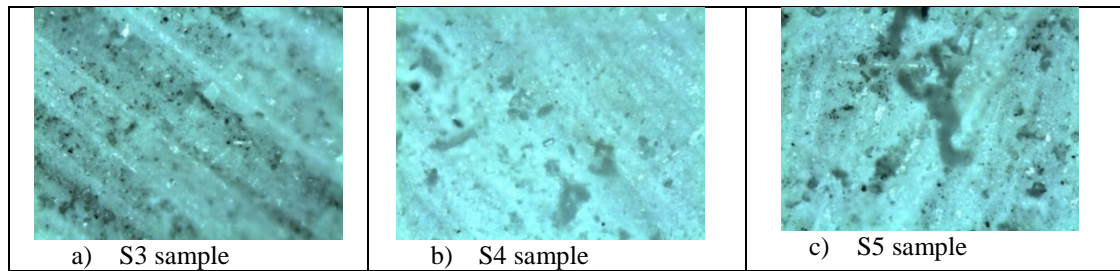


Figure 4. The wear surfaces of samples contained polystyrene, polyvinyl acetate and plasticizers (100x).

Fig.5 and 6 show 3D surface topography of S1 and S4 samples. The mean roughnesses were measured at wear surface ($3 \times 2 \text{ mm}^2$). The mean roughness of S1 sample was $S_a = 8,1 \text{ } \mu\text{m}$ and mean roughness of S4 sample was $S_a = 9,4 \text{ } \mu\text{m}$.

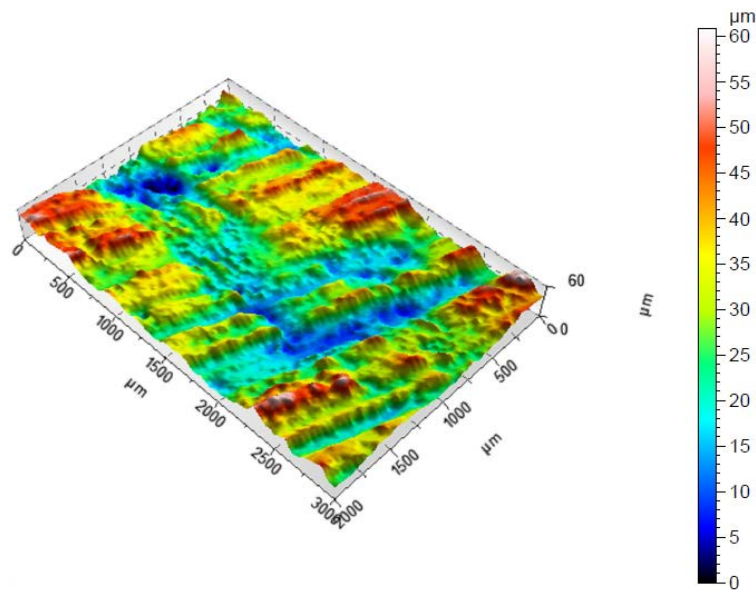


Figure 5. 3D surface topography of sample (S1) contained isophthalic polyester resin

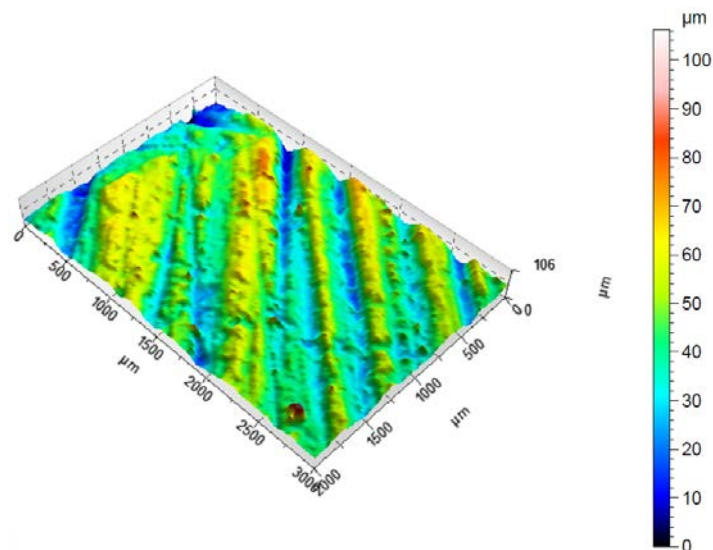


Figure 6. 3D surface topography of sample (S4) contained polyvinyl acetate tensile additive

Conclusion

The main conclusions drawn from the present work are summarized as follows;

- 1- The wear resistance of the sample which contains orthophthalic polyester resin is higher than the sample which contains isophthalic polyester resin.

- 2- The use of polystyrene as tensile additive in GFRP composite materials improves wear resistance.
- 3- The sample which contains polyvinyl acetate tensile additive was the most worn sample in tested samples.

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THE LOCAL BUSINESS ANALYSIS SERVICE USING BIG DATA IN SEOUL METROPOLITAN GOVERNMENT

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Abstract: The transition into a service-oriented government is the focal point of the Seoul Metropolitan Government(SMG) administrative transformation. This transformation must be conducted according to the specific needs of each local municipality.

SMG provides a customized service for individual citizens and support job creation by opening and sharing public information and offering the advanced service to help their local business which is called 'Golmoksangkwon Analysis Service'.

SMG expects to contribute to improving the competitiveness and self-sufficiency of the self-employed by converting the support of the beneficiary point of view of the self-employed into the support of the policy macro perspective by analyzing the factors affecting the business environment of the local business through the big data analysis.

Keywords: e-Government, service-oriented, big data, data analysis.

I. INTRODUCTION

E-government has achieved significant improvements through the deployment of many innovative applications. (Gronlund & Horan, 2005; Lee et al., 2005) Citizens use government web sites as central points of access to government information and services across different agencies via Internet or Mobile access.

Transformation of government processes, transactions, and policy making and implementation that are efficiently carried out through ICTs. Through ICT, new forms of collaboration and inter-organizational public service networks become feasible, making it possible to carry out the public sector's tasks more efficiently and effectively.

As a leading country of e-Government services, Korea's e-Government is transforming into citizen friendly services. In particular, Seoul Metropolitan Government(SMG) as a leader in Korea, tries to provide customized services for individual citizens and support job creation by opening and sharing public information and offer the advanced service to help their local business.

Governments of leading ICT countries have initiated big data application projects to enhance operational efficiency, transparency, citizen's well-being and engagement in public affairs, economic growth, and national security. (Kim et al., 2014) Also, governments expect big data to enhance their ability to serve their citizens and address major national challenges involving the economy, healthcare, job creation, natural disasters, and terrorism.

Among them, start-up and job creation are one of the major issues in SMG. SMG introduced a local business analysis service, which is call 'GolmokSangkwon Analysis Service', based on big data analysis as a way to support and expand it. With the development of the fourth industrial revolution, e-government is evolving service-based e-government using big data analysis.

SMG provides a customized service for individual citizens and support job creation by opening and sharing public information and offering the advanced service to help their local business with 'Golmoksangkwon Analysis Service'. SMG introduced a local business analysis service, which is based on big data as a way to support and expand it.

The objective of this service is to provide information service which is based on data analysis for local business. This service is to overcome the difficulties of the operation of the pre-founder and self-employed and to provide practical support for their business.

The Seoul Metropolitan Government has started 'Golmoksangkwon Analysis Service', which analyzes and provides local merchandise information based on big data for small and midsize businesses established in overcrowded local market.

In this paper, we discuss the 'Golmoksangkwon Analysis Service', which is a local business analysis service using big data analysis and service-oriented government with Seoul Metropolitan Government(SMG) case. Innovative service through ICT should contribute to change citizen's life, local community, and government. The big data

analytics on local business community and its benefits are discussed along with the impact on the effective e-government.

II. BACKGROUND

The emergence of e-commerce and Y2K¹ advanced e-government, as governments began to adopt the changes taking place in the private sector. E-government is defined in various ways. (Relyea & Hogue, 2004; Seifert & Relyea, 2004) Some definitions of e-government are limited as a unit of the government, while others are very broadly defined, with e-governance integrated throughout the government. World Bank defines e-government as “the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government.” (Jeong & Kim, 2003; Kushchu & Kuscu, 2003; Trimi, & Sheng, 2008) These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. (Gronlund & Horan, 2005; Reddick, 2005; Tian & Tianfield, 2003) The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and cost reductions.” (Definition of E-government, World Bank²)

E-government is a transformation of government processes, transactions, and policy making and implementation that are efficiently carried out through information and communication technologies to provide better and efficient services to the citizens while reducing waste and corruption and increasing accountability, transparency, and trust. Furthermore, it is about creating a one-to-one relationship with the government in which citizens are empowered to take part in the democratic process and policy making.

E-government is increasingly being implemented in all areas of government administration at both the local, regional and national levels, increasing efficiency and transparency and bringing convenience and safety to citizens' lives, and consequently improving the quality of life. (Mulgan, 2000; Northrup & Thorson, 2003) While it was initially promoted as a means of improving internal management efficiency in public administration, e-government is increasingly considered an important measure for enhancing citizen access to government services and expediting the delivery of services to citizens. (Morris & Moon, 2005) E-government is used to enhance citizens' access to government as much as government's access to citizens using current network technologies. (Heeks. & Bailur, 2007; Irani et al., 2006; Premkumar et al, 2006; Seifter & Chung, 2008)

A. *Service-oriented Government*

E-government has intrinsic unity of value with service-oriented government, implementing e-government, strengthening social management and public service is an inevitable requirement for building service-oriented government. The effects of e-government in the service-oriented government building manifested through the interaction between government and citizens, government and enterprises and institutions, and governments themselves. E-government can enhance the concept of government services, promote the transformation of government functions, and improve the efficiency of government operations.

Engaging citizens in public governance has not only an intrinsic value in terms of deepening democracy, but it can also be instrumental in enhancing governments' capacity to deliver quality education services, promote gender equality and empowerment in public administration and society at large, deliver health services which can help reduce child mortality, improve maternal health, as well as eradicate disease, and promote a sustainable environment.

Implementing effective service and engaging citizens to take a more active role in development and in decisions that affect their lives poses.

The Korean government places citizens at the heart of all public services. It provides individual citizens with public services customized to their characteristics and life cycles. The Korean government also uses new information technology to realize whole new administrative services in the fields of life, disaster management, environment, and security.

In terms of the integrated provision of customized services, each government agency selects priority policies and services that are most requested by citizens and provides customized services. The government classifies its

¹ The total cost of Y2K was “revised to \$1 trillion or more. Reuters reported Jeffery Boonmee, founder and president of Bicom Link, as saying Y2K is now a \$3 trillion global industry, and that in the United States alone, the market for Y2K solutions is worth about \$800 billion.” (The True Cost of Y2K, Smart Computing, August 1999, Vol.7, Issue 8)

² <http://go.worldbank.org/M1JHE0Z280>, May 2012

services by type of beneficiaries including childbirth, upbringing, the disabled and the elderly, and provides customized services.

To enhance one-stop services for businesses, Korean government will establish an integrated system for small-medium size enterprise support (SME) and manage track records of SME support projects of central and local governments in a systematic manner. Local governments will establish the one-stop permit processing system for businesses and simplify approval processes for start-ups and businesses.

To improving access to services for the information poor, Korean government will improve the service delivery system and accessibility for vulnerable groups to minimize blind spots in public services. Text-to-speech conversion of civil petitions, improving web accessibility of the disabled, providing ICT aids.

The government will also take advantage of the nationwide coverage of postmen networks, thereby enhancing civil affair and welfare services for vulnerable groups in rural areas, such as elderly living alone.

To improve citizen's well-being, engagement in public affairs, economic growth, they are addressed to healthcare, job creation, nature disaster, and so on.

In this paper, we introduce the local business analysis service to support citizen's job creation and business management using big data analysis and provide a service to overcome the difficulties of the operation of local business's owners.

B. Big Data Analysis in e-Government

The global spread of the internet and the application of ICTs in government, as well as greater investments in telecommunication infrastructure coupled with capacity-building in human capital can provide formidable opportunities to transform public administration into an instrument of development at the service of its citizens. ICT is a powerful tool for social and economic development. It promotes people's empowerment, participation, access to information, education and networking possibilities for all social groups, particularly older persons, young people, persons with disabilities and indigenous peoples. ICT applications are introduced to upgrade service delivery, including in terms of their greater effectiveness, efficiency, timeliness and quality, for wider access to services, and a more "citizen-centered" approach to services.

It is clear from this statement that ICT in government is a tool, an enabler and not an end in itself. there is a widespread consensus that ICT alone cannot effect change. In order to produce "public value" we must approach the issue of technology from a holistic perspective where changes in one area need to be accompanied by changes in other areas of government operations. Most importantly, there is a strong need to promote among public officials a service-oriented mentality as it exists in the private sector, i.e. to build or upgrade human resources capacity in this particular area. This cannot be achieved if there is not first an attempt to modify the organizational culture of the public sector to embrace change and to become service oriented, cost effective and vigilant about performance and results.

Big Data (Agnihotri & Sharma, 2015) refers to data sets that are so large and complex that traditional data processing tools and technologies cannot cope with. The process of examining such data to uncover hidden patterns in them is referred to as Big Data Analytics. Data is growing at a high speed and its analysis with various mining techniques giving rise to the valuable results in term of best perception for the future. (Bertot & Choi, 2013) This paper focuses on the impact of big data analysis for the E-governance. Getting insight to the results of the predictive analysis can give huge benefits to the E-governance.

(Agnihotri & Sharma, 2015) discussed asserts that the public sector doesn't getting that much information from big data as compared to other sectors as public sector doesn't keep track of the analytics of big data compared to others. Irrespective from the amount of data available government can provide better services with the analytics of the data to the citizens this is the thinking of everyone. (Chen et al., 2012) discussed the following areas where web analysis has started and their causes for future and further references are discussed. These areas are campaign advertising, voter-mobilization, policy discussion, donations, and many more other areas. Interesting fact is that most of the work in such fields are done by the government itself and remaining contribution is given by the academicians. Big data is in fact playing a major role for the future actions and for providing best of the services.

There are four main principles that should guide innovation efforts in service delivery as follows:

- Quality - High quality service delivery may be manifested in – but is not limited to - the availability of government services at times and in ways that are more convenient to the public, speedy processing of applications or claims, reduction in the amount of paperwork and other activities citizens must perform in order to demonstrate compliance of clearly written government regulations.

- Access - such as the expansion of the coverage or enhancement of quality service delivery to vulnerable groups is critical to inclusive social development.
- Cost-effectiveness –Utilizing the most economic models for delivering quality services to the citizens and ensuring effective delivery is essential, particularly in times of financial crisis.
- Citizen-centric – Utilizing mechanisms that have proven to collect feed-back from citizens and that succeed in engaging them in the delivery of services.

Progress in increasing the quality, access, cost-effectiveness and responsiveness of public services has been uneven across the globe. While some countries have been able to successfully reform their public service delivery systems and institutions to meet today's challenges, others have not been able to do so despite several efforts.

In this paper the big data analytics on local business community and its benefits are discussed along with the impact on the effective e-government.

III. THE LOCAL BUSINESS ANALYSIS SERVICE USING BIG DATA IN SMG

One of the main issue of SMG is 'Job creation' with local businesses. The objective is to provide information related to the trade through the big data-based local business analysis service provided by SMG, to overcome the difficulties of the operation of the pre-founder and self-employed and to provide practical help.

To accomplish these goals, SMG started a service to help small businesses in local area in the city. Local business area, which is called 'Golmoksangkwon', is a range of commercial forces formed along narrow roads near residential areas, not on the street. SMG is defined local business area as follows.

- Scope that does not include large distribution facilities.
- A place where housing is concentrated.
- A four-lane highway back street
- Execute wholesale and retail business, restaurant business, and service business.
- Over 50 wholesale and retail, service and service areas.

The Korean government removes barriers among government agencies to strengthen sharing and interconnection of information, maximizes work efficiency through digital collaborations, and upgrades the quality of public administration and citizens' lives using big data.

The Korean government makes better use of various forms of big data in public administration, thereby developing scientific, proactive policies and providing customized services. It establish a government-wide support systems for predictive data analysis and advance identification of changes and risk factors.

Korean Government is enhancing the private sector's use of public data, they develop a government-wide public data disclosure roadmap and disclose 12,000(60%) out of 21,000 types of public data by 2017. In particular, it will select promising businesses in 15 strategic fields that face strong demands from the private sector, such as transportation, patent, and employment/labor, and help commercialize their business to create jobs.

As a leading country of e-Government services, Korea's e-Government is transforming into citizen friendly and service-oriented services. In particular, SMG tries to provide customized services for individual citizens and support job creation by opening and sharing public information and offer the advanced service to help their local business.

SMG has analyzed the credit card sales and rental quotes for small business owners who want to start business and started 'Golmoksangkwon Analysis Service' which summarized by region. SMG has decided to set the SMG-based local as a business area, including the locals that do not have large-scale distribution facilities, and analyzing the merchandise based on the card usage data and sales consumption data for the life insurance businesses such as Chinese restaurants and convenience stores

On the website, you can see 'Commercial Traffic Light', which shows business risks based on the commercial growth rate and the average closing time of the business. Also, information on the number of stores, average sales, and floating population of the locals in the local can also be retrieved. Furthermore, Even if it does not correspond to 8 areas of local business area, if you set the area you want, you can get the report of the trend of the floating area by the day of week, the time zone.

According to the SMG's analysis of licensing data for lifestyle-related industries in 2016, the survival rate of shops opened 10 years ago was 2.8% lower than that of 21% for locals. However, the average sales period was 8.9 years for local commercials, slightly longer than 8.3 years for development commercials.

A. *Service construction background*

This service needs to solve the difficulties of the market and secure the stable operation and activation of the commercial market for the self-employed who are suffering from intensified market competition and competition with large retailers. To do this, we provided detailed information about the commercial area to help the business.

1. Self-employed market with dense saturation

- There is a growing trend for the number of self-employed businesses, including retired baby boomer generations and young people who are facing job hunting, and competition is fierce.
- Protect and nurture the existing self-employed and provide reasonable information on the status of the business to entrepreneurs.

2. Need to stabilize and activate commercial sector

- Due to the high concentration of similar businesses in the market, due to the nature of low street barriers, short-term closure and conversion rates are high. Therefore, it is necessary to respond appropriately to market changes and reduce uncertainty to improve profitability.
- By analyzing the big data, we anticipate the change of the alley merchandise, thereby creating not only the needs of the customers but also the effective demand to activate the market.

3. Production and provision of relevant information relevant to the local business area

- Consumer behavior changes continuously as economic and social environment changes and market structure changes cause uncertainties.
- It is necessary to produce and provide relevant information on the supply of commerce, competitive structure, and changes in consumer trends.

B. *Application data*

An analysis was conducted to provide information on the alley merchandising units by using 200 billion big data per year. The analytical data set provided analysis and information by supplying 32 kinds of data sets to provide business information.

- The company received 200 billion won annually through alliances with public and private institutions such as shopping malls, stores, consumption patterns, and floating population to build big data related to the trade.
- Based on commercial data, we developed information that can identify business entities such as start-up risk indicators, industry-related indicators, and sales trends.

C. *'Golmoksangkwon' Analysis Service*

Our local business analysis service is to select 43 non-living jobs that self-employed people are most active in, based on the big data related to the trade, which SMG owns or is secured in cooperation with external organizations. This service is as follows.

- Citizens' service provides analysis of the local business area based on big data for small business owners who want to start business or industry change, and implements it on the map, and provides information on new business start-up risk and regional business area analysis by clicking on the area.
- Expert service is a service that helps pre-founders and existing self-employed to effectively consult about business changes, profitability, stability, growth potential, etc.
- The policy utilization service supports the start-up department of SMG and the autonomous regions to monitor the impact of the policy support on the business environment of the local business area, thereby shifting the support to self-employed from policy perspective to macro and macro level. It is also used in the process of establishment and enforcement.

Based on this data, 43 large-sized businesses that are self-employed are selected by the Seoul Metropolitan Government and are provided with a variety of information by sector, based on this data.

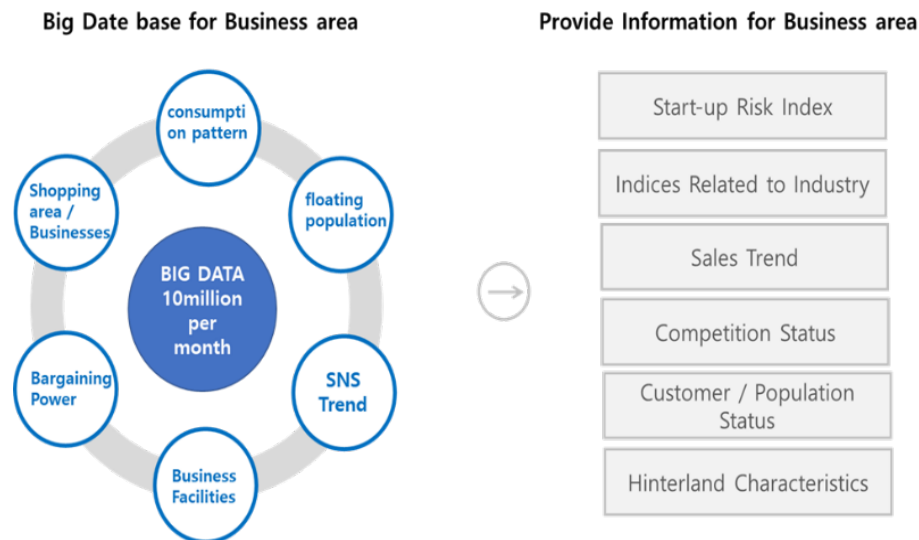


Figure 1. Local Business('Golmoksangkwon') Analysis³

We provide statistical information on self-employment and analytical functions that can analyze the indicators related to business start-ups in the business areas such as commercial traffic signal.

We provide functions to search customized business type, area, and business conditions and search for your business reports. In addition, you can search by simple information on the map, or search quickly by region or business name. If you designate your own store location and industry as a service for existing self-employed users, and you want to freely draw up the merchandise you want to analyze, you can use marketing reports to provide information on the types of customers and consumption characteristics. We will help you select your customers. Trendy themes Search by business category theme by region and compare business indexes, compare key indexes among business areas, and view business reports of each business area.

Local business analysis service provides three things. Commercial traffic light service for pre-founders, customized commercial search service, and mall marketing service for existing self-employed.

The commercial traffic light service is a service that allows you to check the new business start-up risk level in four steps based on the quarterly business data, so that you can check the start-up risk level, closure rate, and average closing time.

The customized business search service allows you to customize the search for specific trade reports such as the number of stores in the locals of interest, the average sales per store, the daily average floating population, the start-up survival rate, and the over-crowding index among 1008 locals.

My-store marketing service can analyze the trend of the floating population by sex, age, day and time, and the number of major hospitality facilities and the number of apartment units in the area if the desired business area is set on the map, even if it is not included in 1008 business areas. It makes you. It also provides a mailing service for analysis reports so that you can regularly check changes in the trade.

D. Local Business Support Structure

In SMG, we are monitoring potential merchants and alleged self-employed businessmen, as well as information related to the trade.

Commercial entrepreneurs that are established by ordinary people tend to start up in local business areas based on residential areas. Also, in the case of a business area, citizens who do not have experience in starting a business are in a difficult situation to know the area where a business area is formed.

More than 200 professional consultants from the Seoul Metropolitan Small Business Management Support Center are using them to support self-employment and start-up consulting through expert local trade analysis services.

The Seoul Metropolitan Government is analyzing the difficulties of self-employed people in the local area through Big Data and making efforts to reflect them in the policy to provide practical help.

³ Our Village Store Business Analysis Service, Seoul Metropolitan Government, 2017.

To help professional consultants conduct comprehensive and scientific consulting such as business transformation, sales growth, marketing, etc., in consideration of changes in the self-employment environment through analysis of big data.



Figure 2. Local Business Support Structure

IV. CONCLUDING REMARKS

The role of ICTs has dramatically changed over the past decade. Governments are attempting to revitalize their public administration, make it more proactive, more efficient, more accountable, more service-oriented and closer to the people. To accomplish this transformation, governments are introducing innovations in their organizational structure, practices, capacities, and how they mobilize, deploy and utilize the human, material, information, technological and financial resources for service delivery to remote, disadvantaged and challenged people.

The Seoul Metropolitan Government has started 'Golmoksangkwon Analysis Service', which analyzes and provides local merchandise information based on Big Data for small and midsize businesses established in overcrowded local market.

Anyone can use this service free of charge through the homepage of SMG. You can freely use menus such as trade statistics, customized commercial search, and mall marketing by accessing 'Golmoksangkwon Analysis Service' without joining a separate member.

This service provides preliminary founders with information on risk and overexposure index of five new traffic lights and various business analysis information to help rational and prudent investment, It is expected to provide an opportunity to increase sales.

Unlike the service of other institutions or private sector, the analysis service of street commerce in SMG provides risk information for start-up. As a result, it is expected that the existing self-employed will be provided with opportunities to improve the business environment and increase sales, and to induce reasonable investment decisions for prospective start-ups.

The results and implications of the analysis are provided through the analysis of our village business analysis service to provide information on the sales patterns of each business type, helped.

The Seoul Metropolitan Government expects to contribute to improving the competitiveness and self-sufficiency of the self-employed by converting the support of the beneficiary point of view of the self-employed into the support of the policy macro perspective by analyzing the factors affecting the business environment of the local business through the big data analysis.

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The Meaning of Chemistry for Tomorrow I

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Abstract. Universal transformation producing serious encounters connecting to energy sources as weather change, intervention is essential and crucial. The Royal Society of Chemistry has identified that the chemical sciences could present rapidly technological and maintainable resolutions. This big organization is in the efficient location to find resolutions to the difficulties by making in corporation with countries, informal organizations, at the manufacturing sectors. We believe that international active networks of this organization could be instrumental in implementing of the possible chemical solutions.

Keywords: chemistry, global world, ecological problem, energy sources

Introduction

The environmental difficulties turned out by life activity as weather change and food problems are some serious deterioration. "It is estimated that more than one billion people now live in poverty without enough food, water or adequate sanitation and healthcare provision" in many countries, especially in Africa (Prest, 2009; The world bank, 2008). Environmental change is creating serious encounters for people from all over the world. By 2040 the world's population is estimated to have increased by 1.9 billion, with most of the publics staying in cities (United Nations, 2014). According to this report, environmental energy necessities would stay to rise. It is noted in this report that the developed countries of Asia and Latin America are undergoing very fast economic development which is transporting contemporary humanity's environmental difficulties (Prest, 2009).

The chemical sciences, according to our approach, can play a clear and an efficient role in following maintainable progress and in presenting technological resolutions to the encounter's humanity. The technologies which the chemical sciences create would advance the value of life for a livable environment or for a health world (Prest, 2009; RSC, 2009).

Generating a livable atmosphere

Developments in the chemical sciences is essential to offer the technological explanations required by humanity and administrations, to answer the environmental encounters in energy, food, health, water in the totally of the world. Accomplishing of the situation does not hinge only on main investigation and technological developments in the sectors deliberated in the paper. That needs evolving a helpful environmental area (Prest, 2009; European Communities, 2004).

The helpful environment needs the source of a suitably various scientific labor force, advancing in investigation and supervisory context which keeps humanity. We believe that it wants assignation with main shareholders, extending from manufacturers, researchers to administrations and big informal corporation and organizations. There is also a necessity to advance in modernization. The transformation of scientific discoveries into practical application and new progresses will be a real and powerful solutions. Society and company's necessity to be obviously conscious of the matters and (Prest, 2009; International Energy Agency, 2006).

The issues in this paper are based on activities of some important society as the RSC aggregated from an environmental perspective. These subjects are as below;

- Trust
- Education
- Innovation

Trust

A developed environment needs attractive with main shareholders and with the community to confirm the effective overview of last and evolving technologies (Prest, 2009). According to Prest, that is a multifaceted procedure which frequently needs a continued study for a long way. Also, this rest on real shareholder interchange on the

prices, profits and dangers to customers and the situation of the technology connected the subject. Moreover, he pointed out that observations of danger change extensively in the world of the chemicals area.

According to us, the people is not much information about the effect of the chemical sciences to the humanity. The profits of the chemical sciences to vital productions are ineffectively connected. To develop at the science and technology, it is essential to make an interchange between shareholders. It should be a simple accepting of the profits of modern technologies to construct confidence between all shareholders (Prest, 2009; www.energysavingtrust.org.uk, last available at 21.06.2018).

Serious sustenance and protection subjects comprise the topics related with biological corruption and the communal reason of healthiness difficulties for clients (figure 1). It could be turned out by reduced heath at any phase of the sustenance sequence. (British Wind Energy Association, 2008).

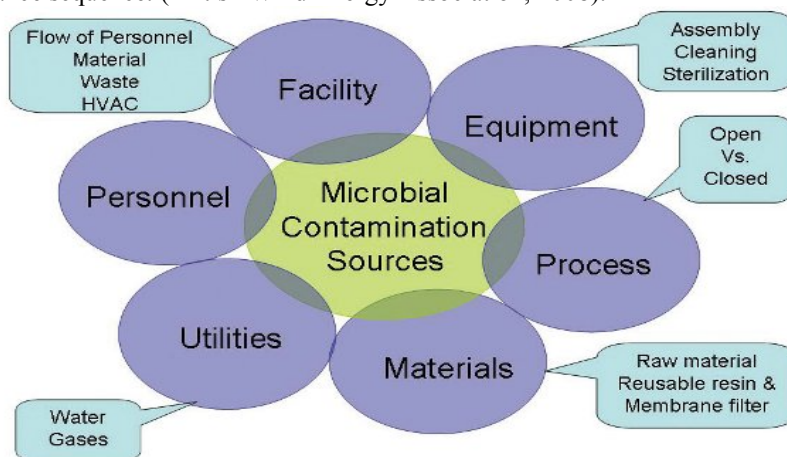


Figure 1. Case Studies of Microbial Contamination from BWEA
(<https://media.americanpharmaceuticalreview.com/m/28/article/36755-fig1.jpg>)

Education

A satisfactory source of qualified researchers would be essential to confirm the continuing feasibility (Prest, 2009). Many countries in the world has adopted the essential position of growing the statistics of the searcher in science, technology, engineering and mathematics (STEM) focusses (Prest, 2009; Teitelbaum, 2007). According to Prest and Teitelbaum, the source of STEM cause on all parts of investigation and advance.

We believe that long-term applications essential to be completed in the parts of teaching, skills to manage the environmental encounters fronting humanity. All stages of instruction have an important action to show in generating a helpful environment and so, a comfortable life all over the world. Teitelbaum also noted that basic education's action is to body the base for teaching and learning, to increase students' attention in the sciences and to inspire attention in the study of the chemical sciences coming from science and technology. The instructors must be educated in the topic and should be reinforced in a college with contemporary services (Prest, 2009).

According to Prest (2009), investigation in science education present strong strategies for the types of program constructions and education methods which could reach the goals. He noted that investigation has exposed constantly the key issues are the real program method with the study of teachers.

Innovation

We believe that developing the chemical manufacturing would aid to the aim of accomplishing a stability for sharing among shareholders in the higher technology areas of innovation. Manufacturing's dedication to improved clarity would aid in the procedure (Prest, 2009). Moreover, it would want sustained community sustenance by connected institutes, projects and big companies' effort.

Technological improvement needed requires investment in investigation for invention. European invention presentation has been weak likened to conflicting sections in all over the countries (HM Treasury, 2004). Some countries in Europe have made first to report by founding a Technology Tactic Boarding in 2004 and by founding the Knowledge Transfer Networks (KTNs). KTN has delivered a central area for enriched invention in businesses of the nations, growing the capacity to change information and knowledge to modern technologies and yields (figure 2).



Figure 2. Nouryon launches chemistry innovation challenge

(<https://www.miningmagazine.com/w-images/ea8cdf9d-19ef-435e-ab40-61d11fc87a2a/3/Nouyonchemicals-1680x600.jpg>)

Result

Environmental encounters has the meaning that progressing vital scientific information, motivating quality in chemical science investigation and exploiting the amount of next innovations. It would need a multidisciplinary method which would construct connections among chemistry's sub-sections, and with some disciplines and manufacturing.

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The Meaning of Chemistry for Tomorrow II

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Abstract. Intervention is required and crucial when universal change producing serious challenges connecting to energy sources as health and climate change. The Royal Society of Chemistry is in the efficient situation to find solutions to the world's difficulties by doing in corporation with countries, professional frames, informal establishments, academics and manufacturing sectors. Focusing universal challenges needs an interdisciplinary approach and the Royal Society of Chemistry must figure connections between chemistry's disciplines, and with other scientific areas. We believe that international active networks of this organization could be instrumental in implementing of the possible chemical solutions.

Keywords: chemistry, global world, ecological problem, energy sources, appreciation, regulatory

Introduction

The chemical sciences provide us with food, water, energy, transportation and many more positive effects to our life, serving us in protecting the resources and caring the natural environment (Prest, 2009). The environmental difficulties produced by human action, for example food problems, are some serious deterioration. We believe that extenuation of the encounters would go on adopting maintainable expansion.

Universal change is producing serious encounters for people from all over the world. By 2040 the world's population is anticipated to have improved by 1.9 billion, that most of the people existing in metropolises (United Nations, 2014). According to this report, universal energy necessities would stay to rise and would the effect on the world's natural resources to offer the quickly increasing population with sufficient food and water. It is noted in this report that the developed nations of Asia and Latin America are fast economic development which is getting contemporary culture's environmental difficulties, with air and water pollution to widespread parts of the global world (Prest, 2009; RSC, 2009).

Creating a livable environment

Developments in the chemical sciences is essential to offer the technological explanations required by humanity and governments, to answer the universal challenges in energy, water in the totally of the world. Realizing that does not hinge on only on key investigation and technological developments in the parts discussed in this paper. It needs evolving a supportive environment (Prest, 2009; European Communities, 2004).

Progresses are turned out by the chemical sciences would be important to next developments in environmentally caring and maintainable energy creation. The progress will be critical improved food creation with lower petition. These progresses will be effective progressive problems deterrence rehabilitations founded on manipulation of the human genome. The development will have useful scheming procedures and foods which reserve funds. Finally, the progress would be formative the capability of fresh available drinking water (Prest, 2009). Also, promotions in chemistry would be required to advance practical supplies to make the constructions, to design lightweight cars and so, reduce greenhouse gas emissions for green world (figure 1).

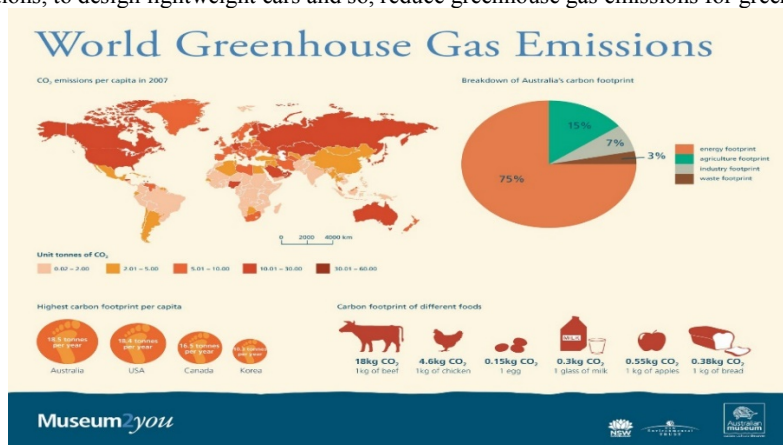


Figure 1. Greenhouse gases act like a blanket for the earth.

(<https://australianmuseum.net.au/learn/teachers/learning/sustainability/greenhouse-gas-a-hot-topic/>)

Translation of scientific discoveries to practical application and new advances will be a real and powerful solutions. Society and companies essential to be aware of the subjects and, in searching of to accomplish the target (Prest, 2009; International Energy Agency, 2006).

The issues in this paper are based on activities of some important society as the RSC aggregated from a global perspective. These subjects are as below;

- Opportunities

- Appreciation of the chemical sciences
- Regulators

Opportunities

Teitelbaum (2007) and Prest (2009) pointed out that the abrasion of females from chemistry is mostly not good in evaluation to STEM (science – technology – education – mathematics) topics and it is vital to have a situation which cares the occupation ambitions of men and women in academic world and in manufacturing sector. Several businesses have recognized enlightening the staff variety as a method of editing a special document archive. Especially, improving the principles to interest women to do the extended occupations in investigation is vital for the chemical sciences (Prest, 2009) (figure 2).



Figure 2. To support female academics, data and accountability are required.
(<https://www.sciencemag.org/careers/2016/08/>).

Appreciation of the chemical sciences

Chemistry sciences have a vital character in the college programs by presenting coming researchers and evolving an upcoming culture. The secondary education is recognized to be serious and training should emphasis on what is available at this period. Researchers has proved that the method makes a rise in demand for students to learn chemistry. It provides a powerful base for allowing everybody to understand the effect of chemistry in the method it could motivate in getting culture (Prest, 2009; Boole, 2008).

Boole pointed out that the prior interferences take place the better. According to him, early impersonations of science would get by children more time. Moreover, it is vital that the initial messages are strengthened through student's instruction with involvement programs (Prest, 2009; HM Treasury, 2004). We think that to create a supportive environment all over the world, it is vital to present long-term act to stimulate an attention in learning chemistry and occupations in science sector (figure 3).



Figure 3. Stimulate an interest in studying chemistry
(<https://www.chem.uci.edu/undergrad>)

Regulators

To generate a helpful atmosphere for modernization and to encounter the difficulties facing humanity it is essential to display advances in EU area, Health and Safety (EH&S) context and connected regulations. An active method requirement to be presented in notifying policy manufacturers so that chemicals regulation is logically practicable and maintainable (Prest, 2009). Moreover, a different range is green supply, where related establishments consider exterior perspective way along with the finding standard of type and excellence. We agree with the idea that procedures necessitating an amount of community gaining to be green can turn out to be a huge demand for maintainable crops (European Communities, 2004; Prest, 2009). Shortly, generating environmentally maintainable energy materials, and developing efficacy of power generation and operate are the basics of targeted points to tomorrow's life (figure 4).



Figure 4. Creating and securing environmentally sustainable energy supplies.
(<https://www.slideshare.net/georgedumitrache399/>)

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THE RAPHIGNATHOID MITES (ACARI: TROMBIDIFORMES) FROM KEMAH, ERZİNCAN (TURKEY)

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Introduction: The Raphignathoidea is a superfamily belonging to the mite superorder Acariformes, order Prostigmata. It contains many predators of small invertebrates, while some are herbivores and others parasites. Small and soft bodied these mites are one of the oldest groups of the world and have a wide distribution in the world. They commonly live in soil, litter, grassy soil, moss, lichen, tree bark, tree cavity, house dust and stored products. In the present work, six mite species of the superfamily Raphignathoidea have been found from Kemah where is a district, located 50 km southwest of Erzincan, on the left bank of river Euphrates. With this study, we aimed to contribute to the knowledge on Raphignathoid mite existence in Turkey.

Material and Methods: Mite specimens were collected in litter under *Populus* sp., *Quercus* sp., *Prunus* sp. and *Juglans* sp. from Kemah, Erzincan. The mite specimens were extracted by using Berlese-Tullgren funnels, cleared in 60% lactic acid and mounted on microscopic slides in Hoyer's medium. The specimens were examined by using a Leica DM 4000B phase-contrast microscope. The short descriptions and the distributions of all species were given.

Results: A total of six raphignathoid species, four of them from the family Stigmaeidae Oudemans, *Eustigmaeus segnis* (Koch), *E. anauniensis* (Canestrini), *Ledermuelleriopsis ayyildizi* Doğan, *Stigmaeus erzincanus* Doğan, Bingül, Dilkaraoğlu & Fan; two species from the family Caligonellidae Grandjean, *Neognathus terrestris* (Summers & Schlinger) and *Caligonella humilis* (Koch) are found from Kemah. All the species already known from Turkey are newly recorded from Kemah.

Keywords: Raphignathoidea, mite, distribution, Kemah, Turkey.

THE RESEARCH OF SOCIO-ECONOMIC DEVELOPMENT IN THE EUROPEAN UNION COUNTRIES WITH AN APPLICATION OF THE MODIFIED HDI INDICATOR

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Abstract: The aim of this paper will be the presentation of an alternative, a deeper one compared to the popular measure of the standard of living, which is HDI, a measure of the socio-economic development of residents of the European Union. In this article the synthetic index of the socio-economic development of the European Union countries will be presented. It will be calculated through the use of the following determinants: 'Economy and Finance', 'Science and Technology', 'Health', 'Education' and 'Living Condition'. This index of the socio-economic development of residents of the European Union countries will be created as an arithmetic mean of indicators counted for particular determinants. The index, which will be created, is treated as a modified Human Development Index due to the fact that it will be completed with the added information.

Keywords: *Socio-economic development, the European Union countries, HDI index, synthetic index, development index*

Introduction

When we inquire about the prosperity of a nation or a region of the world and about the quality of life of its inhabitants the problem still arises: How do we determine this? What information do we require? Which criteria are truly relevant to human 'thriving'? Most social scientists and economists would agree that GNP per capita is a crude and incomplete measure of quality of life. (Nussbaum, Sen 1993, Szirmai 2015). What in this case is important about human quality of life? The problem is actually more complex. It is not only the money people do or do not have, it is about how they are able to conduct their lives and what factors influence it.

The Human Development Index (HDI) was created by M. ul Haq in 1990 with the help and advice of A. K. Sen, who established the first assumptions of comprehensive measurement of socio-economic development (Anand, Sen 1994). The index operationalized the broad concept of human development by combining health, education and income into a composite index (Aguña, Kovacevic 2010). The indicator itself was systematically improved. The most significant change was made in 2010 and was a reflection of several assumptions made by M. ul Haq, inter alia: possibility of measuring the basic concept of human development to expand humans' choices; including only a limited number of variables (to keep it simply and manageable); to be constructed rather than using plethora of separate indices; covering both social and economic choices; with the use of quite flexible methodology and resistance to missing data (ul Haq 2003). HDI is a synthetic measure based on the average of indicators covering three basic spheres of life:

1. The sphere of health, which is assessed by the ratio of the average life expectancy.
2. The sphere of education, which is assessed on the basis of the rate of educational attainment, as measured by two indicators of educational designated for the adult population, ie.: literacy (the share of people who could read and write with understanding) and schooling (the average time of education, understood as the average number years of schooling).
3. The sphere of income, which is assessed on the basis of GNP (US \$) per capita, calculated according to purchasing power parity (PPP \$).

On this basis, the geometric mean of the indicators is calculated and, in result, the HDI ranks countries on a scale from 0 (the lowest level of human development) to 1 (the highest level).

The necessity of finding a new measurement of the quality of life of societies is emphasized by international organizations and especially scientists. That is why the author decided to modify the standard measure. Nowadays important factors are also science and technology and the standard of human living.

That is why, in this paper the following determinants of socio-economic development will be used:

1. Economy and Finance
2. Science and Technology
3. Health
4. Education
5. Living Conditions

Materials and Methods

The construction of the synthetic measure of development requires the division of diagnostic variables set to stimulants and destimulants. Variables included in the set of stimulants have been marked with the sign (+), while the (-) granted destimulants. The transformation of destimulants to stimulants was made according to the following formula:

$$x_{ij}^{\{S\}} = \max_i x_{ij}^{\{D\}} - x_{ij}^{\{D\}} \quad (1)$$

where:

x_{ij} – value of the j-th variable for the i-th country,

S symbol indicates stimulant, while the symbol D destimulant.

Then, after the transformation of destimulants to stimulants, the normalization of variables was used according to the following formula:

$$u_{ij} = \frac{x_{ij}}{\max_i \{x_{ij}\}} \quad (i = 1, \dots, n; j = 1, \dots, m) \quad (2)$$

where:

u_{ij} – normalized value of the j-th variable for the i-th country,

n – number of countries,

m – number of variables.

Synthetic measure of the socio-economic development was calculated by the following formula:

$$u_i = \frac{1}{r} \sum_{q=1}^r u_{iq}, \quad (i = 1, \dots, n; q = 1, \dots, r) \quad (3)$$

where:

u_{iq} – synthetic variable value for the i-th country calculated on the basis of the variables belonging to the q-th determinant,

r – number of determinants.

In contrast, measures of socio-economic development according to separate determinants was calculated using the following formula (Zeliaś 2004):

$$u_{iq} = \frac{1}{m} \sum_{j=1}^m u_{ij}, \quad (i = 1, \dots, n; j = 1, \dots, m) \quad (4)$$

A detailed list of indicators used for the construction of indicators for individual determinants of socio-economic development has been given below. Indicators have been selected based on the availability of Eurostat data.

I. Economy and Finance

1. Unemployment rate (-)
2. GDP per capita 1 (+)
3. Indicator of real expenditure per 1 inhabitant (+)
4. The number of poor people per 1000 inhabitants (-)

II. Science and Technology

1. Gross domestic expenditure on R&D (% of total expenses) (+)
2. Human resources in science and technology (% of the active population) (+)
3. The number of patent applications submitted to the European Patent Office per million inhabitants (+)
4. The number of researchers per 1000 inhabitants (+)

III. Health

1. Self-perceived long-standing limitations in usual activities due to health problem (-)
2. Self-reported unmet needs for medical care due to being too expensive (-)
3. Healthy life years (+)
4. Number of doctors per 1000 inhabitants (+)
5. Number of beds in hospitals per 100 000 inhabitants (+)

IV. Education

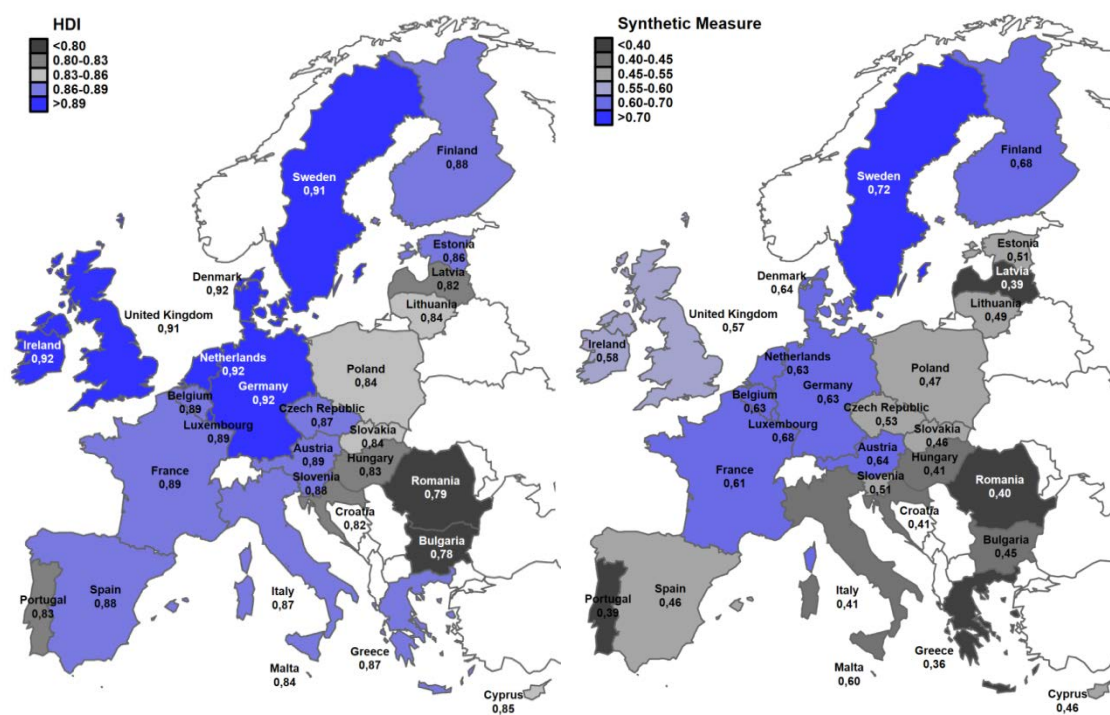
1. Participation rate in education and training (persons aged 25 to 64 years old) (+)
2. The percentage of people with at most lower secondary education and with no further education at the age of 18-24 years old (-)
3. The percentage of people obtaining a higher education between the age of 20 and 24 years old (+)
4. The percentage of people gaining or with higher education aged 15 to 64 (+)
5. The percentage of people with secondary education between the age of 15 to 64 (+)

V. Living Conditions

1. The percentage of people who are unable to meet unexpected financial expenses (-)
2. The percentage of people who are not able/unable to make 'ends meet' (-)
3. The rate of people at risk of poverty (-)
4. Share of people living in under-occupied dwellings (+)

Results and Discussion

The proposed construction of a synthetic measure of socio-economic development is based on five pillars. On the basis of the values of synthetic measures for each determinant of socio-economic development, the final synthetic measure was calculated (table 1 and figure 2). According to the low correlation between variables, the synthetic index was calculated on the basis of all of the analyzed indicators. On the 1. graph the values of HDI index for EU countries are presented. The distribution of HDI values in the EU countries is not very diverse (figure 1), if it is assumed that - hypothetically, this indicator may have values from 0 to 1. In addition, it is a substantive conclusion - HDI is characterized by very low sensitivity for changes in conditions life. Partial indicators included in the HDI: GDP, life expectancy and indicators related to the level of education show high stability over time. Therefore, HDI values, for example, the financial crisis of 2008, which afflicted a country such as Greece, Spain or Ireland, hardly shows, while living standards in the dynamically developing countries of the "new" Union are relatively low (Poland, the Czech Republic, Hungary, etc.).



1 figure. Values for HDI measure
(Source: author's calculations)

2 figure. Values for 'Synthetic measure'
(Source: author's calculations)

Ranking of the EU countries according to the modified synthetic indicator of the socio-economic development was presented in the table 1. It can be seen that the highest values obtained Scandinavian countries – Sweden, Finland and then Luxembourg. The lowest values Portugal, Latvia and Greece, where the highest impact of financial crisis was observed.

Table 1. Positioning the EU countries according to the modified synthetic indicator of the socio-economic development

	Economy and Finance	Science and Technology	Health	Education	Living conditions	Synthetic measure
Sweden	4	2	17	1	1	1
Finland	6	1	16	3	3	2
Luxembourg	1	9	4	6	14	3
Denmark	3	3	6	2	17	4
Austria	5	7	5	9	6	5
Belgium	12	5	23	18	5	6
Germany	9	4	9	16	9	7
Netherlands	7	6	15	8	4	8
France	14	8	19	5	7	9
Ireland	13	11	13	14	8	10
Malta	2	24	20	28	2	11
Great Britain	11	10	2	4	12	12
Czech Republic	16	13	24	11	13	13
Slovenia	15	12	3	10	21	14
Estonia	10	14	14	7	15	15
Lithuania	18	16	10	12	18	16
Poland	21	21	11	17	16	17
Spain	27	15	7	23	10	18
Slovakia	24	23	1	19	11	19
Hungary	19	18	12	21	28	20
Cyprus	8	25	18	13	25	21
Bulgaria	25	26	26	22	20	22
Croatia	26	27	22	20	19	23
Italy	22	20	27	25	23	24
Romania	20	28	8	26	22	25
Portugal	23	17	21	27	26	26
Latvia	17	19	28	15	27	27
Greece	28	22	25	24	24	28

(Source: author's calculations)

Figures 3-7 present regression models for individual determinants of socio-economic development. Models of regression functions allowed to obtain estimated parameters for synthetic measure in terms of each of the determinants of socio-economic development.

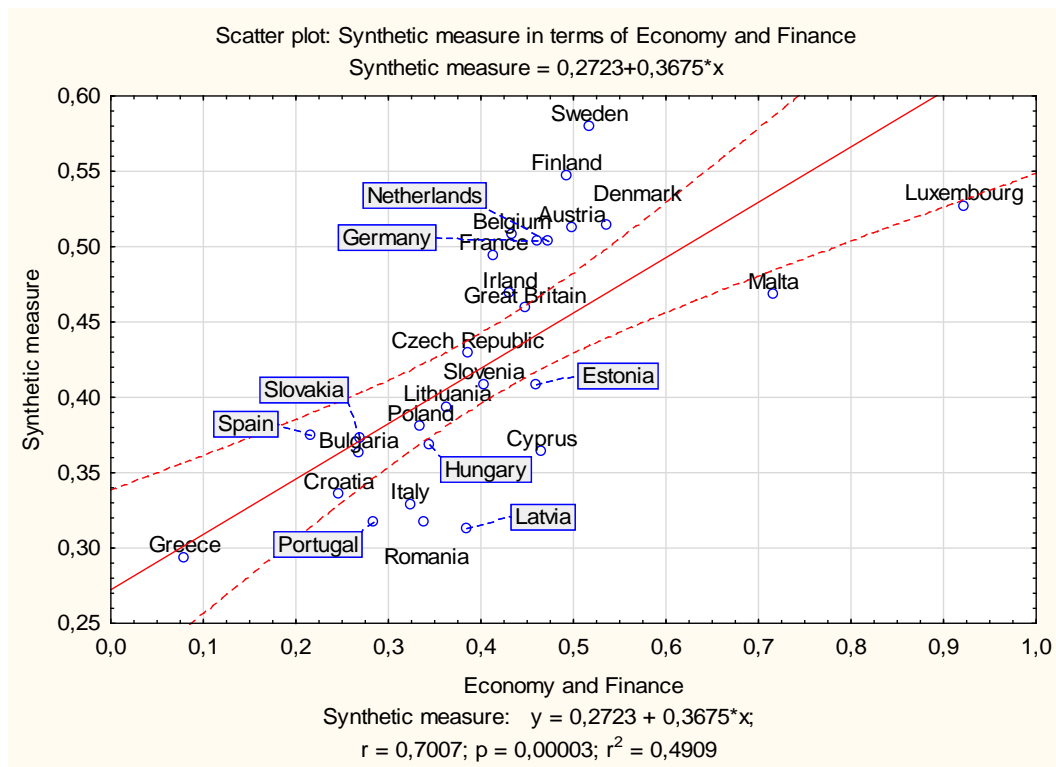


Figure 3. Regression function parameters – synthetic measure in terms of Economy and Finance
(Source: author's calculations)

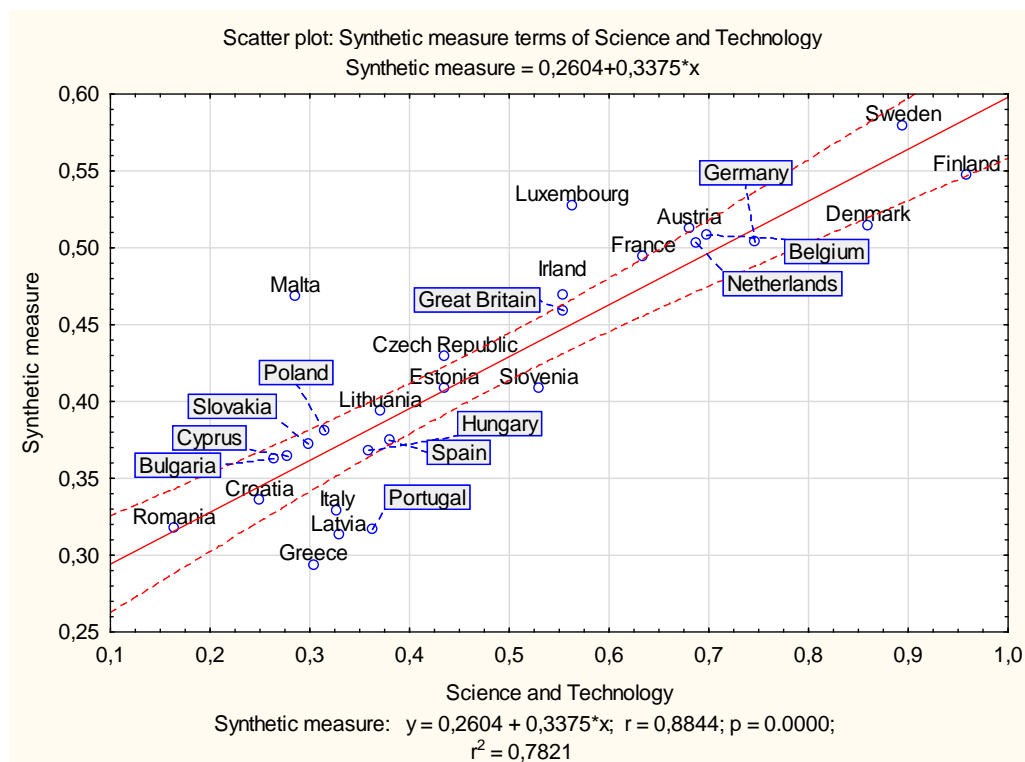


Figure 4. Regression function parameters – synthetic measure in terms of Science and Technology
(Source: author's calculations)

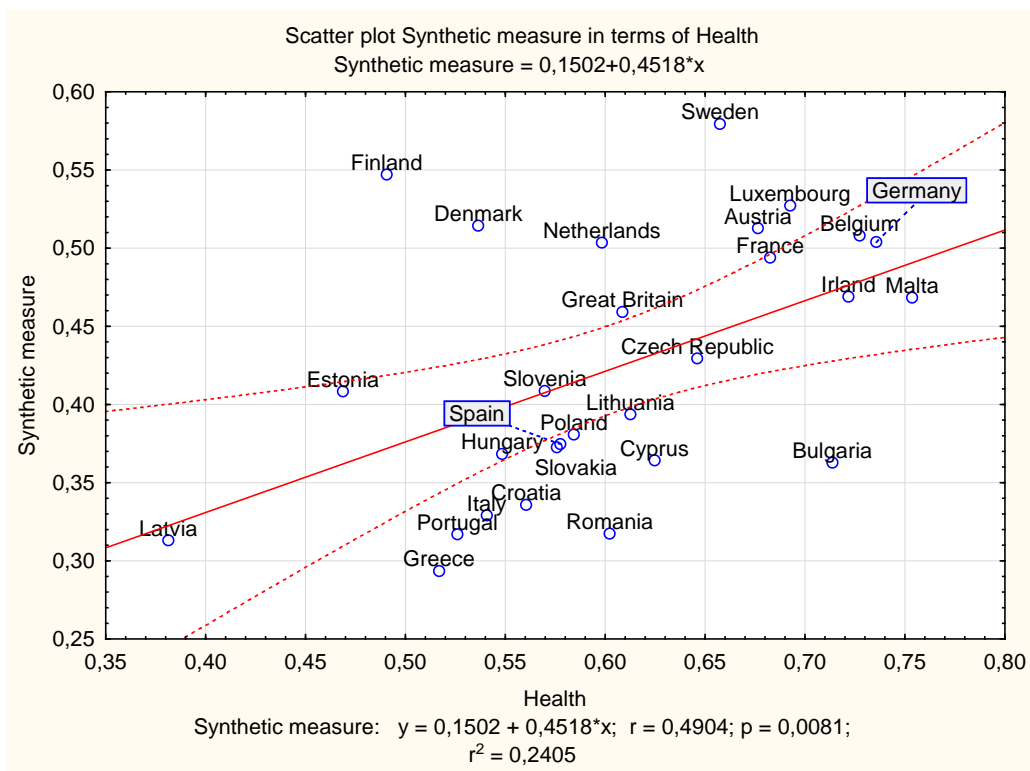


Figure 5. Regression function parameters – synthetic measure in terms of Health
(Source: author's calculations)

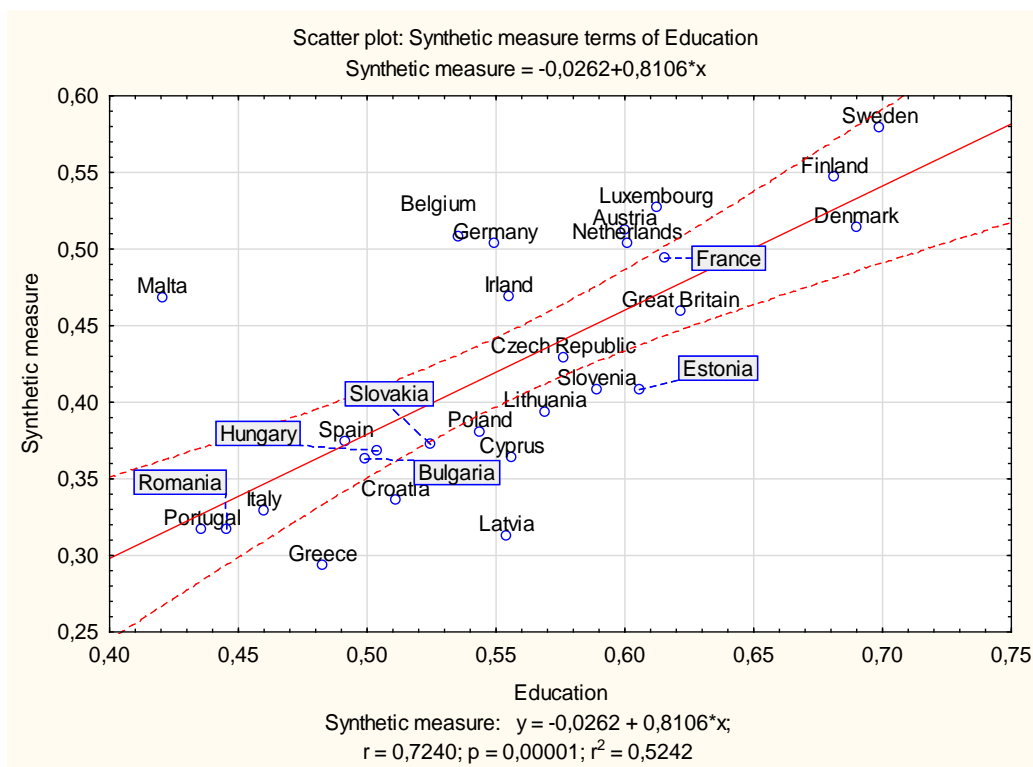


Figure 6. Regression function parameters – synthetic measure in terms of Education
(Source: author's calculations)

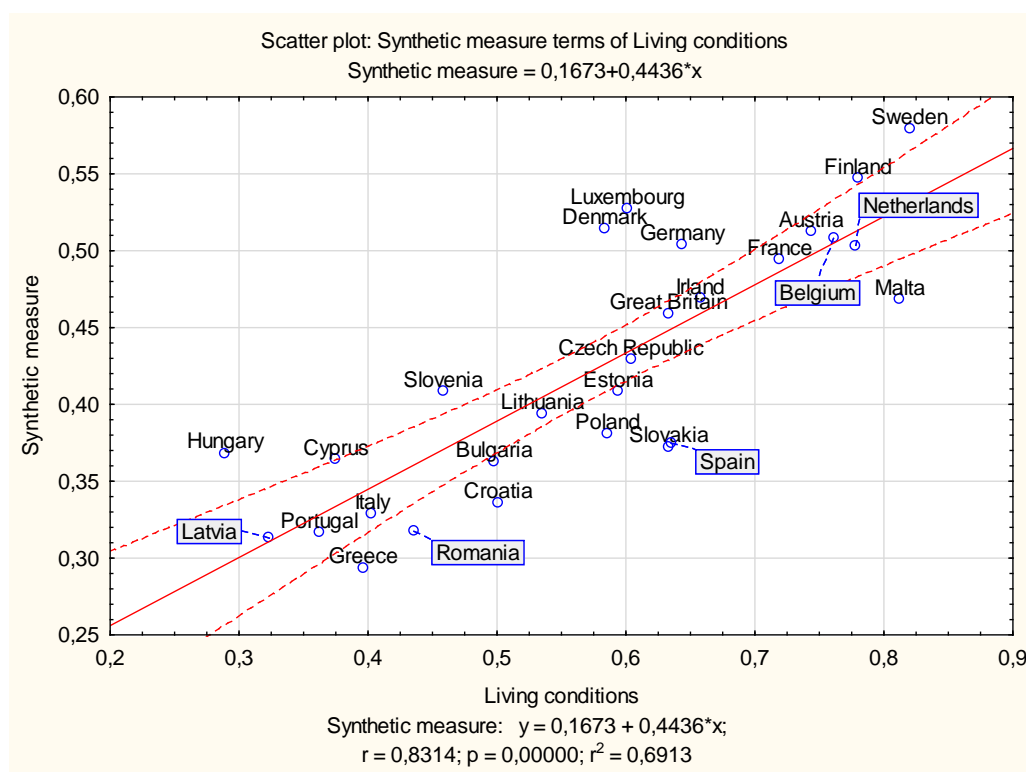


Figure 7. Regression function parameters – synthetic measure in terms of Living Conditions
(Source: author's calculations)

Conclusion

Models of regression functions (presented in Figures 3-7) allowed to obtain estimated parameters for each of the determinants of socio-economic development. Their interpretation will allow to state if the synthetic measure increases, if each determinant increases by 1. This will allow to estimate which determinant has the greatest impact on the socio-economic development of EU countries. From the estimated results, it was obtained that Science and Technology ($r = 0.88$) and Living Conditions ($r = 0.83$) have the greatest impact on socio-economic development. By interpreting the parameters of the models, we will obtain that if we increase the expenditure on Economy and Finance by 1, then an increase in the synthetic measure by 0.37 will be obtained. In the case of Science and Technology, increase by 0.34, Health by 0.45, Education by 0.81, Living conditions by 0.44.

Another issue is the fact that the universally used HDI does not show the property of presenting the sensitivity of the processes taking place in individual countries. In a dynamically changing reality, there is the need for creating indicators of the conditions of social life that will be sensitive to the processes taking place in individual countries. The traditional HDI index does not show this property.

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THE SIGNIFICANCE OF PUBLIC FINANCIAL MANAGEMENT AND GOVERNANCE FOR SUSTAINABLE DEVELOPMENT

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Abstract

It is concerned with the fact that public finance is a rosy politics, a roots in economics, and the other is how the state and the state have taken their decisions; these are the most important elements shaping the macroeconomic status of a sustainable development. For sustainable development, stability in the financial markets and efficiency in management are indispensable, while the assurance element in this activity is emerging as governance. In this context, the focus of this paper will be on the significance of public financial management and governance for sustainable development. the first part of the discussion gives an overview of public financial management and governance. The second section begins by laying out the importance of public financial management and governance in sustainable development. It concludes that the relationship between sustainable financial management and governance is linked to macroeconomic frameworks, public trust, good decision making and efficient resources allocation for sustainable development.

Keywords: Public Financial Management, Governance, Global Governance, Sustainable Development, Macroeconomic Framework.

Introduction

Public financial management is a complex concept that revolves around systems, rules and laws that help in the mobilization of resources, particularly revenue, allocation of public resources, implementation of public spending as well as the accounting and auditing of the usage of public resources (Finch 2010). In this context, governance refers to the exercise of power, particularly in the management of national affairs as well as its relations with other nations. Public financial management and governance assume an imperative role in influencing the public service delivery, poverty reduction and in the attainment of sustainable development (Guinn and Straussman 2016).

According to BPP (2016), sustainable public financial management and governance are key to ensuring financial efficiency as well as strengthening transparency and accountability. Sustainable development is dependent on effective macroeconomic and development policies that allow for proper governance and private investment (Cangiano, Curristine and Lazare 2013). When pursuing development agenda, it is important to ensure that there are effective rules, institutions, and systems to facilitate appropriate management of public finances and governance. This helps in ensuring there are transparency and accountability in terms of how public resources are used (De Melo 2015).

1. Overview Of Public Financial Management And Governance

The public sector plays a crucial role within the society and overall economy of any economy. Public expenditure is one component of the economy, which largely influences the gross domestic product (GDP). According to Tennent (2008), good governance and sound public financial management are considered synonymous with sustainable economic development. Basically, public financial management and governance is a comprehensive system comprising of processes and functions relating to planning, programming, budgeting, execution of the budget, accounting for the public resources, auditing as well as evaluation (Pirdal 2017).

The aim of these activities is to ensure that there is maximum utilization of public financial resources, in accordance with the set laws (Bastida and Benito 2007) Moreover, the public financial utilization should aim at yielding maximum results. Moreover, it should be done in a transparent and accountable manner. This means that there should be effective institutions such as the legislature, to ensure that those responsible for implementing

government projects and policies are held accountable (Akyüz, 2014). Argues that many countries are faced by challenges related to unsustainable development, which arises due to poor public financial management due to pursuit of ideologies such as financial populism as well as lack of effective budgetary mechanisms and financial management institutions to facilitate and oversee the implementation of public policies (Scott 2017).

According to Bevir (2011), sustainable development is achievable if the government reduces its role in the economic sphere and recognizes the important role played by the private sector in spearheading economic growth. However, the function of the government in establishing and managing effective legal as well as regulatory framework is crucial in ensuring that both the private and public sectors operate effectively and in a sustainable manner (Nummy et al., 2011). The frameworks should revolve around creating basic principle and guidelines to ensure effectiveness in economic governance and in the management of public resources (Campo, 2017). It the role of the government to organize an effective financial management system that ensures that there are appropriate economic policies and that these policies are implemented with the aim of promoting sustainable socio-economic development (Allen et al., 2013).

In the contemporary world, politics and public administration have become strongly intertwined, which has raised numerous governance issues. Good governance revolves around ensuring that those who hold public offices have legitimacy and trust of the public to exercise power in the management of public resources. However, they should use the power in ensuring that the resources are used to serve the public interest and for the good of the nation. This implies that governance within the public financial management is closely linked to good governance. The mode of governance intrinsically influences how public financial resources are managed, and the overall quality of life of citizens (Martí and Kasperskaya 2015).

The only way that effective and sustainable development can be achieved is through enhanced public financial management and good governance and it can only be achieved if the three interdependent branches of state, which include legislature, executive, and judiciary, are held accountable and hold other financial management institutions accountable. Moreover, effective power relations among the executive, parliament and civil society are crucial in ensuring that all aspects of governance operate effectively (Simson et al., 2011).

2. The Importance Of Public Financial Management And Governance In Sustainable Development

The importance of sustainable development can be best understood by identifying the benefits as well as problems caused by unsustainable development, particularly in relation to governance and management of public financial resources (Wescott, 2009). According to Chibba (2009), unsustainable development often arises due to poor governance and ineffective public financial management. This is largely evident in disregard or piecemeal approach in policy development and implementation. Sustainable development largely revolves around considering the future consequences of current activities and behaviors (Freestone, 2012). Unsustainable public financial management becomes manifested in different areas such as depletions of non-renewable resources, growing poverty, increase in inequality and failure in public sectors and institutions such as health, education, infrastructure, and social welfare. This leads to social and economic crisis, increased national debt, growing corruption, and depletion of resources putting future societies at risk (Draghi et al., 2003).

Traditional public administration values remain crucial in contemporary public financial management. Such values should be based on ethical financial management to ensure that the public sector functions effectively and renders appropriate services in a timely manner (Pirdal, 2017). Some of the most essential measures of public financial management and governance include budget governance, internal control, public procurement, and revenue control (Elgert, 2018). For effective public financial management and governance to be achieved, there is need for effective political governance through inclusiveness, openness, compliance to rules and regulation, availability of oversight frameworks, and capacity (Rupanagunta, 2006). Good governance helps bridge the wealth gap and reduces poverty levels by ensuring equitable and sustainable development. Moreover, good governance is necessary for sustainable economic growth. This is because having good governance creates an appropriate environment for private and foreign direct investment (Bevir, 2009).

According to Indrawati (2017), there is a connection between good governance and a decrease in absolute poverty levels: Level of illiteracy, infant mortality, reduction in gender inequality, and increased access to resources such as clean water. Tennent (2008) identifies four dimensions necessary for effective public financial management. These include aggregate fiscal management, effective operational management, fiduciary risk management, and governance. These dimensions should be reflected in financial management elements such as planning, budgeting, financial reporting and performance management.

Furthermore, these dimensions help guide setting and achievement of development goals and targets. Aggregate fiscal management revolves around managing the revenues, expenditures, financing flows and other economic flows within the public finances. This is important in ensuring sustainable development by ensuring fiscal sustainability, maximizing the mobilization of resources from revenues as well as borrowing, and ensuring that resource allocation is done in accordance with the set policy priorities (Rupanagunta, 2006). In relation to operational management, sustainable development is assessed based on input versus output analysis. This is achievable through effective performance management, delivering value for public finances through effectiveness, efficiency and economy, as well as appropriate management of budget.

Governance is necessary for sustainable development and is assessed through the governance model of how public resources are managed and the role of stakeholders such as civil society and legislature in overseeing such management. For sustainable development, governance should be such that their governance structures put in place based on the interests of the stakeholders. Moreover, transparency in terms of how stakeholders access relevant information in a reliable and timely manner is important. Moreover, the sustainable government requires that individuals be held accountable in terms of how they use public resources (Agnew et al., 2015).

In relation to fiduciary risk management, sustainability should be based on risk versus cost analysis. This is achievable through putting in place effective financial control, at internal and external level. Moreover, public bodies should comply with the established constitutional, regulatory, and legal requirements, especially when dealing with public finances. Moreover, there should be appropriate oversight of public resources to ensure that they are used maximally and for the appropriate purposes (Ramkumar and Krafchik, 2005).

Conclusion And Suggestions

Sustainable financial management requires various elements, which include a legislative framework to advance financial management and accountability, appropriate governance principles to ensure financial probity, and appropriate institutions to safeguard public resources by being custodians of public finance. Failure to have in place appropriate policies and macroeconomic frameworks to implement these policies impinges on the government service delivery, programs, and even loss of finances through means such as corruption.

At this point, trust, as one of the basic pillars of global financial cash flows, also forms the basis of global governance, have a vital role in countries that supplying funds and demanding funds in global financial markets to be successful in terms of carrying out effective cost and benefit analyzes. In this context, the expenditures in budget, especially as interest payment, and the incomes in budget, especially as the taxes provided for the investments, are of great importance.

In this context, an acceleration of greater integration between public financial management and governance- as a comprehensive system- help any society for good decision making and efficient resource allocation. This holistic approach should primarily be aimed by any government to dealing with poverty and promoting sustainable development. At this point, with the concepts such as transparency, fairness and accountability, the concept of governance aimed at providing support and its implementation depends on the establishment of the infrastructure for the information society and its integration with a legal system strengthened by democracy and human rights.

Following this theoretical work, it is thought that a numerical research to be carried out in the context of observing relationship among the governance levels of countries and other indicators; such as the impact on budget performance, the increase in GDP levels, dealing with poverty, development and democratic indexes would be beneficial.

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THE USE OF NEW TECHNOLOGIES IN THE ELDERLY IN THE NORTH OF PORTUGAL

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Abstract: The elderly, especially those living in institutions, tend to have many health limitations, such as reduced vision, hearing and locomotion, which necessarily implies the risk of loneliness. An exploratory and cross-sectional study was carried out. Data collection took place between February and May 2018, in 5 residential structures for the elderly in the north of Portugal. The study included 130 elderly people, 68,5% female and 31,5% male, with an average age of 82,43 years and an average stay in the institution of 4,5 years and 57,7% are widowers. 43,1% of the elderly would see a robot that interacted with them as interesting and very interesting. The data found in this study shows that it is essential to provide the elderly with new forms of social relationships with the help of new technologies in order to avoid loneliness and to contribute to a better quality of life.

Keywords: New Technologies, Elderly, Robots

Introduction

The elderly, many of them without family support, with several chronic diseases, characteristic of aging, as well as various health limitations, such as decreased visual, auditory and locomotion acuity, also due to the normal aging process, live in residential structures for the elderly (Conselho Económico e Social, 2013).

In Portugal, between 2015 and 2080, the number of elderly people will increase from 2.1 to 2.8 million and the aging rate goes from 147 to 317 elderly people per 100 young people in 2080 (INE, 2017).

Aging is a natural and biological process that necessarily introduces some limitations, which implies effects on the person's lifestyle and well-being, introduces changes in their social relations, and increases the risk of isolation and loneliness (Reis, et al, 2017^a).

It is necessary that the elderly in these institutions do not feel changes in their social role, their routines, and their involvement in stimulating activities (Dillin, Gottschling, Nyström, 2014). Given the quality of life of the elderly, social and family interactions, the decreasing risk of loneliness in the institutionalized elderly, the challenge is placed on the development of technological and communication resources, such as solutions based on social robotics that ensure this challenge (Reis, et al, 2017^b).

Recently, several technologies have emerged with the aim to provide innovative and efficient ways to help the elderly in their daily lives and reduce the cost of health care (Khosravia, Ghapanchia, 2016).

The increase of the life expectancy of the elderly comes to settle in the health area, through the use of social robotics, namely, with the so-called telepresence robots. These are already used in telemedicine, whether in hospitals or in nursing homes, and mobile telepresence robots add an added value to the activities of daily living that people have to perform (Laniel, et al, 2017).

Telepresence robots can be a significant help in promoting a life with as much independence as possible in the elderly, helping the most fragile and reducing loneliness (Pripfl et al, 2016), and because more and more attention is given to the aging of the population, as well as to new forms of social relationship (Bedaf, Marti, Amirabdollahian, Luc de Witte, 2017).

In 2016, through a systematic review of the literature made between 2000 and 2014 on assistive technologies used in care of the elderly, it was recorded that support technologies are a reality and can be applied to improve the quality of life, especially, of the older ones (Khosravia, Ghapanchia, 2016).

In this perspective, a study was developed with the objective of identifying the appetite of the elderly for the use of new technologies.

Materials And Methods

An exploratory and cross-sectional study was carried out, using a form consisting of socio-demographic characteristics, clinical antecedents and issues related to the use of new technologies. Data collection took place between February and May 2018, in 5 residential structures for the elderly in the north of Portugal.

The data was collected in the Institutions by 2 properly trained research scholarship students and oriented to the project objectives. The collection of data was always done in a way that did not interfere with the activities of the Institution.

The elderly who participated in the study were aged 65 or over, oriented in time and space and gave their informed consent.

Also note that all institutions authorized the data collection and the UTAD - Ethics Committee, gave a favorable opinion to carry out the study.

Results And Discussion

The study included 130 elderly people, 68,5% are female and 31,5% are male, with an average age of 82,43 years and an average stay in the institution of 4,5 years. 57,7% of elderly are widowers.

The institutionalization happened on 23,8% because the family did not have time to take care of them, on 20% there was worsening of health status, and on 19,2% of the elderly lived alone, see (Table 1).

Table 1: Reasons for Institutionalization

	N	%
The family lives in a distant geographical area	10	7,7
The family did not have time to take care of him	31	23,8
Worsening of health status	26	20,0
Weak housing conditions in the face of needs	2	1,5
Physical dependence	7	5,4
Difficulty performing tasks of daily living	8	6,2
Death of spouse	7	5,4
Loss of autonomy	8	6,2
Lived alone	25	19,2
Other	1	,8
Total	125	96,2
Missing	5	3,8
Total	130	100,0

95,4% of the elderly reported having health problems, 98,5% take medication and 86,9% suffer from some disability, see (Table 2), namely 22,3% in hearing, 59,2% in mobility and 50% in vision, see (Table 3).

Table 2: Health problems, disabilities and medication

Variables		N	%
Health problems	Yes	124	95,4
	No	6	4,6
Does medication	Yes	128	98,5
	No	2	1,5
Have any disability	Yes	113	86,9
	No	17	13,1

Table 3: Presence of disabilities

Variables		N	%
Hearing	Yes	29	22,3
	No	84	64,6
	Missing	17	13,1
Mobility	Yes	77	59,2
	No	36	27,7
	Missing	17	13,1
Vision	Yes	65	50,0
	No	48	36,9
	Missing	17	13,1

Probably one of the reasons for the existence of 46,9% of the 130 elderly people interviewed, reported already having had falls in the institution, is due to the fact that the majority of the elderly presents limitations in mobility and vision.

Only 37,7% of the elderly use the mobile phone and only 2,3% use a computer, see (Table 4). In this context it should be noted that for 40,8% of the elderly, contact with family, friends and former co-workers has decreased.

Table 4: Phone and computer use

Variables		N	%
Mobile phone	Yes	49	37,7
	No	81	62,3
Computer	Yes	3	2,3
	No	127	97,7

81,5% of the elderly, would like to have more frequent contact with the family, and 70,8% with friends, see (Table 5). 50,8% of the elderly do not contact family, friends and former co-workers more frequently because of lack of resources.

Table 5: Most frequent contacts with

Variables		N	%
Family	Yes	106	81,5
	No	24	18,5
Friends	Yes	92	70,8
	No	38	29,2
Former co-workers	Yes	82	63,1
	No	48	36,9

43,1% of the elderly would see a robot, that interacted with them as interesting and very interesting, 53% of the elderly would see a robot, that would make it easier to do some activities and daily tasks as interesting and very interesting and 39,2% of the elderly would see a robot, who proposed playful activities as interesting and very interesting. However, it should be noted that the majority of the elderly have no interest or did not respond (70%) to the robot's help in reading the emails, as well as 65,4% of the elderly, the robot has no interest to divulge activities of your family members on social networks, see (Table 6).

Table 6: How do you see a robot

Variables		N	%
To interact with you by proposing you some social activities according to your state of mind through the voice	No interest	30	23,1
	Little Interesting	23	17,7
	I would like to try	21	16,2
	Interesting	35	26,9
	Very interesting	21	16,2
That would make it easier for you to do some daily activities and tasks, such as taking medication correctly	No interest	34	26,2
	Little Interesting	17	13,1
	I would like to try	10	7,7
	Interesting	51	39,2
	Very interesting	18	13,8
That could manage your e-mail, for example read your messages	No interest	52	40,0
	Little Interesting	8	6,2
	I would like to try	5	3,8
	Interesting	16	12,3
	Very interesting	10	7,7
That gives you information about the activities of your family members on social networks, such as presenting the new publications and photos of your family on facebook on a daily basis	Missing	39	30,0
	No interest	48	36,9
	Little Interesting	12	9,2
	I would like to try	6	4,6
	Interesting	19	14,6
To propose playful activities, such as a card game	Very interesting	8	6,2
	Missing	37	28,5
	No interest	38	29,2
	Little Interesting	23	17,7
	I would like to try	18	13,8
	Interesting	29	22,3
	Very interesting	22	16,9

With regard to the use of robots in the elderly, in Austria a study was carried out with 7 elderly people over 75 years old living alone (Pripfl et al, 2016). The results showed that the elderly value the robot enough to have lifted objects off the ground and transported them. However, these seniors felt that the robot had not been able to increase their own independence and their sense of security at home.

In the Netherlands, a study was carried out with 10 elderly people, with an average age of 79.3 years with the objective to report the experience of living at home with a robot. The elderly considered the robot very limited and reported that it should perform more complex tasks (Bedaf, Marti, Amirabdollahian, Luc de Witte, 2017)

Conclusion

The data found in this study indicate that it is essential to provide the elderly with new forms of social relationships with the help of new technologies in order to avoid loneliness and contribute to a better quality of life (Ministério da Saúde, 2018; Pripfl, Körtner, Batko-Klein, Hebesberger, Weninger, Gisinger, 2016).

Technologies to aid the elderly have a positive impact not only on the elderly, but also on those who work with them, as they promote a more independent life, increased security, increased social connectivity and advances in mobility (Khosravia, Ghapanchia, 2016).

Robots should be able to perform more complex tasks and related to the limitations of the elderly, as well as perform preferential tasks for each one of the elderly (Bedaf, Marti, Amirabdollahian, Luc de Witte, 2017).

On the other hand, it is fundamental that the new information and communication technologies, real scenarios of the 21st century, do not exclude the elderly and can create appropriate interfaces for their use (Tavares, Souza, 2012).

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Ti6Al4V TİTANYUM ALAŞIMLARININ BORLAMA SONRASI ÖZELLİKLERİNİN İNCELENMESİ

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Özet: Titanyum ve alaşımları, düşük özgül ağırlıkları, yüksek dayanım, kırılma tokluğu ve korozyon direnci sebebiyle, otomotiv, havacılık, kimya ve biyomedikal alanlarında yaygın olarak kullanılmaktadır. Günümüzde toplam titanyum üretimi ve kullanımının yaklaşık % 50'sini Ti6Al4V alaşımı oluşturmaktadır. Ancak bu alaşım, bu üstün mekanik özelliklerinin yanında, zayıf aşınma dayanımına sahiptir. Ti6Al4V titanyum alaşımının aşınma dayanımını iyileştirmek amacı ile karbürleme ve nitrürleme gibi yüzey sertleştirme yöntemleri uygulanmaktadır. Titanyum alaşımlarının aşınma dayanımını yükseltmenin bir diğer yolu ise, titanyum alaşımının yüzeyinde, borlama yöntemi ile, yüksek aşınma dayanımına sahip olan, titanyum diborür (TiB₂) tabakası oluşturmaktadır. Bu çalışmada, Ti6Al4V titanyum numuneleri EKABOR® borlama tozu kullanılarak, farklı sürelerde borlama işlemine tabi tutulmuşlardır. Borlama işlemi sonrasında, borlanmış numunelerinin mekanik ve metalografik özellikleri incelenmiştir. Çalışma sonucunda bulunan sonuçlar değerlendirilmiş ve tartışılmıştır.

TIME ISSUE IN THE ANALYZING WINDOWS NTFS EVIDENCE FOR THE DIGITAL FORENSICS

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Abstract: An analyzing technique in order to evaluate the exact time of the corresponding event is presented in this paper. It is difficult to know the exact time of the interesting time point because the time information can be modified by an user intentionally and by a system fault unintentionally. While the system time is managed by the digital clock chip in the computer system so that the system time is increased automatically as the time go, nevertheless it is possible to modify the system time by the simple GUI command. If the system time is modified, the all time-related information is recorded according to the modified system time. Time stamps of the file system, various log record, event, and registry contents are belongs to this class.

The basic idea to solve this issues is to use two different information sources. The first one comes from HTTP cookies. The expiration date in the cookies file is a good information to estimate the exact time. By comparing the expiration date in the cookies and the created time of the cookie file, we can estimate the exact time because the expiration date comes from the Web server, and the created time of the cookie file is set by the local system time. The second one use time resolution of the NTFS file. If we create or modify a file, the time stamp of the file is recorded in 64bit full time resolution, namely millisecond order. But the conventional attribute change programs such as “attrib” and “ac” do not properly handle the millisecond, thus the millisecond part of time stamp is filled with zero. So using a file viewer program such as “XYplorer”, we can find that the time stamp of the file was modified intentionally.

In this paper, we explain several time issues when the windows NTFS evidence are analyzed for the purpose of digital forensics and propose an analyzing technique while considering date forgery.

UBIQUITOUS LEARNING THROUGH MULTIMODAL COMMUNICATION IN THE PROCESS AND PRODUCTION OF PROJECT-BASED TASKS

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Abstract

When given a coursework task that requires forms of conventional practice, millennials today often take their time to 'start-up' and even procrastinate in its delivery. The current generation who are constantly exposed with information at their fingertips also go through a state of restlessness when the teaching approach used is routine and outmoded. Hence, in the present high-tech ecosphere, teaching using multimodal communication is one solution as it exploits various modes in terms of textual, aural, linguistic, spatial, and visual resources that the current generation can relate to (Jewitt, 2012; Bezemer & Kress, 2015; Bateman & Wildfeuer, 2017). This study uncovers the perspective from a framework in Malaysia of how ubiquitous learning through the multimodality approach is applied on undergraduate students in a Communication Skills course, a subject offered under the English for Specific Academic Purposes Unit (ESAP). The aim of the implementation of multimodal communication in the classroom is to encourage the quality of learning involving both the process and production of project-based tasks encompassing job interview, public speaking and video project using Information and Communication Technologies (ICT) as its main tool, simultaneously enhancing learners' performance.

Keywords: Ubiquitous Learning, Multimodal Communication, Project-Based Tasks English For Specific/Academic Purposes (ESP/EAP)

ULTRASOUND ASSISTED IMPROVED SYNTHESIS OF 5-(BENZYLTHIO)-1,3,4-THIADIAZOL-2-AMINE DERIVATIVES: AN EXPERIMENTAL AND COMPUTATIONAL STUDY

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Abstract

In this study it was aimed to develop new experimental method for the synthesis of 5-(benzylthio)-1,3,4-thiadiazol-2-amine derivatives via the reaction of 5-amino-1,3,4-thiadiazole-2-thiol and various benzyl halides. In the first step 5-amino-1,3,4-thiadiazole-2-thiol was synthesized from thiosemicarbazide and carbondisulfide. In the second step, 5-amino-1,3,4-thiadiazole-2-thiol was reacted with various benzyl halides to obtain 5-(benzylthio)-1,3,4-thiadiazol-2-amine derivatives. In both two steps ultrasound was used, and the results showed that sonication can increase the efficiency of the investigated reactions. Reaction pathway is given in Fig. 1.

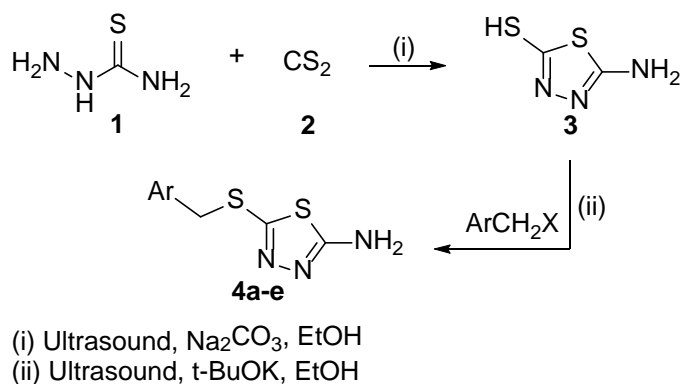


Fig. 1: Reaction pathway.

In the second part of the study, some DFT calculations have been performed on the investigated molecules. Geometry optimizations, vibrational analysis, molecular electrostatic potential maps, frontier molecular orbital calculations, determination of some global reactivity descriptors and NMR calculations have been performed. In the computational part, calculations have been performed at DFT B3LYP level of theory using various basis sets including 6-31G(d), 6-31G(d,p), 6-311G(d,p) and 6-311+G(2d,p) basis sets. NMR calculations have been performed using both CSGT and GIAO methods. Results show that there is a good agreement between experimental and computational data. Molecular electrostatic potential map of compound 4a is given in Fig. 2.

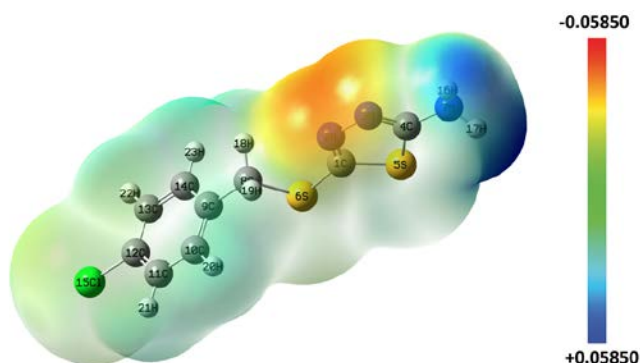


Fig. 2: Molecular electrostatic potential map of compound 4a.

Keywords: sonochemistry, computational chemistry, thiosemicarbazide, 5-(benzylthio)-1,3,4-thiadiazol-2-amine, 5-amino-1,3,4-thiadiazole-2-thiol.

USE OF BROMASS IN BROILER RATIIONS AS A DIFFERENT PROTEIN SOURCE

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ABSTRACT

In this study, we aimed to determine the effects of betaine-enriched β -vinsasse (Bromass) on body weight, body weight gain, feed intake, feed conversion rate, carcass yield, litter quality, blood serum Ca, P and cholesterol and broiler performance index. A total of 600 Ross-308 broiler chicks were used in the experiment, and the chickens were divided into the following 4 main groups: Control (0 g/kg Bromass), Group I (5 g/kg Bromass), Group II (30 g/kg Bromass), and Group III (60 g/kg Bromass). Additionally, each of the main groups was divided into 10 subgroups of 15 chickens each. The trial lasted for 42 days. Supplementation with Bromass (5, 30 and 60 g/kg) caused significant ($p < 0.05$) increases in the average body weight, body weight gain, feed intake, feed conversion rate, carcass weights and carcass yield. Additionally, bromass supplementation caused more dry litter at a significant level ($p < 0.01$) and significant ($p < 0.05$) decrease in serum cholesterol concentration. The addition of bromass to broiler diets resulted in a significant decrease in feed prices ($p \leq 0.001$) and an important increase ($p < 0.05$) in the broiler performance index values. At the end of the study, we concluded that the addition of Bromass as a different protein source, especially at the 30 g/kg level, caused positive effects and bromass makes it possible to produce a more profitable broiler.

Key Words: Betaine, broiler, bromass, cholesterol, performance, protein source,

Introduction

Feed cost in production, including in the poultry sector, is one of the most important factors affecting profitability. It is not possible to produce and consume cheap chicken meat unless the feed problem in poultry production is solved. For this reason, methods for utilizing all types of feed sources should be investigated. Utilizing by-products as alternative feeds for animals an attractive possibility due to enhanced environmental and economic concerns because most food by-products pose problems in areas of environmental protection.

Molasses is used directly as an animal feed or to obtain different fermentation products (yeast, ethyl alcohol, lysine and betaine). Another fermentation product of molasses is vinsasse (Bilal et al., 2001). The chemical composition of vinsasse is 48% nitrogen compounds, 10% betaine, and 5-18% potassium. Therefore, vinsasse can be used as an animal feed ingredient and a source of nutrients and minerals (Lopez et al., 2011). These levels may vary according to processing conditions and extraction methods. With traditionally produced vinsasse, high humidity, potassium and NPN compounds are the major factors that limit its use in poultry. However, with Beta-Vinsasse (β -Vinsasse), which is produced by Integro (Pak Food Production and Marketing Inc., Kocaeli, Turkey), the high potassium level, which inhibits the use of conventionally produced vinsasse, has been reduced to 2% using physicochemical techniques, and the betaine content has been purified. Due to the betaine in the β -Vinsasse structure, β -Vinsasse has gained importance as a valuable additive in poultry feed. In animal nutrition, betaine is widely discussed as a 'carcass modifier' due to its lipotropic and growth-promoting effects (Eklund et al., 2005). Hassan et al. (2005) suggested that supplementation with betaine at approximately 3-5% in diets with adequate methyl group donors

improves weight gain and feed efficiency. Additionally, the high moisture content of β -Vinasse is absorbed into sunflower seeds at a rate of 45-55%, and the result is then dried with a special process to obtain the product termed "Bromass". Thus, the dry matter level is increased to 94% in the Bromass product. Here, we added this product to broiler rations to provide original quality research.

In this study, we aimed to investigate the effects of the addition of Bromass (β -vinasse impregnated with sunflower seeds) to broiler rations as a different protein source on performance parameters, carcass parameters, blood serum parameters, litter quality and economical evaluation parameters.

Material And Methods

Animals, diets and experimental design

A total of 600 Ross 308 male broiler chicks were obtained from the Uludag University Animal Health and Production, Research and Application Centre of broiler breeding (Bursa, Turkey). The study protocol was approved by Ethics Committee of Uludag University (HADYEK decision no: 2016 -16/ 03). One-day-old chicks were obtained from a local hatchery and divided into 4 groups of 150 birds each. The chicks were individually weighed and distributed into 40 floor pens with 15 chicks per pen. Each 2.0x1.2 m floor pen was furnished with wood shaving litter. Fluorescent lamps provided 23 hours of continuous light per day. The chickens were vaccinated against infectious bronchitis and Newcastle disease (Nobilis MA5+Clone30) at 9 days of age and against Gumboro disease at 23 days of age. The experiment lasted for 42 days.

The formulations were adjusted according to phase-feeding practices (three basal diets) as the chickens advanced in age and weight and as established by the breeder (Ross 308). The basal diets were mixed under commercial conditions as one batch, divided into respective parts and then supplemented with Bromass by means of a horizontal mixer. The provided diets were prepared isocalorically (3030-3200 kcal/kg of diet) and isonitrogenously (22.38-19.43% crude protein). Diets were formulated to meet or exceed the requirements of the National Research Council (1994) for broilers at this age. The feeds and water were provided for *ad libitum* consumption. The ingredients and chemical compositions of the basal diets are presented in Table I. The chemical composition of β -vinasse is presented in Table 2. No antibiotics or growth promoters were added to any of the treatment diets. The experimental diets were chemically analyzed according to the methods of the Association of Official Analytical Chemists (2000). The metabolizable energy (ME) levels of the diets were estimated using the equation of Carpenter and Clegg (2001): $ME \text{ (kcal/kg)} = 53 + 38 [(CP, \%) + (2.25 \times \text{ether extract, } \%) + (1.1 \times \text{starch, } \%) + (1.05 \times \text{sugar, } \%)]$. In the study, the feeding program consisted of a starter diet until 21 d of age, a grower diet until 35 d of age and a finisher diet until 42 d of age. The birds were fed either a basal diet (control group) or the basal diet with bromass supplementation at doses of 5 (0.5%, Group I), 30 (3.0%, Group II), or 60 (6.0%, Group III) g/kg feed.

Table 1. Ingredients (g/kg) and chemical composition of the broiler rations

STARTER				
	CONTROL	GROUP I	GROUP II	GROUP III
Ingredients %				
Corn	53.64	53.64	52.76	51.70
Soybean meal	28.62	28.12	25.62	22.63
Full fat soybean	10.30	10.30	11.08	11.95
Corn Gluten	1.33	1.33	1.33	1.53
Vegetable oil	1.80	1.80	1.85	1.96
Bromass ³	-	0.50	3.0	6.00
Dicalcium phosphate	1.95	1.95	1.96	1.99
Limestone	0.9	0.90	0.90	0.90
Salt	0.25	0.25	0.25	0.16
Vit-Min Premix ¹	0.25	0.25	0.25	0.25
DL-Methionine	0.34	0.34	0.34	0.20
L-Threonine	0.10	0.10	0.10	0.12
L-Lysin HCl	0.21	0.21	0.24	0.28
Sodium bicarbonate	0.10	0.10	0.10	0.10
Cholin chloride 60	0.11	0.11	0.12	0.13
Anticoccidial	0.10	0.10	0.10	0.10
Analysed concentration, %				

Crude Protein	22.38	22.36	22.32	22.37
Ether extract	6.62	6.60	6.65	6.55
Saccharose	4.66	4.65	4.70	4.78
Starch	38.03	38.59	38.59	38.22
Dry matter	90.88	90.54	90.07	90.23
Ash	10.19	10.42	9.86	9.86
Calcium	1.06	1.15	1.15	1.07
Total Phosphorus	0.73	0.78	0.78	0.71
Metabolisable energy (MJ/kg)	12.68	12.67	12.69	12.67
GROWER				
Ingredients %				
Corn	54.42	54.39	54.00	53.02
Soybean meal	18.03	17.53	15.03	12.03
Full fat soybean	14.00	14.00	14.10	14.50
Corn Gluten	2.70	2.70	2.98	3.38
Wheat	4.42	4.42	4.42	4.41
Vegetable oil	2.75	2.75	2.75	2.90
Bromass ³	-	0.50	3.00	6.00
Dicalcium phosphate	1.61	1.61	1.65	1.69
Limestone	0.82	0.82	0.80	0.78
Salt	0.20	0.20	0.14	0.07
Vit-Min Premix ¹	0.25	0.25	0.25	0.25
DL-Methionine	0.16	0.16	0.15	0.16
L-Threonine	0.12	0.13	0.15	0.16
L-Lysin HCl	0.17	0.18	0.22	0.27
Sodium bicarbonate	0.17	0.17	0.17	0.17
Cholin chloride 60	0.08	0.09	0.09	0.11
Anticoccidial	0.10	0.10	0.10	0.10
Analysed concentration, %				
Crude Protein	20.42	20.25	20.82	20.92
Ether extract	8.94	8.08	7.56	7.28
Saccharose	5.30	5.88	5.88	5.14
Starch	38.73	40.30	40.80	41.85
Dry matter	90.33	90.35	90.27	90.58
Ash	8.58	9.27	8.58	9.77
Calcium	0.78	0.78	0.78	0.79
Total Phosphorus	0.65	0.65	0.66	0.66
Metabolisable energy (MJ/kg)	13.37	13.39	13.38	13.39
FINISHER				
Ingredients g/kg				
Corn	62.23	62.21	61.55	61.11
Soybean meal	14.50	14.00	11.50	8.62
Full fat soybean	14.41	14.43	14.40	14.60
Vegetable oil	2.00	2.00	2.10	2.20
Corn Gluten	3.23	3.23	3.82	3.82
Limestone	0.80	0.80	0.80	0.76
DCP 18	1.56	1.56	1.60	1.65
DL methyonine 99	0.13	0.13	0.13	0.13
L-Lysin	0.18	0.18	0.23	0.29
Salt	0.20	0.20	0.20	0.12
Sodium bicarbonate	0.20	0.20	0.10	0.10
Vit-Min Premix ²	0.25	0.25	0.25	0.25
Cholin chloride 60	0.09	0.09	0.10	0.11
L-threonine	0.12	0.12	0.12	0.14
Vit-E	0.10	0.10	0.10	0.10
Bromass ³	0.00	0.50	3.00	6.00
Analysed concentration, g/kg				

Crude Protein	19.49	19.78	20.28	19.43
Ether extract	7.75	7.45	7.68	7.66
Saccharose	5.60	5.80	4.42	5.42
Starch	41.60	42.00	42.00	42.10
Dry matter	91.63	89.85	90.28	89.96
Ash	8.79	9.93	8.85	7.86
Calcium	0.76	0.75	0.75	0.78
Total Phosphorus	0.62	0.62	0.65	0.66
Metabolisable energy (MJ/kg)	13.34	13.37	13.35	13.36

¹ R.124 STR.VM: Per 2.0 kg premix contains; Vit A 12 500 000 IU, Vit D₃ 4 000 000 IU, Vit E 125 000 mg, Vit K₃ 3 000 mg, Vit B₁ 2 700 mg, Vit B₂ 7 000 mg, Vit B₆ 4 000 mg, Vit B₁₂ 20 mg, Vit C 66 000 mg, Niacine 60 000 mg, Calcium d-pantothenate 15 000 mg, Folic acid 1 500 mg, Biotin 150 mg, Mn 75 000 mg, Fe 15 000 mg, Zn 60 000 mg, Cu 10 000 mg, Co 200 mg, I 1 200 mg, Organic Se 150 mg, Se 150 mg, Crina Poultry Plus 300 000 mg, Fitase 1 000 000 FTU, Xylanase 270 000 U, Beta-Glucanase 80 000 U, Fungal-1.3-B-Glucanase 70 000 U

² R.124 GRO. VM: Per 2.0 kg premix contains; Vit A 12 500 000 IU, Vit D₃ 3 000 000 IU, Vit E 60 000 mg, Vit K₃ 3 000 mg, Vit B₁ 2 700 mg, Vit B₂ 7 000 mg, Vit B₆ 4 000 mg, Vit B₁₂ 20 mg, Niacine 40 000 mg, Kalsiyum d-pantothenate 15 000 mg, Folic acid 1 500 mg, Biotin 150 mg, Mn 75 000 mg, Fe 45 000 mg, Zn 60 000 mg, Cu 10 000 mg, Co 200 mg, I 1 200 mg, Organic Se 150 mg, Se 150 mg, Crina Poultry Plus 160 000 mg, Fitase 1 000 000 FTU, Xylanase 270 000 U, Beta-Glucanase 80 000 U, Fungal-1.3-B-Glucanase 70 000 U

³ Bromass: Contains 45% β -Vinas 55% Sunflower meal (%36 HP)

Table 2. Nutrient Composition of Bromass and β -Vinasse

NUTRIENTS		BETA VINASSE	BROMASS
Dry matter	%	63.0	94.0
Crude Protein	%	22.30	36.50
Crude ash	%	11.00	10.50
Metabolisable Energy	MJ/kg	3.91	9.12
Crude cellulose	%	0.80	10.20
Lysine	%	0.137	0.90
Meth&Cys	%	0.032	1.00
Methionine	%	0.032	0.50
Threonine	%	0.169	1.00
Valine	%	0.206	1.30
Isoleucine	%	0.136	1.00
Arginine	%	0.061	2.00
Tryptophan	%	0.0392	0.30
Calcium	%	0.0276	0.30
Total Phosphorus	%	0.0537	0.70
Sodium	%	1.41	0.90
Potassium	%	2.05	1.80
Betaine	%	20.00	11.10
D.Lysine	%	0.086	0.41
D.Meth&Cys	%	0.20	0.48
D.Methionine	%	0.21	0.29
D.Threonine	%	0.105	0.43
D.Valine	%	0.130	0.58
D.Isoleucine	%	0.084	0.62
D.Arginine	%	0.039	1.05
D.Tryptophan	%	0.024	0.25

Performance parameters

The chicks were weighed individually at the beginning of the experimental period, after which the animals were weighed weekly to calculate the body weight gain (BWG). Mortalities were recorded as they occurred. Feed consumption (FC) was recorded weekly and is expressed as kg per chicks per week. The feed conversion ratio (FCR) was calculated as kg feed per kg body weight gain. At the end of the study, to determine the carcass yield (CY), 50 male animals from each group (a total of 200 animals, 5 from each subgroup) were weighed and slaughtered under commercial conditions. The hot carcass weight was taken as the weight of the carcass after processing. The cold carcass weight was taken as the weight of the carcass after it was kept for 18 h at 4 °C. The hot and cold CY were calculated by dividing the carcass weights (CW) by the body weights.

Determinations of the European Production Efficiency Factor (EPEF) and the European Broiler Index (EBI)

For the analysis of performance indicators, including the BWG, average daily gain (ADG), FCR, viability, EPEF and EBI, the following formulas were used:

BWG (grams on period) = BW (g) at the end period - BW (g) in first d;

ADG (g/chick/d) = BWG/number of days in the growth period;

FCR (kg feed/kg gain) = cumulative feed intake (kg)/total weight gain (kg);

Viability (%) = chicks remaining at the end of the period (%);

EPEF = [BW (kg) x viability (%) / FCR (kg feed/kg gain) x age (42d)] x 100;

EBI = (ADG (g/chick/d) x viability (%)) / (10 x FCR (kg feed/kg gain)).

Determination of serum biochemical values

At the end of the sixth week of the experiment, 10 birds from each pen were selected randomly, and serum samples were taken from the neck vein by puncture and drawn into Vacutainer tubes. Blood samples were collected in glass serum-collecting tubes. The blood samples were then centrifuged at 3000 rpm for 10 min. Serum Ca, serum P, cholesterol were measured by means of commercial kits.

Determination of Litter Dry Matter

Litter samples were taken from each replicate group, and dry matter analyses were performed. Litter quality was assessed in a series of samples that were obtained from five different points located at the edges and in the center of each compartment. A designated cylindrical sampler, which was 30 cm long and 8 cm in diameter, was used to obtain vertical core samples of the litter. Each sample was put in a polyethylene bag that was sealed and temporarily kept in a portable refrigerator until it was transferred to the laboratory for analyses. The analyses of the litter samples were performed immediately when the samples arrived at the laboratory of Animal Nutrition and Nutritional Disease Veterinary Faculty of Uludag University of Turkey. Following the AOAC Analytical Methods (2000), the moisture content was determined for each individual sample. The moisture contents (%) of the samples were determined by drying them at 105°C to a constant weight.

Statistical analyses

The statistical analyses were performed with the SPSS (1997) software package (SPSS Inc., Chicago, IL, USA) for Windows. Variance analysis was used to determine the significance of the differences between the statistical calculations for the groups and the mean values of the groups, Tukey tests were used as post hoc tests, and the level of significance used in all of the tests was $p < 0.05$. The results are expressed as the means \pm the standard errors of the mean.

Results And Discussion

The present study was conducted to investigate the effects of different levels of Bromass on the performance parameters, carcass parameters, blood serum parameters, litter quality and economical evaluation parameters of broiler chickens. The ingredients and chemical compositions of the diets are presented in Table 1. The nutrient compositions of Bromass and β -Vinsasse are presented in Table 2. In summary, the β -vinsasse used in this research contained 63% dry matter, 22.3% crude protein, 11% crude ash, 20% betaine and 2.05% potassium. These levels may vary according to processing conditions and extraction methods. The dry matter level was raised to 94% with the Bromass product. Bromass, which was added to the broiler rations in this study, contains 36.5% crude protein, 10.5% crude ash, 11.1% betaine and 1.8% potassium.

The results concerning the effects of Bromass on broiler performance are presented in Table 3. At the beginning of the study, there were no differences in the BW of the animals in the experimental groups. This situation demonstrates that the animals in the experimental groups were homogeneously distributed in terms of body weights. In this study, significant differences ($p < 0.05$) in BW and BWG were observed. Specifically, bromass at 30 mg/kg caused a significant increase in BW and BWG during the growing and finishing periods. When we performed assessments across the overall duration of the study (1-42 days), the addition of the high level of

bromass resulted in a significant ($p < 0.05$) decrease in feed consumption value. In this study, significant differences ($p = 0.000$) in feed conversion values between the control and experimental groups were identified in the 1-42 d period (Table 3). The best feed conversion rate in the study was observed in the group in which 30 g/kg (group II) of bromass was added to the ration. Bilal et al. (2001) determined that the effect of the addition of 2.5% vinasse to broiler diets on weight gain was significant ($p < 0.05$) from 7 to 14 and 14 to 21 days of age. No difference was observed in the 35-d body weights due to vinasse feeding at the 2.5 or 5% levels. Additionally, neither the feed intake nor the feed conversion of the broilers was influenced by the treatments. The use of vinasse as a feed additive in poultry and pigs has been reported on by Stemme et al. (2005), who demonstrated an influence of this additive on animal performance. The positive effects of the addition of β -vinasse are due to its contents of yeast walls (polysaccharides and beta-glucans), minerals and B-complex vitamins. These compounds, which have been found to increase the efficiency of the utilization of nutrients, can exert effects on the immune systems of the chicken and cause the exclusion of pathogens at the digestive measurement, which therefore, produces better performing birds.

Table 3. Effects of Bromass supplementation on average body weight, body weight gain, feed intake and feed conversion rate in broiler chicks

	Control		Group I		Group II		Group III		P
Average Body weight (g)(n=150)									
1 day	47.67 ± 0.32		47.25 ± 0.30		47.31 ± 0.30		46.75 ± 0.28		0.185
7 day	162.39 ^b ± 1.73		167.65 ^{ab} ± 1.68		171.65 ^a ± 1.47		170.64 ^a ± 1.53		0.000
14 day	432.07 ^b ± 4.06		439.33 ^{ab} ± 4.56		449.19 ^a ± 3.84		443.74 ^{ab} ± 4.11		0.028
21 day	837.57 ± 8.60		848.35 ± 9.61		859.00 ± 8.38		863.59 ± 8.20		0.149
28 day	1371.55 ± 16.60		1392.41 ± 16.74		1407.17 ± 16.15		1399.11 ± 14.30		0.432
35 day	1971.27 ^b ± 24.05		2027.44 ^{ab} ± 25.49		2062.62 ^a ± 17.88		2028.19 ^{ab} ± 20.40		0.034
42 day	2605.70 ^b ± 21.78		2644.41 ^{ab} ± 33.37		2738.72 ^a ± 25.92		2650.16 ^{ab} ± 25.91		0.019
Body weight Gain (g)(n= 150)									
1-7 day	114.77 ^b ± 1.46		120.51 ^a ± 1.53		124.35 ^a ± 1.23		123.96 ^a ± 1.31		0.000
7-14 day	269.68 ± 2.70		272.06 ± 3.78		277.89 ± 2.65		273.11 ± 2.75		0.264
14-21 day	406.01 ± 5.27		409.02 ± 5.66		410.16 ± 4.99		419.85 ± 4.56		0.252
21-28 day	533.98 ± 8.89		545.32 ± 8.26		548.17 ± 8.62		537.30 ± 6.92		0.577
28-35 day	604.84 ^b ± 10.78		635.02 ^{ab} ± 9.99		658.81 ^a ± 7.29		629.08 ^{ab} ± 7.57		0.000
35-42 day	652.14 ^b ± 12.96		616.97 ^b ± 9.76		716.44 ^a ± 14.00		643.77 ^b ± 11.50		0.000
1-42 day	2558.02 ^b ± 27.90		2597.39 ^{ab} ± 33.14		2692.27 ^a ± 25.71		2603.83 ^{ab} ± 25.70		0.010
Feed Intake (g) (n=10)									
1-7 day	218.46 ^a ± 19.12		162.60 ^b ± 5.55		165.70 ^b ± 4.52		159.07 ^b ± 6.72		0.001
7-14 day	482.17 ^a ± 18.05		427.60 ^{ab} ± 13.47		416.74 ^b ± 12.16		467.55 ^{ab} ± 12.98		0.007
14-21 day	641.83 ± 30.01		607.66 ± 7.43		604.59 ± 9.10		691.12 ± 38.30		0.533
21-28 day	955.79 ± 12.73		972.20 ± 18.99		967.78 ± 20.48		955.80 ± 18.18		0.881
28-35 day	1225.90 ± 23.90		1218.64 ± 16.79		1206.85 ± 18.94		1186.20 ± 17.00		0.501
35-42 day	1481.13 ± 16.11		1473.25 ± 23.28		1441.62 ± 17.95		1412.29 ± 18.67		0.060
1-42 day	5005.28 ^a ± 31.00		4861.65 ^{ab} ± 64.73		4803.28 ^b ± 53.65		4772.02 ^b ± 55.08		0.017
Feed Conversion Rate (kg/kg) (n=10)									
1-7 day	1.90 ^a ± 0.16		1.36 ^b ± 0.06		1.33 ^b ± 0.02		1.28 ^b ± 0.06		0.000
7-14 day	1.79 ^a ± 0.86		1.58 ^{ab} ± 0.07		1.50 ^b ± 0.04		1.71 ^{ab} ± 0.05		0.008
14-21 day	1.58 ± 0.52		1.49 ± 0.02		1.48 ± 0.03		1.42 ± 0.10		0.295
21-28 day	1.80 ± 0.03		1.78 ± 0.03		1.77 ± 0.04		1.79 ± 0.05		0.957
28-35 day	2.05 ^a ± 0.09		1.92 ^{ab} ± 0.01		1.84 ^b ± 0.04		1.89 ^{ab} ± 0.03		0.050
35-42 day	2.29 ^a ± 0.08		2.39 ^a ± 0.04		2.01 ^b ± 0.06		2.22 ^{ab} ± 0.09		0.005
1-42 day	1.96 ^a ± 0.03		1.87 ^b ± 0.01		1.78 ^c ± 0.04		1.84 ^{bc} ± 0.07		0.000

a, b, c: Different superscripts in each row shows the significant difference between the groups * $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$

The effects of dietary treatment on carcass weight, carcass yield, litter dry matter and mortality are presented in Table 4. Significant differences ($p < 0.05$) between the control and experimental groups were observed in the parameters of carcass value (carcass weight and carcass yield).

Additionally, bromass addition to the broiler rations at the 30 and 60 g/kg levels caused a significant increase ($p = 0.002$) in the dry matter of the litter. It should be remembered that the bromass additive was used as a betaine

source. Rodriguez et al. (2013) determined that the carcass weights and carcass yields of birds on diets that included 30% vinasse torula yeast were lower than those birds that received 10% supplementation, although the 30% group did not differ from the control group or a group that received feed with 20% supplementation. When using vinasse as an additive (5 mL during the starter, 10 mL during the grower, and 15 mL during the finisher phases), vinasse provoked greater carcass weight (1087 and 1242 g/bird) (Hidalgo et al., 2009).

Table 4. Effects of Bromass supplementation on carcass characteristics, litter dry matter, mortality rate in broiler chicks

	Control		Group I		Group II		Group III		P
Final body weight (g)	2715.28 ^b	± 66.41	2944.50 ^a	± 44.19	2990.28 ^a	± 34.03	2933.40 ^a	± 30.64	0.000
Hot carcass weight (g)	2013.14 ^b	± 50.83	2212.64 ^a	± 32.66	2264.18 ^a	± 26.09	2221.80 ^a	± 23.91	0.000
Cold carcass weight (g)	1962.80 ^b	± 52.28	2186.48 ^a	± 32.64	2232.92 ^a	± 25.83	2194.00 ^a	± 22.89	0.000
Carcass yield (%)	72.42 ^b	± 0.90	74.28 ^{ab}	± 0.22	74.69 ^a	± 0.27	74.83 ^a	± 0.33	0.003
Carcass Shrink (%)	2.67 ^a	± 0.33	1.19 ^b	± 0.08	1.38 ^b	± 0.06	1.23 ^b	± 0.08	0.000
Litter dry matter (%)	22.56 ^b	± 1.95	31.63 ^{ab}	± 1.90	35.82 ^a	± 0.68	34.17 ^a	± 3.98	0.002
Mortality (%)	2.67	± 1.09	3.34	± 1.49	3.34	± 1.49	2.67	± 1.09	0.967

a, b, c: Different superscripts in each row shows the significant difference between the groups *P<0,05 **P<0,01 ***P≤0.001

Similar to the present study, increased carcass yield following betaine supplementation has been reported in broilers (Virtanen and Rosi, 1995; Firman et al., 1999; Mcdevitt et al., 2000; Wang, 2000). It would be ideal to optimize the quantity of supplemental DL-methionine with betaine, which has a positive influence on carcass meat yield (Mcdevitt et al., 2000; Waldroup, 2006). In the poultry sector, controlling litter moisture is essential for the maintenance of animal health, welfare and production performance. Some feed additives are used with the objective of directly drying litter moisture by maintaining the water balance of the birds. Osmolytes, such as betaine, affect the water balance or osmotic pressure of cells and tissues by regulating the movement of water through the cell. When poultry diets are supplemented with betaine, it is quickly absorbed by intestinal cells and balances the osmotic pressure of the gut, which contains high concentrations of inorganic salts after a meal (Trott, 2013). In other words, water loss is reduced, and the integrity of the intestinal cells is maintained. Betaine seems to be effective at maintaining intestinal water balance and drying poultry litter. In the present study, the addition of bromass to the broiler ration improved the quality of the litter by providing a stable intestinal water balance.

The results concerning the effects of Bromass on some blood parameters are presented in Table 5. In this study, the serum calcium and phosphorus levels were not affected by the levels of bromass in the broiler diets. In contrast, bromass supplementation significantly (p<0.01) decreased the serum cholesterol concentrations. The decreased cholesterol concentrations were 197.12, 190.40 and 186.95 in the broilers fed the diets supplemented with 5, 30 and 60 g/kg bromass, respectively, compared to the control (199.27). These results may have been due to betaine, which plays a major role in lipid metabolism, which in turn is associated with enhanced synthesis of methylated compounds in the liver and muscle including carnitine and creatine (Zhan et al., 2006). Carnitine functions in the transport of long-chain fatty acids across the inner membrane of the mitochondria where fatty acid oxidation occurs, and thus carnitine has a role in the regulation of fat metabolism (Wang et al., 2004). Accordingly, increased hormone-sensitive lipase activity (Zhan et al., 2006) following dietary betaine supplementation results in reduced lipid deposition (Eklund et al., 2005). These results are in agreement with those obtained by Jahanian and Rahmani (2008) who found that betaine enhances lipase activity and decreases the concentrations of plasma triglycerides and cholesterol in broilers and ducklings (Awad et al., 2014).

Table 5. Effects of Bromass supplementation on some blood serum parameters.

Parameters	Control		Group I		Group II		Group III		P
Cholesterol, mg/dL	199.27 ^a	± 2.96	197.12 ^a	± 1.79	190.40 ^{ab}	± 2.58	186.95 ^b	± 2.57	0.002
Calcium, mg/dL	7.93	± 0.18	7.64	± 0.34	6.71	± 0.49	6.77	± 0.28	0.068
Phosphorus, mg/dL	4.89	± 0.21	5.09	± 0.16	5.26	± 0.18	5.51	± 0.18	0.117

a, b, c: Different superscripts in each row shows the significant difference between the groups *P<0,05 **P<0,01 ***P≤0,001

The effects of bromass on the economically relevant parameters of the broilers in the trial groups are presented in Table 6. In this study, differences in the total feed consumption, feed cost, average body weight, EPEF and EBI economic parameter were determined to be statistically significant. For the overall experimental period (1 to 42 d), the bromass supplemented broilers ate less feed (P<0.05), required lower feed costs (P<0.01) and reached greater body weights (P<0.05). Production efficiency was assessed using the EBI and EPEF. The best EPEF and EBI values in this study were observed in the experimental groups that received feed with added bromass.

Table 6. Economic Evaluation of Trial Groups

Parameters	Control	Group I	Group II	Group III	P
TFC, g/chick	5005.28 ^a ± 31.00	4861.65 ^{ab} ± 64.73	4803.28 ^b ± 53.65	4772.02 ^b ± 55.08	0.017
FC, €/chick	1.51 ^a ± 0.009	1.46 ^{ab} ± 0.019	1.44 ^b ± 0.016	1.41 ^b ± 0.016	0.001
ABW, kg/chick	2605.70 ^b ± 21.78	2644.41 ^{ab} ± 33.37	2738.72 ^a ± 25.92	2650.16 ^{ab} ± 25.91	0.019
EPEF Value	309.86 ^b ± 12.08	326.11 ^{ab} ± 5.06	353.07 ^a ± 5.48	335.38 ^{ab} ± 9.66	0.010
EBI Value	304.21 ^b ± 11.94	320.29 ^{ab} ± 4.97	346.98 ^a ± 9.56	329.48 ^{ab} ± 5.43	0.009

Feed prices has been calculated taking into consideration the T.C. Central Bank's exchange rate dated 25.11.2016 (1 Euro=3,64₺).

(TFC) Total Feed Consumption; (ABW) Average Body weight; (FC) Feed Cost

(EPEF) European Production Efficiency Factor = Body weight (kg) x Viability (%) / FCR (kg feed/kg gain) x Age (42 d)

(EBI) European Broiler Index = (Average Daily Gain (g/chick/d) x Viability (%)) / (10xFCR (kg feed/kg gain))

Betaine supplementation may stimulate protection of the intestinal epithelium against osmotic disturbances and improve digestion, absorption and nutrient utilization in broiler chickens (Mahmoudnia and Madani, 2012). Betaine supplementation of diets with adequate methyl group donors improves weight gain and feed efficiency by approximately 3-5% (Hassan et al., 2005). Ezzat et al. (2011) found that economic efficiency was improved by betaine supplementation in the Matrouh poultry strain from 24-36 weeks of age under hot Egyptian summer conditions. Zayed (2012), reported that the economic efficiency was increased by feeding turkeys a diet supplemented with 0.75 or 1.5 g betaine/kg in summer conditions.

Conclusion

Particularly in recent years, the spread of genetically modified soy varieties has increased the demand for natural and different protein sources. If all of the yield characteristics are taken into consideration, it is possible to safely use Bromass, which is obtained by special methods, at up to 6% in broiler rations as a performance enhancer different protein source. Moreover, we conclude that the use of Bromass at the 3% level in broiler ratios facilitated the development of chickens by optimizing the use of nutrients in the rations and thus provided an economic benefit.

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USE OF DIFFERENT GRAPHICS PROCESSING UNIT ARCHITECTURES TO ANALYZE VARIANCE IN HASH CRACKING RATE AND REAL WORLD IMPLICATIONS OF PASSWORD CREATION BY USERS

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Abstract: The study looks at using different graphics processing Unit (GPU) architectures to analyze variance in hash cracking rate and real world implications of password creation by users. The study has two tests; the first experiment is coded with a benchmark setup where the two GPU Architectures are compared based on their hash cracking rates. The second proves which GPU Architecture performs better based on mean average using t – test of Independent Means. The third shows the implications of the raw results of the first experiment, it puts into practical use of real, randomly sampled hashes collected from a leaked database. Which is then decrypted using “hashcat”. The first experiment’s results are put through ANOVA to see if there is variance between GPU Architecture and Hash Cracking Rate. The Pascal and Maxwell architectures are used as a sample since they represent what a user would typically have in a system. However, the use different GPU Architectures show that there is no variance between the hash-cracking rates after being tested in ANOVA, which showed a P-Value of 0.084 at a significance level of 0.05. The second experiment proves that there is a significant difference between the Maxwell and Pascal Architecture, with Pascal having the higher average. Additionally, the recent GPU Architecture (Pascal) is utilized for its practical application of Hash Cracking Rate in five trials with a preset number of hashes, which proved to be intriguing due to the time taken for the randomly sampled hashes to get decrypted. The findings may be useful in the password creation and security of all individuals that use online services that require password creation.

Keywords: *Graphics Processing Unit (GPU), hash cracking, hashcat, Pascal architecture, Maxwell architecture*

Introduction

The use of passwords nowadays are common, anyone with some sort of Internet presence uses a password. Passwords are what keeps our online life, such as banking, email logins, computer logins, and more safe and secure. However, these can get compromised, it can be from password leaks, user ignorance, and password cracking/decrypting. Focusing on password cracking, specifically hashtypes, these are what plaintext passwords get encrypted to when they are registered by the user, however according to Kioon, et al., (2013), hastypes such as the Message Digest 5 (MD5) hash function, which is one of the most commonly used protocols, may contain security risks.

There are many types of attacks that can decrypt hash functions, the most common are the brute force attack, and dictionary attacks. With each method of attack has its strengths regarding efficiency and time taken, however there are also downsides. Based on a review done by Suchithra, et al., (2014), there is a set spectrum of possibilities regarding password cracking attacks. This review focuses on the information available to the attacker on the victim and the corresponding type of attack to use. Focusing one type of attack, brute force, it is the use of a multitude of potential alphanumeric combinations while having the ability of using non-dictionary words on the hash making it viable for more complex passwords.

Graphics Processing Units (GPU) was chosen instead of Central Processing Units (CPU) due to the fact that GPU's have many more cores. Supported by Nickolls and Kirk (n.d.), CPU's typically have an average of 4-8 cores with 8-16 threads (as of 2017). While GPU's can have hundreds of cores with thousands of threads, with more expensive models going further than that. With this information it can be inferred that GPU's may have better processing capabilities when faced with graphically intensive workloads, or workloads that require many cores (in this case has computing). Additionally, Graphics Processing Units are found and used in many computers nowadays, their most basic function is to render 2D and 3D graphics, images, and video that allow operating systems, graphical user interfaces, video games, and many more. The more advanced functions are used for highly multithreaded applications such as visual computing that provide real-time visual interaction with rendered objects through graphics, images, and video Nickolls and Kirk (n.d.). Graphics Processing Units are normally paired with Central Processing Units since the Central Processing Unit instructs the Graphics Processing Unit on the tasks that need to be done.

Numerous studies have been found on password cracking. Each using different methods, hardware and programs. Methods such as the brute force which tries every combination of hash, dictionary that use a predefined wordlist to compare against, and rainbow table attacks that use a space-time tradeoff algorithm that is similar to the dictionary attack. Hardware, in regards to using a different processing unit in this case using the Graphics Processing Unit (GPU) over the Central Processing Unit (CPU), since GPU's have more working cores, therefore allowing faster processing, according to Nickolls and Kirk (n.d.). Finally, the different use of hash cracking programs such as "hashcat", developed by Jens 'atom' Steube, "john the ripper", developed by Alexander Peslyak, and "cain and abel", developed by Massimiliano Montoro, all programs are open source, with each program having respective strengths and weaknesses are stated.

Useful information regarding the use of dictionary attacks can be found in (Olson, 2007) paper, which analyzed the simple ways to solve ciphers using a system called the dictionary attack, in which several optimizations were described as well as methods for effectively dealing with non dictionary words. It also reveals quantitative performance results for several variations of the approach, in addition to other implementations presented. However, the algorithm used in the experiment did not include non-English words and letters, and it was stated in the paper that it could be done provided it receives modifications.

In addition, (Weir, 2010) details new ways that information using probability can be used to maximize the success rate of hash cracking attacks. "From evaluating the usefulness of known techniques and models to creating unique techniques such as using probabilistic context others". In contrast, the paper does not cover the possibility of future ways of password creation, human nature, and future encryption technologies. While new types of prevention were created, there were also new ways to crack them.

In a similar study, (Sprengers, 2011) focuses on requirements regarding security and properties of password hashing techniques. Using a GPU to show a proof of concept that launches intensive processes to process data instead of a CPU to increase maximum hash rates. For future work, it would be able to intrigue, implement and optimize other password cracking methods, such as SHA-crypt, bcrypt, Windows NLTM, and Oracle's proprietary scheme. To add, it would be valuable to observe how Nvidia Graphics Processing Units perform compared to other chipsets manufactured by other companies.

All Processing Units (CPU, GPU, following), have what is called a core, in Central Processing Units these typically have an average of 4-8 cores. According to Nanekaran and Ahmadi (2013), these are units that read and execute program instructions. Using common sense, more cores usually means more power, however it also means more energy is consumed. This is where threads are introduced, these threads are not physical, but they do increase the power of a processor by significantly reducing the time taken to process a command by queuing the next task beforehand. The benefits of threads range from video editing, 3D rendering and heavy multitasking.

This is supported by: Information regarding multi-core processing of Nanekaran and Ahmadi (2013), which describes the trends of increasing speed a processor gets when more cores are added. It also shows the basic layout of a typical CPU, and shows the advantages of using certain layouts, advantages and disadvantages.

As regards to password cracking optimization methods, (Yiannis, 2013) describes the most popular types of password cracking techniques and creates optimized attacks using other techniques which optimize for performance such as the hybrid attack that utilizes rainbow table and wordlist algorithm, which used a leaked

database (Phpb) as a data set. However, at the time of data gathering, the paper's data set had not been 100% recovered (password database leak), therefore the whole list could not be used for the experiment since certain password were not recovered and multiple hashes are to be used for the experiment.

Additionally, (Kioon et al., 2013) analyzes the security strength of the Message Digest 5 (MD5) hashing algorithm and what happens if external algorithms such as salts and iterative hashing are used to further encrypt the hash. It states that the use of those external algorithms in the paper make it difficult for attackers to crack hashes as it has more characters in the hash. The researchers have also conducted an experiment with improved hashes using the external algorithms and most of time each attack or application has failed to crack the selected hash. The usage of the MD5 hashtype in this paper is towards decrypting it to show a practical application of password cracking in terms of real world implications.

In addition to that, (Suchithra et al., 2014) describes the different types/methods of how passwords are encrypted and stored onto servers. Also, he further stated the different ways to decrypt said passwords. Out of the varying types and methods stated in the paper, this paper focuses on one method, the brute force benchmark. This attack is used since the storage requirements for the files of the dictionary attack and the rainbow table attack are too large, ranging from Gigabytes to Terabytes.

Furthermore, the study conducted by (Kulkarni, 2015) and (Chester, 2015) examines how password cracking terms and modern applications that crack passwords. It also explains how implementations of two hash-based password-cracking algorithms are developed. This study as well as Kulkarni's talk about password cracking but this study specifies on applications and utilizes only one form of attack which was used for this paper as well.

In regards to multiple types of attacks for password cracking, (Kulkarni, 2015) discusses different methods of password attacks, various countermeasures for said password attacks, different authentication methods, and an analysis of different password attacks and their relative countermeasures. As the paper focuses on the brute force benchmark, this paper gives a more defined analysis on the said attack (other attacks as well) as well as their respective countermeasures.

With regards to password cracking and its possible effects to the society, (Hranicky' et al., 2016) explains how information (passwords in this case) was leaked by "hackers". It also touches on how forensic experts legally decipher suspects' data as well as how they conduct password recovery.

Hong, (2016) emphasized on the "rainbow tradeoff" algorithm, auxiliary techniques were used to reduce the time taken for the algorithm to complete its goal. However, it requires delicate manipulations of the random function, therefore, making it a challenging task. While these techniques were not conducted due to the current timeframe and were not part of the experiment proper, this paper gave a better insight on how password recovery can be more efficient with these said techniques. Although it required careful manipulation and holds a large amount of risks, it showed how quick and efficient password recovery can be if done correctly. Another thing to consider, it does not use other forms of algorithms but does consider the possible outcomes with errors within the used algorithm.

Nickolls and Kirk (n.d.) focuses on GPU system architectures, its framework, and describes each parts functions. The paper also featured how each feature can be used to its best performance. Additionally, the paper defines the many uses for GPU's and it's architecture. It also introduces how Moore's law interacts with GPU's.

This paper is based on a research done by Chester (2015) on Analysis of Password Cracking Methods and Applications, which focuses on the various methods of password cracking and multiple applications for password cracking with varying results with the same number of hashes. Out of all the possible methods and applications found in the research, the paper focuses on the application "Hashcat" as it is the research tool being used. "Hashcat" is a commonly used program among hackers due to it being quick and efficient. In terms of its efficiency, it has a large amount of possible hashes that can crack and can do various attacks such as the Brute Force attack that are used for the paper.

The findings of this study aims to show the relative simplicity or complexity of how passwords get decrypted. It also aims to enlighten users on password strength and how to create them properly. With the rise of new security technology, users believe that their data is safe and they have nothing to fear. However, there is also an amount of ways to get through the vulnerabilities and steal data. Every individual with an online presence is impacted since

they input their passwords day to day, with more than 80% of users using the same password with different variations according to a survey done by Dalieda (2017).

This research experiment determines the correlation of the use of different Graphics Processing Unit architectures to the rate of decrypting multiple hashtypes. There are many different methods of attacks and many different types of hash functioning. The first experiment utilizes the most common hashtypes, ranging from MD4 to ArubaOS. The next experiment only uses the MD5 hashtype, since it is the most commonly used hashtype, typically obtained from leaked websites or databases. In addition, for the third experiment, hashtypes with plaintext keyspaces over eight are coded to be automatically rejected, since keyspaces with nine and above take up too much time to decrypt. Additionally, ASIC cards are not used in the research since it is not on the “consumer grade” price. Finally, brute force is used for the third experiment, to simulate a scenario where the attacker does not have access to a large dictionary file for a dictionary attack, or a large rainbow table for the rainbow table attack.

The analysis of the experiment is done for only one day, and the data of experiment one has a sample of ninety-six hashtypes, applied to both the Pascal and the Maxwell GPU Architecture. However, some of the hashtypes for the first experiment may not be processed by the GPU because of unforeseen errors. On the other hand, the third experiment contains five trials based solely on the architecture with better results in the experiment to feature the real life implications of hash cracking using the brute force attack method found in hashcat. The second experiment does not take into account the practice of “salting”, which is a process that farther encrypts a hash by providing a unique decryption key. Finally, all hashtypes found in the paper are commonly used hashtypes that originate from sites such as employee database passwords, blogspot logon prompts, and so on.

The researchers would like to seek answers on the following questions:

1. Do the two different GPU architectures (Pascal and Maxwell) process hashes in a way that one surpasses the other in terms of efficiency, regardless of raw performance?
2. How fast can passwords be decrypted using hashcat with either of the specified GPU Architectures (Pascal and Maxwell)?
3. How can users improve their password strength based on the results of this research?

Materials and Methods

This research follows a repeated-measures experimental design. It analyzed the time taken and number of successful passwords decrypted collected by the researchers in a random sample of a leaked database, which allowed the testing of password vulnerability. In more detail, this was a true experimental type of research since it was based on testing various samples. Additionally each item that was examined, in this case hashtypes, were tested in their “natural environment”, which was the computer. The plan of the experiment was to observe the brute force attack on a random sample and analyze the time taken to decrypt the passwords. Lastly, the goal of this research was to spread knowledge on user password creation and security.

The experiment started with the researchers using the hashcat program and created a benchmark for both of the GPU’s to analyze with ANOVA. Additionally, a random sample of five hundred hashes were subjected to brute force attack for five consecutive times, the time was recorded and analyzed. The control setup for the experiment was the i3-4150 Central Processing Unit to simulate hashrates with a consumer end system. Additionally, the treatment setup was the GTX 750ti and GTX 1050ti Graphics Processing Units, for the “enhanced” hashrates and password cracking times.

In this paper, two GPU’s from different generations utilized (Pascal and Maxwell) to determine if the architectures of the said GPUs’ process data differently (hashes). This paper acknowledges Moore’s law (1965), however it does not take the law into account since efficiency of the architectures was being observed and not the difference in raw performance.

This study was based on analyzing the rate at which a hash is cracked and what GPU Architecture was more suited for cracking hashtypes. The study was conducted on a consumer grade computer using two different GPU’s. This was done because the study required the researchers to collect and code the program needed to decrypt the password. Upon completion, the study was able to identify GPU Architecture that was most effective in terms of decrypting passwords.

Results and Discussion

The study was intended to know if either of the two Graphics Processing Unit Architectures processed hashes in a different mechanism due to the different ways that the Architectures are handled. As previously stated, a sample of ninety-six (96) hash-types, and three trials for both GPU Architectures used. On this sample, the experiment was conducted to find out if GPU's are changing the way that hashes are handled by GPU's for every new generation GPU Architecture. The results were then analyzed using ANOVA to determine if there was any observable difference when it comes to variance in efficiency.

After the first experiment, the researchers found out that the Pascal GPU architecture was superior to the Maxwell architecture. In addition, after the data was tested in ANOVA, there was no evidence that there was a variation in mean of the hashrates. Therefore, the Maxwell GPU Architecture has no advantages over the Pascal GPU Architecture. In addition, both GPU Architectures were not able to complete all benchmarks due to a system error that would not allow it to proceed. During the experiment, two hashtypes were unable to get analyzed due to the following error: "clGetEventProfilingInfo(): CL_OUT_OF_RESOURCES", this indicated that the GPU Architectures cannot process such a hash.

For the third experiment, the data gathered showed promising results. Since the practical usage of a consumer grade GPU to crack hashes was relatively simple. It took only minutes to be able to crack five hundred randomly sampled hashes in one go. However, the researchers coded the brute force attack to reject hashes that ranged greater than eight keyspaces due to the results of a pilot study conducted prior to this research, which resulted in cracking rates that estimated in an exponential growth per added key-space. Therefore, even though GPU's can process hashes with relative ease but this does not count passwords that have keyspaces greater than eight.

Table 1. ANOVA computation (experiment 1)

Source of Variation	Df	SS	MS	F	P-Value
Treatments	5	47648817.66	9529763.532	1.9533	0.084
Error	558	2722434530	4878914.928		
Total	563	2770083348			

Table 1 shows the process of ANOVA at $\alpha=0.05$ and the data that was put into the test. As can be seen, the P value of 0.084 is greater than α level of 0.05. It means that there is no significant difference among the means of the groups.

However, once the groups were analyzed, the experiment shows that there is no variance between the mean average of the two groups. This means that the two GPU Architectures used in the experiment perform at similar efficiency. Additionally, this may not be the case for other solutions for hash cracking such as ASIC cards as mentioned previously.

Table 2. t - test of Independent Means

	x	sd	df	t	p	Interpretation
Pascal	1658.708	2.568	562	3.136	0.00	Significant
Maxwell	1077.422	1.759		3.136		

At $\alpha=0.05$, significant if $p < 0.05$

Table 2 shows that t-test of Independent Means between the Pascal and Maxwell groups. It shows that the mean of the Pascal group is greater than the Maxwell group. Additionally, the p value of 0.00 is less than $\alpha=0.05$, therefore there is significant difference between the means of the Pascal and Maxwell groups.

Table 3. *Time Taken for Pascal GPU to crack 500 Hashes (experiment 2)*

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Pascal GPU	0:28:19	0:19:21	0:25:03	0:27:26	0:25:01
In seconds	1699s	1161s	1503s	1646s	1501s

Many promising results can be seen from the results of table 3, as it reveals the speed at which hashes can be cracked. It shows that 500 MD5 hashes can be cracked within 30 minutes. This is an alarming result, considering the hardware used in the experiment can be easily acquired and allow individuals to decrypt passwords.

However, as mentioned previously, the passwords are only limited to eight keyspaces due to the exponential processing power required to proceed further. Therefore, it may be safer to use keyspaces that are greater than eight, due to the fact that it takes more time for individuals to decrypt the hash.

Conclusion

Password security is a widespread issue in current times. Every person with any kind of online presence uses one to protect his or her information, accounts, etc. Due to the use of poor passwords created by the users, hackers are able to exploit that vulnerability and are able to decrypt their passwords. This paper has shown the theoretical and practical side of password cracking, furthermore, its implications in the real world, with the decryption of the Message Digest 5 (MD5) hashtype. Results of the study concludes that the usage of different Graphics Processing Unit (GPU) Architectures does not have a varying difference from architecture to architecture, proving that the methods used by each Architecture to decrypt passwords is essentially the same. Elaborating further, it means that there is no specific consumer GPU Architecture that is specifically specialized for tasks such as password cracking. The results of the second experiment show how simple it is to crack hashes. Practical uses of this software paired with consumer grade GPU's can be used by hackers and potentially target a user with sensitive information, sniff their hashes, and cracking the hash within minutes.

The hypothesis of the study stated that the use of the Maxwell GPU Architecture has a hashrate mean that is more significant than the rest. The results of the study prove the hypothesis wrong with the use of one-way ANOVA. However, there are specialized graphics cards that are used by data centers and supercomputers that excel in processing large chunks of data at a time, which most of the time, hackers do not have therefore not a part of this research as mentioned previously.

Implications of this research are that newer GPU Architectures are able to decrypt passwords quicker, thereby allowing hackers to target a user, and withdraw their data, given that the user's password is within eight characters. Therefore this paper implies that users should use passwords than nine characters to circumvent a brute force attack against the user's password. However, simply using a long obvious password such as "password123" is not advisable, while it does stop the brute force attack but not the dictionary attack. Therefore, a recommended password should be a character which is over eight characters long and it should have random characters, an example would be "d#fd@g\$4hs%!", which circumvents both the brute for and the dictionary attack. Finally, it is recommended to use different password for each account, so that when one account does get compromised, none of the other accounts get compromised.

In the future, studies should include testing for more GPU Architectures. In addition, the use of specialized ASIC cards as mentioned previously. This should be explored so that factors such as GPU Architectures outside of Pascal and Maxwell can be accounted to allow for more data accuracy.

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USE OF JUNIPER ESSENTIAL OIL IN QUAIL DIETS AS A NATURAL ANTIOXIDANT INSTEAD OF SYNTHETIC ANTIOXIDANTS

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Abstract

This study for safe and natural alternative to reduce over-dependence on the use of antibiotic aimed to evaluation of the effects of Juniper oil on growth performance and meat quality of quails. A total of 1000 1-day-old Pharaoh (*Coturnix coturnix Pharaoh*) quails, including both males and females, were divided into four groups containing 250 quails and treated as follows: (1) a control group with 0 mg volatile oil/kg of diet; (2) 100 mg/kg juniper oil plus; (3) 150 mg/kg juniper oil and (4) 200 mg/kg juniper oil. The diets were prepared fresh for each treatment. The experiment was carried out for 42 days. The results of the study showed that the supplementation of Juniper oil (100 and 150 mg/kg) caused a significant ($p < 0.05$) increase in live weight, live weight gain and carcass yields during the growing and finishing periods. But feed intake and FCR were not significantly influenced by treatments. The quails fed with rations containing the Juniper oil had reduced ($p < 0.05$) thiobarbuturic acid levels (TBA) in raw thigh meat samples at different storage time. And at this study was determined that Juniper oil has a significant antioxidant activity in preventing lipid oxidation in stored meat. In conclusion, natural antioxidants as a juniper oil have been used instead of synthetic antioxidants to retard lipid oxidation in animal diets to improve meat products quality and animal performance.

Key Words: antioxidant, juniper, MDA, performance, quail

Introduction

In animal nutrition, the utilisation of plant extracts such as volatile oils (VO) in livestock production has expanded after the ban of the use of antibiotic growth promoters including ionophores, in livestock nutrition (OJEU, 2003). Aromatic plants, herbs and various plant extracts have received increased attention as possible antibiotic growth promoter replacements. As a result, new commercial additives of plant origin, considered to be natural products that consumers would accept, have been proposed to livestock producers.

Free radicals are atoms or groups of atoms with an odd (unpaired) number of electrons and can be formed when oxygen interacts with certain molecules. Free radicals are types of Reactive Oxygen Species (ROS), which include all highly reactive, oxygen-containing molecules such as the hydroxyl radical, the super oxide anion radical and hydrogen peroxide (Kohen and Gati, 2000). Their chief danger comes from the damage they can do when they react with important cellular components such as DNA, or the cell membrane. To prevent free radical damage the body has a defense system of *antioxidants*. Antioxidants can control the destruction of biomolecules caused by free radicals. Although there are several enzyme systems within the body that scavenge free radicals, the principle micronutrient (vitamin) antioxidants are vitamin E, beta-carotene, and vitamin C. Additionally, butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) are two major synthetic antioxidants, with a wide range of usage in food industries. Because of the side effects of artificial antioxidants, replacement of them with natural antioxidants is highly considered (Parke and Lewis, 1992). Over the years, synthetic antioxidants such as hydroxyanisole, butylated hydroxytoluene and tertiary butyl hydroquinone have been widely used to preserve meat (Fasseas *et al.*, 2007). The use of these antioxidants has been questionable since they have been discovered to possess toxic, pathenogenic and carcinogenic effects to humans and animals (Hayes *et al.*, 2010). Hence there has been a growing interest in the use of natural antioxidants (Jung *et al.*, 2010). It has also been reported that these natural antioxidants, especially of plant source, have greater application potential for consumer's acceptability, palatability, stability and shelf-life of meat products (Jung *et al.*, 2010).

The genus *Juniperus* consists of approximately 68 species and 36 varieties. *J. communis* is the only *Juniperus* species that occurs in both hemispheres (Adams, 2000). In Turkish folk medicine, the fruits of *J. communis* are used as diuretic, stomachic and antiseptic (Baytop, 1999). There are some studies about the constituents of the fruit of *J. communis* where polyphenols, polyphenol esters and monoterpene hydrocarbons (Ochacka *et al.*, 1996) were isolated. The antioxidant effects of aromatic plants occur due to the presence of hydroxyl groups in their phenolic compounds (Shahidi and Wanasundara, 1992). On the basis of the results of studies, juniper extracts have significant antioxidant activity against various antioxidant systems in vitro; moreover juniper fruit can be used as

an easily accessible source of natural antioxidants. The various antioxidant mechanisms of juniper extracts may be attributed to strong hydrogen donating ability, a metal chelating ability and their effectiveness as good scavengers of hydrogen peroxide, superoxide and free radicals. In addition, phenolic compounds appear to be responsible for the antioxidant activity of juniper. The present study was conducted to evaluate the *Juniper communis* volatile oils, on performance parameters and the susceptibility of raw quail breast meat to lipid oxidation during different storage periods.

Material And Methods

Animals, Diets and Experimental Design

A total of 1000 1-day-old Pharaoh (*Coturnix coturnix Pharaoh*) quails, including both males and females, were obtained from the Uludag University Animal Health and Production, Research and Application Centre of quail breeding (Bursa, Turkey). The study protocol was approved by Ethics Committee of Uludag University. The quails were randomly allocated to one control group and three treatment groups containing 250 quails. Each group was randomly divided into five subgroups, comprised of 50 quails each. Newly hatched chicks in all of the groups were reared under the same growing conditions, in brooding cages (colony type) in an open-sided house with mechanical ventilation. The quails were transferred randomly at the fourth week of age from the growing cages to laying cages (100 cm wide, 45 cm deep, 21 cm high in front, and 17 cm high in the rear, 112.5 cm² per quail) and housed there until the end of the study. All of the chicks were brooded and reared at 28 °C for the 1st wk, 27 °C for the 2nd wk, 24 °C for the 3rd wk, and 18–21 °C from the 28th day until the quails reached 42 days of age. The quails received a basal diet (maize and soya bean based; 24.0 % crude protein; 12.2 MJ/kg ME) that was formulated to meet the NRC (1994) requirements for nutrients, including vitamins and minerals. The diet did not contain antibiotics, coccidiostats or growth promoters. The content of the basal diet is presented in Table 1. Group feeding was used in all treatment groups. Volatile oil dosages added to diet were chosen based on information from the literature and from the effective dosage from a previous study (Florou-Paneri *et al.*, 2005; Yesilbag *et al.*, 2011). There were 4 treatment groups: (1) a control group with 0 mg volatile oil/kg of diet; (2) 100 mg/kg juniper oil plus; (3) 150 mg/kg juniper oil and (4) 200 mg/kg juniper oil. The diet was fed to the quails in the form of mash and water *ad libitum* throughout the entire experimental period (42 d). A 24- h constant lighting program was also maintained throughout the experimental period.

The nutritional composition of the diets was determined according to the AOAC (2000). Metabolisable energy (ME) levels of diets were estimated using the equation of Carpenter and Clegg (Leeson and Summers, 2001): ME, kcal/kg = 53+ 38 [(CP, %) + (2.25 x ether extract, %) + (1.1 x starch, %) + (1.05 x sugar, %)].

Performance Parameters

The quails were weighed individually at the beginning of the experimental period, after which the animals were weighed weekly to calculate live weight gains (LWG). Mortality was recorded when it occurred. Feed consumption was recorded weekly and expressed as g per quail per week. The feed conversion ratio (FCR) was calculated as kg feed per kg body weight gain. At the end of the experimental period, the sex ratio was established in each group and 20 male quails of each group (4 male quails from each replicate) were randomly selected and weighed to determine the carcass yield (CY). At the end of the experimental period, blood samples (2 ml) were taken from the axillary vein of 20 quail from each group and put into glass collecting tubes without coagulant. The quails were slaughtered by severing the jugular vein. The inert organs, heads and feet were removed after the carcasses were passed through a poultry defeathering machine. The chilled carcass weights were determined after allocation 18 hours at 4°C, and then the CY was calculated. Blood samples were collected in glass serum-collecting tubes without coagulant and heparin-coated tubes.

Determination of Volatile Oils in Juniperus

Gas chromatography analysis was carried out on an Mass Spectrometry-Thermo Polaris Q GC-Thermo Trace GC (Thermo Ficher inc, MA, USA) ultra-fitted with a fused HP5-MS capillary column (Thermo Ficher inc, MA, USA) (30 x 0.25 x film thickness 0.5 µm). The temperature was programmed to rise from 95°C to 240°C at 4°C/min. The injection was performed at 250°C in split mode. Helium gas was used as a carrier at 1.3610 atm. The detection was performed by FID at 250°C, and the injection volume for all samples was 0.1 µl. Chromatograms were determined using MS (mass spectrometer) or MS/MS. The data were calculated using internal standards (Pala-Paul, 2004).

TBA analysis of meat samples

Malondialdehyde (MDA), was measured as a secondary oxidation product according to the TBA method described by Tarladgis *et al.* (1964), using spectrophotometry with some modifications. At the end of the experimental period, 40 breast meat samples (10 meat samples from each group) were tested for TBA analysis. The lipid oxidation value of breast meat samples stored at +4°C was determined on days 1, 7, 15 and 30 post slaughter. A

modification of the 2-thiobarbituric acid method was used, and the results were expressed as the amount of 2-thiobarbituric acid reactive substances (mg malondialdehyde MDA). This method is based on the observation of a red colour that is created by the oxidation of unsaturated fatty acids with thiobarbituric acid (TBA) after heating MDA. For the analyses, 10 g of sample was homogenized with distilled water in a blender and transferred to a Kjeldahl flask, where it was distilled to distillate aggregation by adding 2.5 ml 4 N HCl (Merck, Germany) and 1 ml Antifoam A. The reactant, 5 ml TBA (Merck, Germany), was added to 5 ml distillate and incubated in a boiling water bath for up to 30 min. The final solution and a blank were measured in a spectrophotometer at 538 nm. The absorbance value that was obtained was multiplied by 7.8. The final value was expressed as mg MDA per kg sample.

Statistical Analysis

Statistical analysis was performed using the SPSS (1997) software package for Windows (SPSS Inc., Chicago, IL, USA). One way ANOVA was used to evaluate the effects of essential oil combinations on performance and egg traits. Duncan's test was used as a post-hoc test and the level of significance used in all of the tests was $p < 0.05$ (Dawson and Trapp, 2001).

Results And Discussion

The present study was conducted to investigate different levels of Juniper volatile oil on performance parameters, carcass characteristics, organ weights, and meat MDA level of quails. The ingredients and chemical composition of the diets is presented in Table 1. Volatile oil compositions of juniper plant is shown in Table 2. The α -pinene (89.75%), myrcene (2.12%) and β -pinene (1.20%) were determined to be the main active components for Juniper oil. According to previous studies the main active substances are derived from Juniper oil α -pinene, sabinene, myrcene and β -pinene. Moreover, these researchers stated that these active compounds have high antioxidant and antimicrobial activity due to the presence of phenolic compounds in their structure. The content of juniper volatile oil differs depending on its origin and volatile oil composition of these plants may change during the seasons and also depend on soil and climatic factors.

The effect of dietary juniper oil on some quail performance parameters are presented in Table 3 and Table 4. The dietary treatment of 1-day-old quails with different concentrations of a juniper oil for 6 weeks did not affect feed intake and feed conversion ratio, regardless of the dosage. In this study, significant differences ($p < 0.05$) in LW and LWG were observed. The concentrations of juniper oil 100 mg/kg and 150 mg/kg caused a significant increase in LW and LWG during the growing and finishing periods. Similar to the study increasing concentration of rosemary and oregano oil (140 mg/kg) caused a significant increase in LW and LWG but equal concentrations of rosemary and oregano oil showed a significant decrease in LW and LWG (Yesilbag *et al.*, 2012). Studies on the use of essential oils or oil combinations have yielded inconsistent results. Hernandez *et al.* (2004) reported that the addition of plant extracts to feed mixtures generates reasonably higher weights in broiler chickens. Furthermore, several researchers have reported a growth-promoting mode of action of volatile oils in quails (Denli *et al.*, 2004) and broilers (Jamroz *et al.*, 2003; Halle *et al.*, 2004; Çiftçi *et al.*, 2005). In contrast to these findings, others have suggested that essential oils or oil combinations does not improve body weight gain (Botsoglou *et al.*, 2002; Papageorgiou *et al.*, 2003; Zhang *et al.*, 2005). In addition, in this study, the dietary treatments had significant effects on carcass yield. Addition of Juniper oil at 100 mg/kg caused a significant increase in carcass yield. At the end of the experiment, there were no significant differences among the groups in organ weights. In contradiction, the growth promoting effect of dietary volatile oil supplementation on broiler has been demonstrated in numerous works during the past decade; however, these have been conducted under different management conditions for different breeds, diet compositions, experimental periods, vaccination programs and inclusion levels (Bozkurt *et al.*, 2009). Herbs and herbal extracts have variable effects on performance parameters. Therefore, further scientific research is needed to use volatile oils effectively in poultry feeding, especially because, there was in vivo study related to the efficiency of juniper oil.

The effects of dietary treatment on TBA development in raw breast meat during refrigerated storage at days 1, 15 and 30 are shown in Table 5. The extent of lipid oxidation, as measured by malondialdehyde formation, differed ($p < 0.05$) between treatments at Days 1, 15 and 30. The TBA values were lower in Group II and Group III at Days 15 and 30 compared to the control group and Group I. Herbs contain several compounds that can extend the shelf life and improve the quality of meat products (Liu *et al.*, 1992; Basmacıoğlu *et al.*, 2004). Botsoglou *et al.* (2002) determined that broilers that were given diets enriched in oregano essential oil (50, 100 mg/kg) increased the antioxidative stability of chicken tissue. In addition, dietary administration of rosemary and sage essential oil extract to broilers resulted in a decrease in TBA levels from the Day 3 to Day 9 (Lopez-Bote *et al.*, 1998). Yesilbag *et al.* (2012) detected the lowest TBA values in groups of containing high dosages of rosemary and oregano volatile oil. In this study, the lowest TBA values were determined in groups of (Group II and Group III) containing high dosages of Juniper volatile oil. This result indicated that phenolic compounds from aromatic herbs and extracts could prevent meat from oxidizing (Dorman *et al.*, 2003).

Many plant extracts are an excellent source of natural antioxidants that can improve meat shelf-life and quality mainly by retarding lipid oxidation and microbial growth. Using of oregano oil on meat microbial variation and meat quality has been studied the most, however there is less information about other plants. At this study supplementation of Juniper oil have a positively effect on performance parameters as live weight, live weight gain and feed efficiency. Also the addition of Juniper oil into quail diets improved meat shelf-life. Juniper oil as some other plant extracts have had a positive effect on lipid oxidation by reducing 2-thiobarbituric acid (TBA) or malondialdehyde (MDA) formation on meats during refrigeration storage. But bioavailability of essential volatile oil in meat cannot be directly demonstrated, more research is needed to identify the main metabolic pathway of these compounds and the key essential oil antioxidant compounds deposited in meat. Further research is needed to determine the effects of natural antioxidants on other meat quality characteristics.

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Table 1. Ingredients (g/kg) and chemical composition of the basal diet

Ingredients	g/kg
Corn, grain	443.0
Soybean meal	360.0
Wheat	80.0
Corn gluten	50.0
Vegetable oil	30.0
Ca CO ₃	16.0
Dicalcium phosphate	6.2
Salt	3.0
L Lysine	3.5
DL Methionine	4.0
L Threonine	0.8
Vitamin mineral premix ^a	3.5

<i>Values analyzed, g/kg</i>	
Metabolisable energy ^b , MJ/kg	12.26
Crude protein	246.9
Crude fiber	36.0
Ether extract	50.7
Ash	73.6
Dry matter	880.3

^a Provides (per kg diet): Vitamin A (retinol), 2.4 mg; Vitamin D₃ (cholecalciferol), 0.075 mg; Vitamin E (α -tocopherol acetate), 20 mg; thiamin, 3 mg; riboflavin, 3 mg; pyridoxal, 3.5 mg; cobalamin, 0.01 mg; niacin, 20 mg; panthotenic, 4 mg; folic acid, 1 mg; choline, 600 mg; biotin, 0.03 mg; Mn, 80 mg; Fe, 60 mg; Zn, 60 mg; Cu, 5 mg; I, 1 mg; Co, 0.2; Se, 0.15.

^b Metabolisable energy content of diets was estimated using the equation of Carpenter and Clegg (Leeson and Summers, 2001)

Table 2. Volatile Oil Components of the Juniper Plant (*Juniperus communis*)

<i>Components</i>	<i>(%)</i>
α -Pinene	89.75
Mirsene	2.12
β -pinene	1.20
Terpinolen	0.85
Limonene	0.83
Ý-Terpinene	0.62
α -sedrene	0.45

Table 3. Effect of *Juniperus communis* volatile oil on means of live weight (LW), live weight gain (LWG), feed intake (FI) and feed conversion ratio (FCR) of quails.

	Control			Groups I			Groups II			Groups III			
<i>Juniperus VO (mg/kg)</i>	0			100			150			200			<i>P value</i>
<i>Sex ratio (M/F)</i>	121/109			115/117			108/125			116/119			0.318
<i>LW (g) (n=250)</i>													
1 d	10.79	±	0.08	10.75	±	0.07	10.59	±	0.08	10.57	±	0.07	0.067
14 d	69.77	±	0.48	69.81	±	0.60	71.14	±	0.57	70.29	±	0.44	0.225
28 d	114.35	±	0.96 ^b	119.23	±	0.88 ^a	119.81	±	1.07 ^a	116.67	±	0.70 ^{ab}	0.000
45 d	182.73	±	1.66 ^b	189.68	±	1.61 ^a	190.05	±	1.70 ^a	187.57	±	1.48 ^{ab}	0.004
<i>LWG (g) (n= 250)</i>													
1 to 14 d	58.97	±	0.48	59.07	±	0.60	60.54	±	0.58	59.75	±	0.45	0.128
1 to 28 d	103.51	±	0.96 ^b	108.50	±	0.87 ^a	109.22	±	1.06 ^a	106.13	±	0.70 ^{ab}	0.000
28 to 45 d	68.49	±	1.88	70.45	±	1.88	70.23	±	2.12	71.27	±	1.64	0.756
1 to 45 d	171.90	±	1.67 ^b	178.94	±	1.61 ^a	179.44	±	1.70 ^a	177.01	±	1.47 ^{ab}	0.003
<i>FI (g) (n=5)</i>													
1 to 14 d	195.11	±	9.39	195.59	±	2.73	192.40	±	3.07	192.23	±	9.48	0.978
14 to 28 d	285.24	±	12.31	300.54	±	8.79	295.96	±	7.08	287.01	±	6.74	0.592
28 to 45 d	300.42	±	33.60	259.65	±	19.60	244.46	±	23.00	245.43	±	32.68	0.252
1 to 45 d	743.57	±	24.73	748.87	±	18.77	738.51	±	9.61	722.19	±	4.09	0.690
<i>FCR (g/g) (n=5)</i>													
1 to 14 d	3.31	±	0.16	3.34	±	0.11	3.18	±	0.07	3.21	±	0.12	0.742
14 to 28 d	6.41	±	0.22	6.12	±	0.32	6.16	±	0.27	6.20	±	0.19	0.849
28 to 45	4.39	±	0.48	3.69	±	0.28	3.49	±	0.10	3.44	±	0.23	0.144
1 to 45 d	4.31	±	0.11	4.18	±	0.09	4.12	±	0.07	4.08	±	0.05	0.215

^{a,b} Mean values with different superscripts in the same row differ significantly ($p < 0.05$) VO: Volatile oil M: Male F: Female
LW: Live Weight LWG: Live Weight Gain FI: Feed Intake FCR: Feed Conversion Ratio

Table 4. Effect of *Juniperus communis* volatile oil on carcass quality of Pharaoh quails. (Mean ± std error)

	Control			Groups I			Groups II			Groups III			
<i>Juniperus VO (mg/kg)</i>	0			100			150			200			<i>P value</i>
<i>Carcass characteristic (n=25)</i>													
Body Weight (g)	168.24	±	2.09 ^b	178.36	±	0.98 ^a	170.84	±	2.68 ^{ab}	171.20	±	2.05 ^{ab}	0.005
Hot Carcass Weight (g)	126.02	±	1.13 ^b	139.61	±	0.87 ^a	128.93	±	0.77 ^b	129.20	±	0.82 ^b	0.000
Carcass Yield (%)	75.07	±	0.79 ^b	78.29	±	0.43 ^a	75.84	±	1.06 ^{ab}	75.65	±	0.72 ^{ab}	0.023
<i>Organ Weights (% of LW)</i>													
Heart	1.26	±	0.03 ^{ab}	1.22	±	0.04 ^b	1.36	±	0.05 ^a	1.22	±	0.03 ^b	0.023
Gizzard	2.77	±	0.05	2.86	±	0.08	2.95	±	0.08	2.09	±	0.07	0.320
Liver	2.61	±	0.10	2.51	±	0.13	2.78	±	0.12	2.45	±	0.12	0.236

^{a,b} Mean values with different superscripts in the same row differ significantly (p< 0.05) LW: Live weight

Table 5. Effect of *Juniperus communis* volatile oil on meat TBA (storage of samples at +4 °C) of Pharaoh quails. (Mean ± std error)

	Control		Groups I		Groups II		Groups III		
<i>Juniperus VO (mg/kg)</i>	0		100		150		200		<i>P value</i>
<i>Thiobarbuturic acid</i>									
<i>(TBA mgMDA/kg meat)(n:10)</i>									
1 d.	0.309	± 0.007 ^a	0.211	± 0.009 ^b	0.185	± 0.005 ^b	0.193	± 0.005 ^b	0.000
15 d.	0.556	± 0.33 ^a	0.540	± 0.30 ^a	0.423	± 0.01 ^b	0.401	± 0.01 ^b	0.000
30 d.	1.15	± 0.04 ^a	1.01	± 0.16 ^{ab}	0.68	± 0.01 ^b	0.79	± 0.06 ^b	0.006

^{a,b} Mean values with different superscripts in the same row differ significantly (p< 0.05)

USE OF NEW TECHNOLOGIES TO PROMOTE HEALTH IN TOURISTS WHO TAKE CRUISES ON THE DOURO RIVER – PORTUGAL

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Abstract: The health and well-being of tourists who make river cruises in the river Douro should be a premise of the vessels that realize this type of cruises. This is an exploratory and cross-sectional study, where a questionnaire is being applied, consisting of socio-demographic characteristics, clinical antecedents and issues related to the use of new technologies. The data collection instrument began to be applied in April 2018 to the tourists that carry out the river cruise from Régua to Pinhão and on board the ships of the company Barcadouro. 416 tourists participated in this study. 62,7% are women and 37,3% are men, with a mean age of 54,9 years. 75,2% of the tourists saw the use of a health data platform that would allow their health surveillance to be interesting/very interesting. The existence of a mobile application and a back-office application for database management and information to be provided to tourists and tour operators, respectively, will add value to safety in terms of well-being and health.

Keywords: Data platform, Mobile application, Tourists

Introduction

Tourism in Portugal is increasingly a reality and is constantly growing. For example in 2016, 28,4 million international tourists visited Portugal, with 4,7 million tourists from Spain (25,6% of the total), 3,1 million from the United Kingdom (17,2%), 2,7 million from France (14,7%) and 1,6 million from Germany (8,5%), being that for more than half of the tourists (71,3%) this was not the first time they visited the country (INE, 2017) .

The Douro region is one of the oldest in Portugal, and has been a UNESCO World Heritage since 2001. Here it should be said that the main tourist resources and products of this region of the Douro are (Sousa, Monte, Fernandes, 2013): the wine (where the porto wine is highlighted), the river (which is navigable), the landscape, safety, tranquility and well-being, nature and architectural heritage.

River tourism, in particular on the Douro River, as in the case of tourism in general, is in an upward phase. This type of tourism includes river cruises of several hours, one day, or even several days and possibly complemented by activities of leisure, adventure, gastronomy and visits to the architectural heritage (Nunes, Moreira, Paiva, Cunha, 2016, pg .256).

The waterway of the Douro, in the Portuguese part, has 208km, 5 navigation locks (from 13 to 35 meters), about 60 river piers and develops between the mouth of the river Douro and Barca D'Alva, being the only way to travel nationally that incorporates the Trans-European Transport Network (Via Navegável do Douro, 2018)^{a)}.

Turismo de Portugal, in its action plan for the development of tourism in Portugal, and with regard to international trends, states that there are concerns about health, food and well-being in countries with more affordable costs, such as Portugal (Turismo de Portugal, 2016, p. 28) and where the use of technologies in travel through digital platforms for information consultation and purchase of tourism products is already a reality that has been affirming (Ibidem, 2016, p.31).

It is a fact that health tourism is also growing (Brito, 2015), which is another excellent opportunity for the economic development of the entire Douro region.

The health and well-being of tourists who frequent river cruises on the Douro River should be a premise of vessels that perform such cruises (Guy, Henson, Dotson, 2015, Kim, Woo, Uysal, 2015). And if tourists who want to take cruises, can at the time of booking, request, through mobile applications, various health services according to their

needs, there is no doubt that we will be contributing to the health promotion of tourists who visit the Douro region (Ker-Cheng et al, 2014).

One of the objectives of this study has to do with the evaluation of the health needs of the tourists that go on river cruises in the river Douro and later build a backoffice application and mobile application.

Materials And Methods

This is an exploratory and cross-sectional study, where a questionnaire is being applied, consisting of socio-demographic characteristics, clinical antecedents and issues related to the use of new technologies. The data collection instrument began to be applied in April 2018 to the tourists that carry out the river cruise from Régua to Pinhão and on board the ships of the company Barcadouro.

The data was collected by 2 properly trained research scholarship students, who were oriented towards the project objectives. Data collection took place on board the ships, on the route from Régua to Pinhão, disturbing to a minimum the trip that the tourists were making. The study was authorized by the Ethics Commission of UTAD and the company Barcadouro, as well as the tourists who participated in the study gave their informed consent.

Results And Discussion

416 tourists participated in this study. 62,7% are women and 37,3% are men, with an average age of 54,9 years. 64,7% of tourists are married and 62% have higher education.

39,2% of the tourists are Portuguese and 60,8% are foreigners. Among foreigners, the nationality that stands out the most is the French with 17,1%, followed by the Brazilian with 7,9%, the Canadian with 7,7%, the German with 6,7% and the American with 6,5%, see (Table 1).

Table 1: Nationality of Foreigners

	N	%
American	27	6,5
Australian	10	2,4
Brazilian	33	7,9
Canadian	32	7,7
English	10	2,4
French	71	17,1
Germany	28	6,7
Other nationalities	32	7,7
Portuguese	163	39,2
Spanish	10	2,4
Total	416	100,0

In 2016, 946,728 tourists performed cruises on the Douro River, which represented a growth rate of 31,26% compared to 2015. 71,02% of these tourists were Portuguese, 7,08% American, 5,39% French, 3,81% English, 3,25% German and 1,13% Spanish, very similar numbers to those found in this study (Via Navegável do Douro, 2018)^{b)}.

For 59,6% of the tourists this was the first cruise they made. The reasons for choosing this type of tourism, have to do with knowing the Douro (28,8%), for repetition of the experience (17,1%), curiosity in boating (10,6%) and family/friends invitation (10,3%), see (Table 2).

Table 2: Reasons for choosing this type of tourism

	N	%
Getting to know the Douro	120	28,8
Family / Friends Invitation	43	10,3
Curiosity in Boating	44	10,6
It was part of a tourist route	24	5,8
Repetition of the experience	71	17,1
Recreation	37	8,9
Professional Reasons	6	1,4
Spiritual retreat	2	0,5
Missing	69	16,6
Total	416	100,0

28,6% of tourists have some type of disease or limitation, and 36,1% take medication, see (Table 3). The tourists who take medication, in average, take 2.17 different medications per day.

Table 3: Health problems, medication and medical treatment

Variables		N	%
Health problems	Yes	119	28,6
	No	282	67,8
	Missing	15	3,6
Does medication	Yes	150	36,1
	No	249	59,9
	Missing	17	4,0
Does some medical treatment	Yes	41	9,9
	No	340	81,7
	Missing	35	8,4

75,3% of the tourists saw the use of a health data platform that would allow their health surveillance to be interesting/very interesting, 74,8% considered interesting/very interesting the existence of a mobile application in tour operators, to identify their health needs and 86,3% of the tourists see as interesting/very interesting the presence of a health professional (for example, a nurse) on board of the cruises, see (Table 4).

Table 4: How do you see a health data platform, a mobile application and the presence of a health professional

Variables		N	%
How would you see the use of a health data platform that would allow your health surveillance?	No interest	23	5,5
	Little Interesting	63	15,1
	Interesting	197	47,4
	Very interesting	116	27,9
	Missing	17	4,1
How would you see the existence of a mobile application in tour operators that would allow you to identify your health needs?	No interest	33	7,9
	Little Interesting	59	14,2
	Interesting	202	48,6
	Very interesting	109	26,2
	Missing	13	3,1
How would you see the presence of a health professional (for example, a nurse) on board of the cruises?	No interest	11	2,6
	Little Interesting	37	8,9
	Interesting	211	50,7
	Very interesting	148	35,6
	Missing	9	2,2

In case of re-cruising in the Douro River, 19,2% of the tourists intend to request medical/nursing care services and 11,1% assistance in emergency situations, see (Table 5).

Table 5: Re-cruising and health services

	N	%
Medical / nursing care	80	19,2
Assistance in emergency situations	46	11,1
Missing	290	69,7
Total	416	100,0

Conclusion

If the companies that perform cruises in the Douro River can provide personalized services that meet the needs and expectations of the tourists, the final result will be of greater well-being, greater satisfaction and loyalty to the company (Bauer, 2012; Lujun, Swanson, Xiaohong, 2016).

The existence of a mobile application and a back-office application for database and information management to be provided to tourists and tour operators, respectively, will add value to the safety in terms of well-being and health (Tseng, 2013; Hung-Che, Ching-Chan, Chi-Han, 2018).

It is also a reality that the creation of digital solutions in the health area, are an asset for all citizens and are a necessary bet (Ministério da Saúde, 2018, pg 73).

It is clear that mobile health applications can contribute effectively to the health promotion of the individual, however, further studies and verifications are needed to prove the creation of value for all involved (Baldwin, Singh, Sittig, Giardina, 2017).

Acknowledgements

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UZAKTAN EĞİTİM İLE BİLGİSAYAR OKURYAZARLIĞI DERSİNİN ÖĞRETİM ORTAMI TASARIMI

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Özet

Bilgisayar Okuryazarlığı dersi lisans ve ön lisans programlarında öğrenim görmekte olan öğrencilerin alması gereken bir zorunlu bir derstir. Dersin yüz yüze eğitim ile yürütülmesinde öğretimin ulaşamadığı öğrenci sayısının fazla olması, üniversitenin fiziki imkânlarının ve öğretim elemanlarının iş gücünün etkili kullanılamaması problemleri yaşanmıştır. Bu nedenle, zaman ve mekândan bağımsız, zengin öğrenme ortamları ile donatılmış yeni teknolojilerin kullanıldığı uzaktan öğrenme ortamının kullanımı ihtiyacı ortaya çıkmıştır. Bu çalışmanın amacı, Bilgisayar Okuryazarlığı dersinin uzaktan eğitim teknolojileri kullanılarak yürütülmesi için öğretim tasarımı hazırlamaktır. Uzaktan eğitim ile öğretim tasarımının hazırlanmasında analiz, tasarım, geliştirme, uygulama ve değerlendirme aşamaları ile sistematik bir süreç izlenmiştir. Ders izlencesinde, Avrupa Bilgisayar Yetkinlik Belgesi (ECDL – European Computer Driving Licence)’nin temel modül ve standart modülü dikkate alınarak konu başlıkları oluşturulmuştur. Amaç Analizinde genel amaçlar ve alt amaçlar ortaya konulmuştur. Daha sonra bu amaçlar doğrultusunda ölçme araçları geliştirilmiştir. Ders izlencesi ve 14 haftalık zenginleştirilmiş çevrimdışı ders kaynakları tasarlanıp geliştirilerek Öğrenme Yönetim sisteminde erişilebilir duruma getirilmiştir. Dersin 2015-2016 Bahar yarıyılında pilot uygulaması yapılmış, 2016-2017 Güz döneminde tüm üniversite bu ders uzaktan eğitim ile verilmeye başlanmıştır. Öğrencilerden ve öğretim elemanlarından elde edilen verilerin analizi bu dersi uzaktan eğitim ile yürütmek isteyen akademik ortamlara katkı sağlayacağı düşünülmektedir.

Anahtar Sözcükler: Uzaktan eğitim, öğretim tasarımı, uzaktan eğitim için öğretim tasarımı, bilgisayar okuryazarlığı dersi

THE INSTRUCTIONAL DESIGN OF COMPUTER LITERACY COURSE FOR DISTANCE EDUCATION

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Abstract

Computer literacy course is a required course for undergraduate / graduate students. Problems such as the fact that the number of students that education cannot be reached and the physical facilities of the university and the the work force of teaching staff cannot be used effectively were encountered when carrying out the course with face-to-face training. For this reason, the need to use the distance learning environment in which new technologies equipped with rich learning environments independent of time and space are used has emerged. The purpose of this study is to prepare the instructional design so that the Computer Literacy course can be implemented using distance learning technologies. The instructional design for distance education was followed by a systematic process with analysis, design, development, implementation and evaluation phases. Topics were set up by considering the basic module and standard module of the European Computer Driving License (ECDL) in the creation of the course syllabus. General objectives and sub-objectives were put forward and purpose analysis was established. Then, measurement tools have been developed for these purposes. The course syllabus and 14 weeks of enriched offline course resources have been designed and developed and made accessible to the Learning Management System. The course was piloted in spring semester 2015-2016, and then in the fall semester of 2016-2017 the whole university started to be given this course by distance education. The analysis of the data obtained from the students and the lecturers is thought to contribute to the academic environments that want to carry out this course by distance education.

Keywords: Distance education, instructional design, instructional design for distance education, computer literacy course

3 FAZLI ASENKRON MOTORUN ANFİS YÖNTEMİ İLE YÜK MOMENT KONTROLÜNÜN SAĞLANMASI

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Özet: Asenkron motorların yapısının basit olması yük altında kalkınabilmeleri ve doğrudan yol verme gibi imkanlarının bulunması sebebi ile endüstride DC motorlara karşı tercih edilmesine rağmen DC motorların hızlı moment cevabı ve doğrusal hız kontrolü gibi konularda DC motorlar özel tercih sebebidir.

Son yıllarda kontrol sistemleri ve güç elektroniğindeki gelişmeler sonucunda Asenkron Motorların hız kontrolleri yapılabilmektedir. 1995 yılında ticari olarak kullanıma sunulan Doğrudan Moment Kontrolü (DTC) motor akısı ile momentinin temel kontrol değişkenleri olarak kullanılması, DC sürücülerde yapılan işleme benzer özellik göstermektedir. DTC’de, akı ve momentin her ikisi de bir denetleyici ile kontrol edilir ve PWM ile ilgili gecikmeler ortadan kalkar. Böylece, DC sürücünün sahip olduğu moment kontrol ve doğrudan akı kontrolü ile hızlı cevap verme gibi özellikler elde edilir.

Üç fazlı asenkron motorların hız denetiminde sistemin doğrusal olmayan yapısı, yük momentindeki değişimler, ısı değişimi, rulman gibi ekipmanların hıza bağlı olarak sürtünme katsayılarının değişmesi ve bozucu harmonik etkiler gibi nedenlerden dolayı PID tipi denetleyiciler ile iyi bir sonuç alınamamaktadır.

Bu çalışmada; matlab simulink ortamında Asenkron Motorun doğrudan moment kontrolünde sadece motor akısı ve moment giriş değişkeni olarak alınmayıp; nüve ile sargı ısı, dönen ekipmanların sürtünme katsayısı giriş değişkeni alınarak adaptif sinirsel-bulanık denetimli (ANFIS) bir kontrol yöntemi uygulanmış ve PID denetime göre performans karşılaştırılması yapılmıştır. Çalışma sonucunda, asenkron motorun hız kontrolü simülasyon çalışmasında, yükselme zamanı, aşım, yerleşme zamanı ve sürekli hal hatası gibi performans parametreleri ayarlanarak önerilen denetim sistemi geleneksel PID denetime kıyasla daha iyi bir performans sağlamıştır.

VERGİ BİLİNCİ VE VERGİ AHLAKI KAVRAMININ EĞİTİM BİLİMİ ÖZELİNDE İNCELENMESİ

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Özet

Vergi kamusal hizmetlerin finanse edilmesi, sürekliliğinin sağlanması ve daha nitelikli hizmet sunulması için devletin egemenlik gücüne bağlı olarak topladığı en önemli gelir kalemidir. Şüphesiz ki devletlerin vergiler dışında elde ettiği gelirler söz konusudur. Ancak vergilerin en önemli alternatiflerinin borçlanma ve senyöraj gelirleri olduğu ve söz konusu gelir kalemlerinin ülke ekonomileri üzerinde uzun vadede meydana getirdiği olumsuz durumlar düşünüldüğünde vergi gelirlerinin önemi ortaya çıkmaktadır. Bu sebeple ülkelerin güçlü ve istikrarlı bir ekonomik yapıya sahip olmalarında vergi bilincine sahip bir toplum yapısının olması büyük önem taşımaktadır çünkü vergi bilincine sahip olmayan toplumlarda kayıt dışı ekonomi olgusu oldukça ciddi boyutlara ulaşmaktadır. Bu tür toplumlarda insanlar vergisel yükümlülüklerini zamanında ve etkin bir biçimde yerine getirmek yerine vergiden kaçınma ve vergi kaçırma yoluna gitmektedir. Böyle bir durumun oluşmasında sıklıkla vergi af uygulamalarına gidilmesi de etkili olmaktadır.

Vergi bilinci üst seviyede bir toplumun oluşması çeşitli politikalara başvurarak kısa vadede oluşturulması pek mümkün olmayıp ancak uzun vadede sonuç alınabilecek bir durumdur. Bu çalışmada, ekonomik politikaların yanı sıra eğitim sistemi içerisine başta genel kavramsal çerçevesi ile vergi kavramı olmak üzere vergi bilinci ve vergi ahlakı kavramının dahil edilmesi ile vergi bilinci yüksek bir toplum oluşturulabilir mi? Sorusu çerçevesinde ülkemizdeki mevcut durum değerlendirilecektir.

VERIFICATION OF SIMPLIFIED MODELLING METHOD FOR THERMAL LAG ANALYSIS

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Abstract: Safety equipment used in nuclear power plants is required to maintain its function for safety shutdown and containment integrity during severe accident. However, the high temperature environment resulted from hydrogen explosion during severe accident causes the malfunction of safety equipment. Especially, non-metallic parts of equipment installed inside the metal housing, such as cable and torque switch in actuator of motor operated valve, have been reported as vulnerable in high temperature environment. Therefore, it is important for the non-metallic part temperature during severe accident to be estimated for evaluating the survivability. The temperature estimation is generally through thermal lag analysis.

This study is aimed to estimate the temperatures of non-metallic parts inside safety equipment through thermal lag analysis and verify the results of analysis by comparing with the temperature measured by performing the related experiment to thermal lag. Temperatures on inner and outer surface of specimen composed of stainless steel and insulation materials layers were estimated with computational fluid dynamics analysis. Then, for verifying the results of analysis, an experiment using rapid thermal process equipment was performed with mock-up sample of metal housing.

WEAR BEHAVIOUR OF TiC PARTICLE REINFORCED AZ31 MAGNESIUM ALLOY

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Abstract: In this effort, effect of TiC particle addition in two distinct size (13 and 93 μm) on the sliding wear properties of AZ31 magnesium matrix alloy has been investigated. Composites were produced by powder metallurgy technique and they contains 10 vol.% of TiC particles. Microstructural evaluation showed that the primary α -Mg phase grains surrounded by β -Mg₁₇Al₁₂ and TiC particles which embedded in β -Mg₁₇Al₁₂ phase boundary. The TiC particles exhibited significantly improved sliding wear performance over that of the alloy. Fine TiC particles provided enhanced wear resistance at same volume fraction than did the coarse particles.

Keywords: Magnesium metal matrix composites, TiC particles, Sliding wear

Introduction

A growing competition in manufacturing the highly efficient vehicles in the automotive industry has become a driving force to develop low density alloys [1]. The highest specific strength and low density values of Mg alloys make them attractive for machine elements and engine applications. Magnesium is the lightest structural metallic materials, which has a density about two-thirds that of Al, one quarter of steel, and almost identical to polymers. Mg alloys offer great potential for increasing vehicle efficiency with reducing component weight up to 70 %. [2]. Some Mg based alloys such as AZ91D have found the application in the various automobile parts like seat frame, valve cover, steering wheel and steering column parts [3]. The increased use of magnesium for automotive applications is limited by several technical challenges. These challenges including difficulty in joining with dissimilar materials, low wear resistance, as well as corrosion. Tribological properties of can be improved by incorporation of hard carbide or oxide ceramic particles such as SiC, TiC, Al₂O₃ [4-7]. For instance, well-dispersed SiC within the Mg matrix provide high wear resistance as well as low friction coefficient under sliding wear conditions [8]. Nano-alumina (n-Al₂O₃) particles and carbon nano-tubes (CNTs) reinforced stir cast AZ31 magnesium alloy composites were obtained more resistant in wear than their monolithic alloy [9]. Dry sliding wear behavior of AZ31 Mg alloy composites reinforced with 2 wt.% Al₂O₃ nano-particles were investigated by Korayem et. al [1] using pin-on disc test under normal stresses of 0.5, 1.0 and 1.5 MPa at sliding speeds of 0.5 and 1.5 m/s. They found that grain refinement, higher load-bearing capacity, and improved hardness contribute to wear mechanisms of AZ31 composites.

Mg-based MMCs have many advantages over Mg alloys, such as high mechanical properties, enhanced creep and wear resistance. Several fabrication methods have been adopted to produce Mg-based composites with friction stir processing [5], powder metallurgy method [8], rheocasting [4], die cast [10]. Among them, powder metallurgy method provides a more uniform distribution of particulates in matrix without or less with reactions between matrix and reinforcement phase [11]. However, dry sliding wear of carbide reinforced AZ31 Mg alloy is scarcer. Therefore, this paper attempts to investigate the influence of TiC particulate size on the microstructure and wear properties of AZ31 Mg composites. For this purpose, wear volume and relative wear properties of composites were evaluated by 2D profile and the obtained results were compared with that of AZ31 Mg alloy.

Materials and Methods

In this study, a commercial ingot of AZ31 alloy with the following composition: (in mass %) 3% Al, 1%Zn, 0.3%Mn and Mg balance was chosen as matrix alloy and reinforced with two different size (13 μm and 93 μm) of TiC (99.9%, supplied from Atlantic Equipment Engineering) particles. AZ91 chips (-100 mesh) containing TiC particles were milled for 30 min. Milling experiments were carried out using steel balls (6.36 mm) and a steel vial

as grinding media in Frisch mixer/mill and powders were collided at the speed of 600 rpm. The ball to powder weight ratio (BPR) was kept as 4:1. In order to prevent oxidation during milling vials were sealed and opened inside a glove box under purified Ar gas (99.995%). Finally, three different batches were prepared to constitute of following compositions: AZ31 alloy, AZ31/10 vol.% TiC (13 μm) and AZ31/10 vol.% TiC (93 μm), hereafter referred to as AZ31, AZ31/TiC-13, AZ31/TiC-93. The milled powders were pressed by using a pressure of 30 MPa in a steel mold to form a 20 mm cylindrical compact and then sintered at the temperature of 500 °C. XRD investigations of sintered samples were conducted in a Bruker™ D8 Advanced Series Powder Diffractometer with $\text{CuK}\alpha$ (1.54060 Å) radiation in the 2θ range of 30-70° with 0.02° steps at a rate of 2°/min. The microstructure of sintered samples and worn surfaces were characterized using a scanning electron microscope (FESEM, Zeiss Supra 55, Germany) equipped with an energy dispersive spectrometer (EDS, Bruker). Prior to microstructural investigations, samples are polished and etched with an acetic glycol solution (1 ml HNO_3 , 19 ml distilled water, 20 ml acetic acid, 60 ml diethylene glycol) to reveal grain boundaries of the sintered samples. Wear properties were determined using a dry sliding reciprocating wear instrument (UTS Tribometer T30) by rubbing $\varnothing=6$ mm steel balls (AISI 52100-62 HRC) on the surface of the samples. The round shape samples with radius of 20 mm were used for the tests. The wear tests were conducted at normal atmospheric conditions (25 °C and 50% relative humidity) with a sliding speed of 20 mm s⁻¹, under the normal load 5N for a constant sliding distance of 100 m, with a stroke of 5mm and a frequency of 1 Hz. Results of the wear tests were evaluated according to the volume of the material loss measured by 2D profilometer.

Results and Discussion

Characterization of sintered samples

Figure 1 shows the XRD patterns taken from the sintered samples of AZ31 alloy, AZ31/TiC-13 and AZ31/TiC-93 composite samples. The XRD patterns of the AZ31 alloy exhibited strong diffraction peaks belonging to Mg (card no. 98-005-3767), Al (card no. 98-015-0692) while AZ31/TiC composite samples consisted of the additional diffraction peaks belonging to TiC (card no. 98-019-2036). From the XRD pattern of composite samples, it can be observed that no apparent shift on the position of Mg and Al phases was observed with the addition of TiC. Therefore, it can be suggested that TiC remains stable in the Mg matrix and did not cause strain.

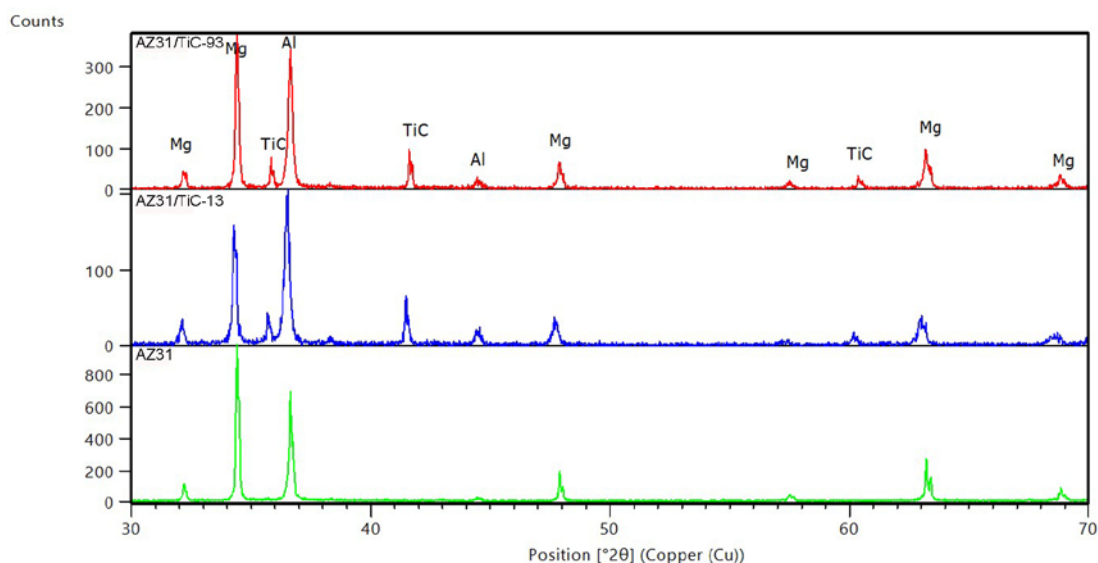


Figure 1. XRD pattern of sintered AZ31 alloy and AZ31/TiC-13 and AZ31/TiC-93 composites.

Low magnification SEM images of sintered AZ31 alloy and TiC reinforced composite samples reveals the overall morphological features. As seen in Fig. 2a, the microstructure of AZ31 alloy comprises the primary α -Mg phase grains surrounded by β - $\text{Mg}_{17}\text{Al}_{12}$ (dark gray phases). Besides, the microstructure of alloy contains small light appearance phases belonging to Al-Zn based precipitates. The morphologies of TiC reinforced AZ31 alloy composites (Fig. 2b and c) revealing remarkably homogeneous dispersion of TiC particles located in a continuous network structure of β - $\text{Mg}_{17}\text{Al}_{12}$. From Fig. 2b and c, it should be noted that primary α -Mg phase grains remain between the network structure of β - $\text{Mg}_{17}\text{Al}_{12}$.

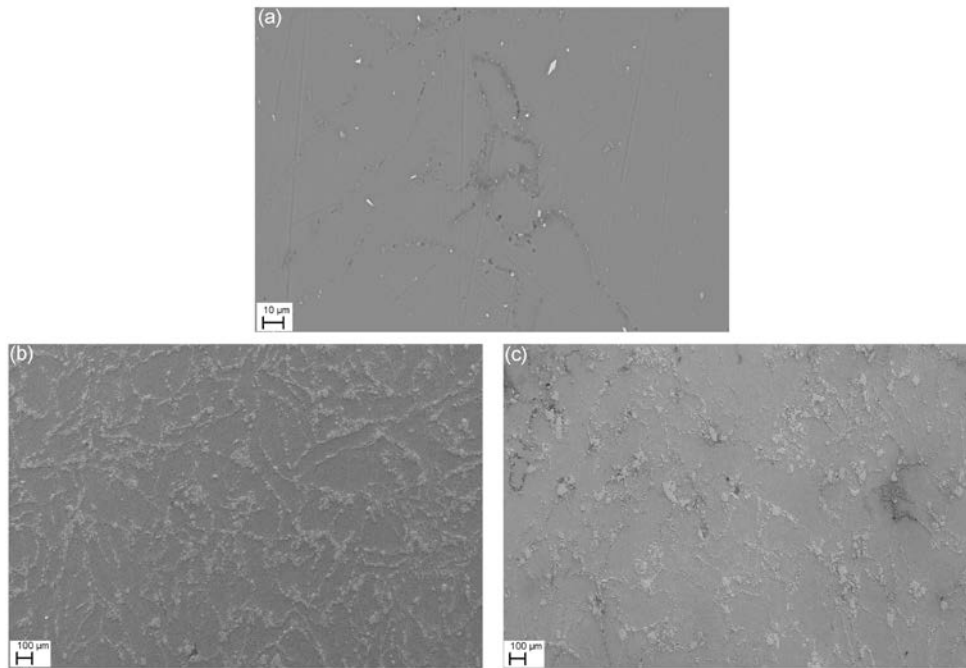


Figure 2. SEM images of sintered (a) AZ31 alloy, (b) AZ31/TiC-13 and (c) AZ31/TiC-93 composite samples.

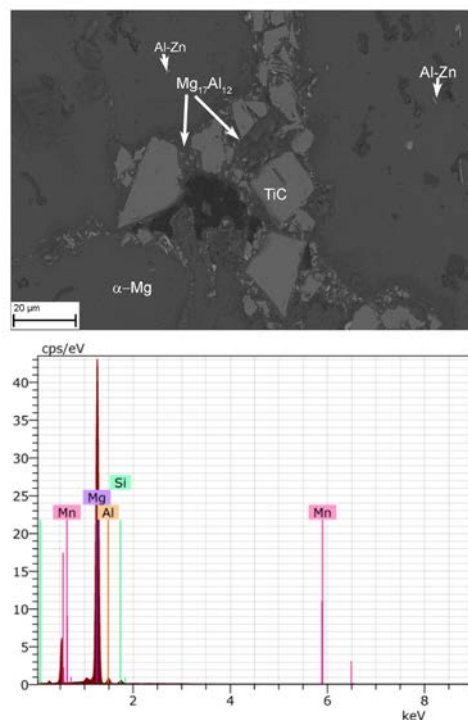


Figure 3. High magnification images of AZ31/TiC-13 sample and corresponding EDS analysis taken from $\text{Mg}_{17}\text{Al}_{12}$ phases.

A high magnification image (Figure 3) taken from AZ31/TiC-13 composite sample reveals presence of angular shaped TiC particles which mainly distributed along the β - $\text{Mg}_{17}\text{Al}_{12}$ phase boundary. Besides, small elongated shaped Al-Zn precipitates embedded in α -Mg matrix was also observed. Smooth carbide interfaces indicate that TiC particles remain stable and no interfacial phase occurred with matrix during sintering. EDS spectra from the dark gray areas shows mainly Mg (56.33 at.%), Al (2.29 at.%) elements with minor amounts of other elements Si (1.33 at.%) and Mn (0.14 at.%). This semi-quantitative analysis indicates that these dark gray areas to be the TiC particles host belong to β - $\text{Mg}_{17}\text{Al}_{12}$ phase.

Sliding wear response

In the present study, wear behavior of the samples was studied against the steel ball under slow sliding wear conditions (0.02 m/s). Wear rate (W_{rate}) was calculated using the following equation: $W_{rate} = V/L \cdot D$, where L is normal load (N) and D is sliding distance (m), respectively. The relative wear rate of the samples was quantified by dividing the wear rate of the base alloy to that of the composites. Wear rate values of the AZ91 alloy and those of the composites containing two distinct size of TiC is given in Figure 4b.

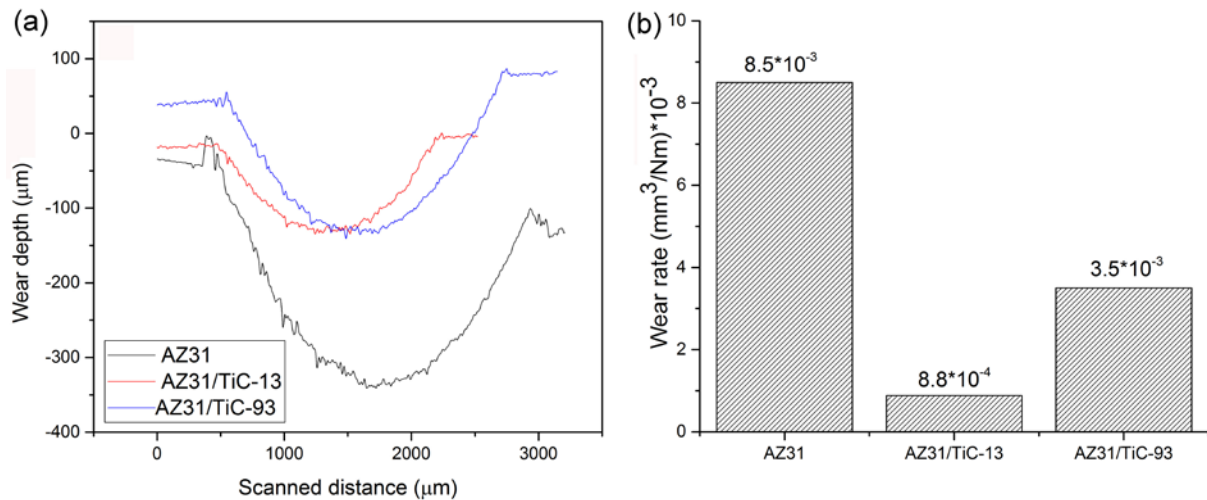


Figure 4. 2D wear track morphologies of AZ31 alloy and AZ31/TiC-13 and AZ31/TiC-93 composites.

It is generally known that the wear performance of composites containing hard reinforcement particles depends on some intrinsic and extrinsic parameters [12, 13]. Matrix microstructure, hardness, interfacial bonding between matrix and reinforcement, volume fraction and particle size of carbides can be listed as intrinsic parameters. Extrinsic parameters cover tribological ones such as sliding speed and distance, applied normal load, hardness of counterpart, etc. In this study, tribological parameters are same for all the samples therefore, the described extrinsic parameters do not affect the wear performance of samples. In the current study, differences in TiC particle size are the major important factor that contributes the wear resistance of composites. The effect of particle size differences on the wear performance of composites was obviously seen in Figure 4. 2D profile images of the wear tracks are given in Fig.4(a) and wear rate values of samples calculated from wear volume values in Fig.4(a) are given in Figure 4(b). Narrow and shallow wear tracks were developed on the surface of TiC reinforced composites as compared to the AZ31 alloy, as seen in Fig. 4(a). Figure 4(b) demonstrates that fine TiC particles has led to a lower wear rate (i.e. higher wear resistance) of AZ31/TiC-13 composite as compared to coarse TiC reinforced AZ31 alloy composite. In addition, AZ31/TiC-13 and AZ31/TiC-93 composite samples exhibit lower wear rate by a factor ~ 9.6 and ~ 2.4, respectively compared to that of AZ31 alloy.

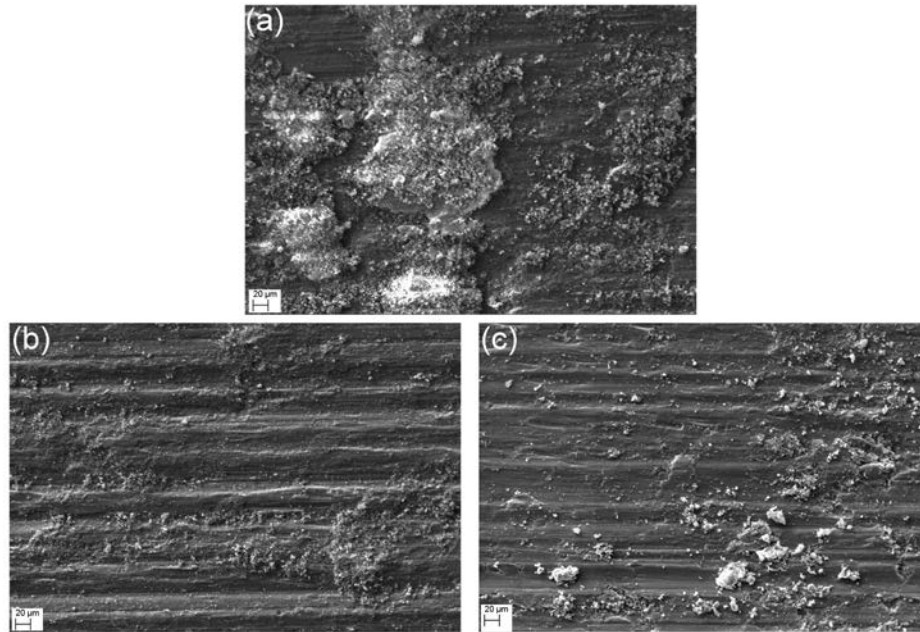


Figure 5. SEM micrographs of wear surfaces generated from reciprocating wear test. (a) AZ31 alloy, (b) fine TiC (13 μm) particles-composite and (c) coarse TiC (93 μm) particle -composite.

SEM images of the typical appearances of the worn surfaces of the sintered AZ31 alloy, AZ31/TiC-13 and AZ31/TiC-93 composites at low magnifications are given in Fig. 5. Substantial amounts of the dimples and adhered oxide particles (wear debris) were observed on the worn surface of the AZ31 alloy (Fig. 5a) revealing that adhesive wear is likely dominant wear mechanism. Deeper and wider grooves developed on the worn surfaces of AZ31/TiC-93 composite sample compared with that of the AZ31/TiC-13 composite. In addition, deep grooves with ploughing and series of fine cracks perpendicular to sliding direction generated on the surfaces of coarse TC particle reinforced composite. As seen from wear surface of the composite samples (Fig. 5b and c) abrasive wear characteristics are identified.

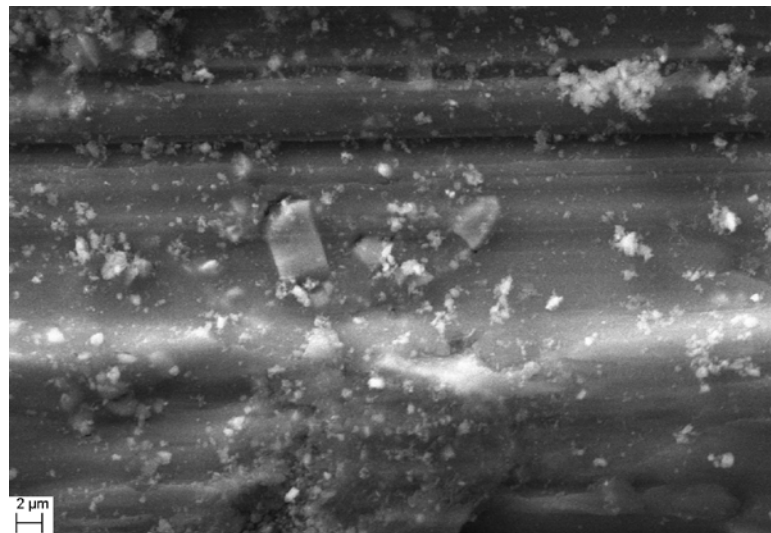


Figure 6. High magnification SEM image from the wear surface of AZ31/TiC-13.

High magnification SEM image from the worn surface of AZ31/TiC-13 composite sample (Figure 6) showing the presence of fine carbide particles tend to align themselves in the sliding direction during wear. The presence of well bonded carbide particles with matrix continuously protect the contact surfaces of AZ31/TiC-13 composite sample against the destructive action of steel ball. This figure also explain the reason of wear rate differences observed between AZ31/TiC-13 and AZ31/TiC-93 composite sample (Fig. 4b). A relatively low wear resistance (i.e., high wear rate) of the coarse TiC reinforced AZ31 composite is believed to arise from the weak bonding

between coarse TiC and Mg matrix material.

Conclusion

The aim of this work was to evaluate the wear behavior of TiC (13 and 93 μm) reinforced AZ31 alloy composites to determine the microstructure and reinforcement size. Based on the obtained results, the following major conclusions were obtained:

1. XRD analysis of sintered samples revealed that main phases Mg, Al and TiC for composite materials and no interfacial product has been occurred after sintering at 500 °C . This is also confirmed by the SEM images which show angular shaped TiC particles having smooth edges distributed along $\beta\text{-Mg}_{17}\text{Al}_{12}$ phase.
2. The decreased TiC reinforcement particle size (13 μm) can be attributed to relatively high wear resistance by factors of 9.6 and 2.4 as compared with AZ31 alloy and AZ31/TiC-93 composite, respectively. SEM image from worn surfaces of AZ31 alloy provide evidence for adhesive and oxidative wear dominant. However, abrasive wear with sign of some ploughing and small cracks perpendicular to sliding direction is the main wear mechanisms for TiC reinforced composites.

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YUMURTA PARAZİTOİTİ TRICHOGRAMMA (HYM:TRICHOGRAMMATIDAE) TÜRLERİNE BESİNLERİN ETKİSİ

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Özet: Biyolojik mücadele çalışmalarında en çok kullanılan etmenlerden birisi yumurta parazitoitleridir. Yumurta parazitoitleri içinde bulunan Trichogramma (Hymenoptera:Trichogrammatidae) türleri, birçok Lepidoptera yumurtalarını parazitleme yeteneğine sahiptir. Bu parazitoitin erginleri doğada çeşitli bitkilerin özleri, polenleri ve ballı maddeleri ile beslenmektedir. Tarım ürünlerine zarar veren böcekler ile mücadelede kullanılabilen bu parazitoitin laboratuvarında kitle üretimleri yapılabilmektedir. Kitle üretim çalışmalarında parazitoitin etkinliğini birçok faktör etkilemektedir. Bu çalışma ile parazitoitin etkinliğine besinin etkisi değerlendirilmiştir. Denemede Trichogramma'nın üç türüne (Trichogramma evanescens, T. brassicae ve T. dendrolimi) besin olarak arı sütü, polen, propolis ve bal verilmiştir. Bir günlük çiftleşmiş dişiye ortalama 50 adet Ephestia kuehniella (Lepidoptera:Pyrilidae) yumurtaları verilmiş ve parazitoitlerin parazitleme oranları, parazitli yumurtalardan erginlerin çıkış oranı, gelişme süreleri ve cinsiyetler oranı belirlenmiştir. Denemeler 26 ± 1 °C, $\%65\pm5$ orantılı nem ve 8:16 aydınlatmalı iklim kabinde 10 tekrarlı olarak yürütülmüştür. Yapılan değerlendirme sonucu, parazitoitin, verilen konukçu yumurtalarını parazitleme oranı, ergin parazitoitlerin çıkış oranı ve cinsiyetler oranı yönünden en iyi sonuçlar T. evanescens türünün bal ile beslenen bireylerinden elde edilmiştir. T. brassicae türüne ait bireylerden ikinci en iyi sonucu alınmıştır. Bal ile beslenen T. evanescens ve T. brassicae bireyleri gelişmelerini 8 günde tamamlamış, diğer 3 besinde ise bu bireyler 9 günde gelişmişlerdir. T. dendrolimi türü ise tüm besinlerde en düşük parazitlemeyi ve en uzun gelişmeyi gerçekleştirmiştir.

YÜKSEKOKUL ÖNCESİ ÖĞRENİMİN SÜRECİNİN ÜNİVERSİTEDEKİ EĞİTİME YANSIMASI

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Özet: Teknolojinin günden güne ilerlemekte olması, ülkemizde gelişen iş alanlarına ve bu alanlardaki rekabete bağlı olarak nitelikli eleman ihtiyacının artmasına neden olmaktadır. Bununla beraber günümüzde endüstri 4.0 ile birlikte gelişen ve teknolojik bir yapıya kavuşan işletmelerde nitelikli elemanın yanında olası problemlere karşı çözüm üretebilen, analitik düşünce yapısına sahip ara eleman tercih sebebi olmaktadır.

Günümüzde istenilen ara elemanı yetiştiren kurumlar arasında Meslek yüksekokulları ve meslek liseleri büyük önem arz etmektedir. Nitelikli ara eleman ihtiyacını karşılamada önemli yere sahip olan Meslek Yüksekokullarını düz lise ve meslek lisesi öğrencileri tercih etmektedir. Meslek yüksekokullarında hazırlanan Eğitim programları, öğrencilerin hazırbulunuşluk durumları göz önüne alınarak temel bilimler ve meslek dersleri olarak iki gruba ayrılmaktadır. Şüphesiz ki öğrencilerin hem Temel bilimlerde hem de mesleki derslerde başarılı olması iş hayatına da olumlu katkı sağlayacaktır.

Bu çalışmada 2016-2017 eğitim öğretim yılında Manisa Celal Bayar Üniversitesi Teknik Bilimler Meslek Yüksekokulundan mezun olan öğrencilerin başarı durumları ile Meslek Yüksekokullarına kaynak olan eğitim programları arasındaki korelasyon sonuçları incelenmiştir. Yöntem olarak Öğrenci kayıt sistemindeki başarı durumları, IBM SPSS programları kullanılarak analiz edilmiş olup korelasyon sonuçlarına bakılmıştır. Çalışmada; yüksekokulumuzu tercih eden düz lise ve meslek lisesi mezunlarının 4 yarıyıllık eğitim sonucundaki başarı durumları, buna etki eden sebepler, başarının artması hususunda alınacak önlemler değerlendirilmiş ve tartışılmıştır. Çalışma sonucunda; meslek lisesi müfredatında meslek derslerinin yanında genel liselerde uygulanan müfredatın eklenerek mezun olacak öğrencilerin hem mesleki derslerde hem de temel bilimlerde yeterli eğitiminin alınması sağlandığında yükseköğretimde daha nitelikli ara eleman yetişmesi sağlanacağı görülmektedir.

Zero Divisors Element of a Ring

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Abstract

In this paper, we focus zero-divisor graph for numerous different structures of rings that domains of the general evaluation domains to the setting of rings with zero-divisor elements. These special rings which contains zero-divisors elements with having some basic “divisible element” situations for its finite elements and special contracture of the ring such as subrings with identity and isomorphic rings with has zero divisor elements are be detailed by some theorems, lemmas and examples. R refer a ring such that \mathbb{R} by its special sets of the prime ideals in \mathbb{R} defined by $I(\mathbb{R})$ are linearly ordered. Moreover, it is denoted the diameter and girth by $D(\mathbb{R})$ and $D(\mathbb{R}[X])$. It is used the model of idealization of a module to compose exercises for this study.

Keywords: rings, zero-divisor graph, prime ideals, ideal of a ring

Introduction

We first note that some basic definitions which are used in the examination of the concepts. Let \mathbb{R} be a commutative ring with 1_R , and let $I(\mathbb{R})$ be the set of zero-divisor elements in this ring. The zero-divisor graph of \mathbb{R} , given by $D(\mathbb{R})$, is the graph with symbols $I(\mathbb{R})^* = I(\mathbb{R}) \setminus \{0\}$, the set of nonzero zero-divisor elements of \mathbb{R} , and for different $a, b \in I(\mathbb{R})^*$ (Selvakumar and Ramanathan, 2016);

The vertices a and b are adjacent if and only if $ab = 0$

(Anderson and Badavi, 2008). Moreover,

\mathbb{R} is an integral domain if and only if $D(\mathbb{R})$ is the empty graph

and,

A nonempty $D(\mathbb{R})$ is finite if and only if \mathbb{R} is finite and not a field

(Anderson and Badavi, 2008; Anderson and Livingston, 1999).

Let GRAF be a graph in the ring. It is presented that GRAF is related if there is path between any two distinct vertices of GRAF . Another expression is that GRAF is completely disconnected if no two vertices of GRAF are adjacent. For vertices a and b of GRAF , we give dab to be the length of a shortest path from a to b in GRAF ($d_{aa} = 0$ and $dab = \infty$) (Anderson and Badawi 2008; Huckaba, 1988).

The diameter of GRAF is $\dim(\text{GRAF}) = \sup\{dab \mid a \text{ and } b \text{ are vertices of } \text{GRAF}\}$.

Linearly Ordered Primes of a Ring

The main research point of this study is to analyse the zero-divisor graph of a ring \mathbb{R} and in this ring, the prime ideals of \mathbb{R} settled in $I(\mathbb{R})$ are linearly ordered. They are exactly the rings \mathbb{R} by the prime ideals of $D(\mathbb{R})$ are linearly ordered, and contain chained rings, divided rings, $\text{CU}\mathbb{R}$ s, $\emptyset\text{-CU}\mathbb{R}$ s, rings with $I(\mathbb{R}) = \text{Nil}(\mathbb{R})$, and zero-dimensional quasilocal rings. It is expressed that $\dim(D(\mathbb{R})) \leq 2$ and $\text{gr}(D(\mathbb{R})) = 3$ or ∞ (Anderson and Badawi 2008).

Theorem. Let \mathbb{R} be a ring and $a, b \in \text{Nil}(\mathbb{R})^*$ be distinct with $ab \neq 0$. In this step $(0: (a, b)) \neq \{0\}$, and also, there is a path of length 2 from a to b in $\text{Nil}(\mathbb{R})^* \subseteq D(\mathbb{R})$. Additionally, if $I(\mathbb{R}) = \text{Nil}(\mathbb{R})$, then $\text{diam}(D(\mathbb{R})) \leq 2$ (Anderson, 2008).

Proof. It is given that $ab \neq 0$ and $a \in \text{Nil}(\mathbb{R})^*$, let $x \geq 2$ be the least positive integer which $a^x b = 0$. Moreover, since $a^{x-1} b \neq 0$ and $b \in \text{Nil}(\mathbb{R})^*$, let $y \geq 2$ be the least positive integer which $a^{x-1} b^y = 0$. In this position $0 \neq a^{x-1} b^{y-1} \in \text{Nil}(\mathbb{R})$ and $a^{x-1} b^{y-1} \in (0: (a, b))$. So, it is clear $a - a^{x-1} b^{y-1} \cdot b$ is a path of length 2 from a to b in $\text{Nil}(\mathbb{R})^*$ (Anderson, 2008).

It is given that if $I(\mathbb{R}) = \text{Nil}(\mathbb{R})$, it is not difficult to determine the diameter of $D(\mathbb{R})$; and additionally, $\dim(D(\mathbb{R})) \neq 3$. Moreover, at this last step $\text{Nil}(\mathbb{R})$ is the single minimal prime ideal of \mathbb{R} and is the only prime ideal of \mathbb{R} subset of $I(\mathbb{R})$; and it could be expressed that the trivial situation that the prime ideals of \mathbb{R} subset of $I(\mathbb{R})$ are linearly ordered (Anderson and Badawi, 2008).

Lemma. Let \mathbb{R} be a ring with $a \in \text{Nil}(\mathbb{R})^*$ and $b \in I(\mathbb{R})^*$. Then $\text{day} \leq 2$ in $D(\mathbb{R})$ (Anderson and Badawi, 2008).

Proof. It is selected that $a \neq b$ and $ab \neq 0$. Since $b \in I(\mathbb{R})^*$ and $ab \neq 0$, there is a $z \in I(\mathbb{R})^* \setminus \{a\}$ so that $bz = 0$. Let n be the least positive integer such that $a^n z = 0$. Then $a - a^{n-1} z - b$ is a path of length 2 from a to b (if $n = 1$, then $a^{n-1} z = z$). So $\text{dab} \leq 2$ in $D(\mathbb{R})$ (Axtel et al., 2005 and Anderson and Badawi, 2008).

It is a correlated relation with the above theorem that;

“The prime ideals of \mathbb{R} contained in $I(\mathbb{R})$ are linearly ordered if and only if the prime ideals of $T(\mathbb{R})$ are linearly ordered” (Dobbs, 1976).

Also, Anderson and Livingston (1999) show that

“A non - reducible ring \mathbb{R} has $D(\mathbb{R})$ complete if and only if $I(\mathbb{R})^2 \neq \{0\}$ ”;

Finally, they noted that

If $ab = 0$ for all $a, b \in I(\mathbb{R})$ with $a \neq b$, then $a^2 = 0$ for all $a \in I(\mathbb{R})$.

So,

if \mathbb{R} is a non - reducible ring with $I(\mathbb{R})^2 \neq \{0\}$, then $\{0\} \neq N(\mathbb{R}) = \text{Nil}(\mathbb{R}) = I(\mathbb{R})$ and $\dim(D(\mathbb{R})) \leq 1$, with equality when $|I(\mathbb{R})^*| \geq 2$.

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ZİHİNSEL ENGELLİ BİREYLERDE *DEMODEX FOLLICULORUM* ve *DEMODEX BREVIS* (ACARI: DEMODICIDAE) PREVALANSI VE YOĞUNLUĞU

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Giriş: Eklem bacaklılar şubesine ait olan *Demodex* akarların (Acari: Demodicidae) insanlarda parazit olarak yaşayan iki türü bulunmaktadır. Bunlardan uzun opistozomaya sahip olan *Demodex folliculorum* kıl foliküllerinde, kısa opistozomaya sahip olan *D. brevis* sebase bezlerde yaşamaktadır. Sahip oldukları delici ağız parçaları ve çeşitli enzimleri sayesinde foliküler epitel hücrelerin içeriği ile beslenmektedirler. Ortalama yaşam süreleri 15 gün kadar olan bu organizmalar 0.3-0.4 mm vücut büyüklüğüne ve dört çift bacağına sahiptir. Gerek sağlıklı bireylerde gerekse çeşitli hasta gruplarında *Demodex* spp. prevalansı ve yoğunluğunu belirlemeye yönelik çok sayıda epidemiyolojik çalışma yapılmıştır. Ancak günümüze kadar zihinsel engelli bireylerde bu konuda yapılmış herhangi bir çalışma bulunmamaktadır. Bu çalışma Erzincan ilindeki rehabilitasyon merkezlerinde bakım hizmeti almakta olan zihinsel engelli bireylerde *D. folliculorum* ve *D. brevis* prevalansı ve yoğunluğunu belirlemek amacıyla yapılmıştır.

Yöntem: Çalışma için Erzincan Binali Yıldırım Üniversitesi Etik Kurulu, Erzincan Aile ve Sosyal Politikalar İl Müdürlüğü ve Erzincan İl Milli Eğitim Müdürlüğünden onay alındı. Çalışmaya Erzincan ilindeki 7 ayrı rehabilitasyon merkezinde bakım hizmeti almakta olan zihinsel engelli bireyler dahil edildi. Katılımcıların yüz bölgelerinden Standart Yüzeyel Deri Biyopsi yöntemi ile alınan örnek materyalleri Hoyer ortamında preparat haline getirilerek ışık mikroskopunda 4X, 10X ve 40X büyütmelemlerle *Demodex* akar varlığı ve sayısı bakımından incelendi. Örnek materyalinde *D. folliculorum* veya *D. brevis*'in larva, nimf veya erginine rastlanılan katılımcılar *Demodex* bakımından pozitif kabul edildi. Ortalama *Demodex* akar sayısı, toplam akar sayısının *Demodex* pozitif katılımcı sayısına bölünmesi ile hesaplandı. Verilerin istatistiksel değerlendirmesi SPSS 23.0 paket programı kullanılarak yapıldı. Katılımcıların *Demodex* spp. pozitifliği Ki kare testi ile, *Demodex* spp. yoğunluğu Mann-Whitney U testi ile karşılaştırıldı. P değeri 0.05'den küçük olduğunda istatistiksel olarak anlamlı kabul edildi.

Bulgular: Çalışmaya 135'i kadın (ortalama yaş 26.4), 82'si erkek (ortalama yaş 24.5) olmak üzere toplam 217 zihinsel engelli birey dahil edildi. Katılımcıların 80'i hafif, 96'sı orta, 41'i ağır düzeyde zihinsel engelle sahipti ve yaşları 10 ile 60 arasında değişmekteydi. Çalışmada zihinsel engellilerin %57.6'sında *D. folliculorum* (ortalama 5.10/cm²), %25.3'ünde *D. brevis* (ortalama 0.77/cm²) olmak üzere toplamda %61.3'ünde *Demodex* spp. (ortalama 5.88/cm²) tespit edildi. Zihinsel engellilerde *D. folliculorum*'un görülme sıklığı *D. brevis*'e göre yaklaşık 2 kat daha fazla bulundu. Benzer şekilde cm²'deki ortalama akar sayısı bakımından karşılaştırıldığında *D. folliculorum*'un, *D. brevis*'ten yaklaşık 7 kat daha fazla olduğu saptandı. Diğer taraftan zihinsel engel şiddeti ile *Demodex* spp. varlığı ve yoğunluğu karşılaştırıldığında, zihinsel engel şiddetinin artışına bağlı olarak *Demodex* spp. varlığı ve sayısında da artış olduğu tespit edildi (P<0.05).

Sonuç: Gerek sağlıklı bireylerde gerekse birçok hasta grubunda olduğu gibi zihinsel engelli bireylerde de *D. folliculorum* ve *D. brevis*'in yaygın ve yoğun olduğu tespit edildi. Çalışmada elde edilen bulguların dermatolojik şikayetleri olan zihinsel engelli bireylerin klinik değerlendirme sürecinde göz önünde bulundurulmasının faydalı olabileceği düşünüldü.

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Anahtar Kelimeler: Akar, *Demodex*, deri, enfestasyon, rehabilitasyon, zihinsel engelli

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Abstract. Scientific discoveries, academic researches and new technologies are basic to talk the world's most demanding problems. Technology, engineering and chemistry education can develop national capacity, but lone if science and teaching systems focus consideration on one of the most vital learning actions and exploring how the contact of human principles and opinions affect national policy decisions. Unfortunately, national fixed targets with simply measurable results is using too many academicians and educators. In its place of significant academic success challenging, we need important learning that prepares young public for life, effort and human.

Key words: Science, Chemistry, Human Values

Introduction

Life power are interesting when the concepts made by the indication-founded enterprises of science, technology and engineering correlation of opinions and human standards. There is no lack of contentious issues that request contemplation of that connection, including worldwide warming or global erosion. The manufacture, quality, care and delivery of the world's supplies of food, water and, lifesaving drugs are still widespread around the world. According to Earp, & Trafimow, (2016), "we have to adequately harness the possible for technology in the facility of such values-driven subjects as ending deficiency" Artificial photosynthesis is about the chemical processes by which green plants grow (Libby, 2004). As chemists we stayed that they are beautifully designed and efficient. When we've fully understood them, there undoubtedly will be tremendous practical applications in raising the photosynthetic efficiency to even higher levels than nature achieves. Also, Libby stayed that we see our way through the psychological effects of chemicals as drugs and control of mental processes and illnesses or other human health problems. Libby focused that this neverland is a dream with witchcraft and non-scientific way, but it begins to clarify, and it looks as though we can dream justifiably when some of our most mental illnesses will be medical (Earp, 2016; Kortman 1941).

The initiative of science needs the implementation of sure principles that are observed to by its consultants with excellent rigor (Wrangham, Peterson, 1996). They explained that the principles also deliver the foundation for ornamental human competences and human wellbeing. Certainty and integrity are of the greatest reputation of life. According to Wrangham and Peterson, any expert who productions data risks existence disliked indeterminately from the methodical public, and he or she exposes the sincerity of discipline for the superior culture. An expert may make mistake in understanding data, but no one can receive the structure of information (copy of data). Group studies has develop vital in most arenas of discipline, and it needs that all the associates of the group accept the credit they merit. Charities are also increasing, and each must be documented for his or her contribution (; Kortman 1941; Earp, 2016).

Biochemistry and molecular biology are largely chemical in cast and substance. The interesting story of the unraveling of the deoxyribonucleic acid structure has moved us to home, the great importance of understanding the detailed chemical structure and behavior of the basic units out of which our bodies are constructed (Libby, 2004; Earp, 2016; Kortman 1941). Libby underlined that "nothing gives more promise for our future than the understanding and development and revelation of the chemical basis of heredity". Another way, genetic changes can be made by chemical treatment at a future day.

Some Famous Approaches

"It seems possible that our understanding of the deterioration of tissue may turn us as the protection of our substance from aging" (Dodd and Stem -Gillet, 1995). These are dreaming of the future but logical and credible possibilities. These are in biochemistry and molecular biology which we cite first because the field is so rich. In fact, present accomplishments in these areas probably have been small position as compared to those lying ahead in the future, although these in themselves have been extraordinary things (Earp, 2016). Only one century since man could protect himself against infections in wounds which broke the skin. And, only one century since the principle of antiseptis and antitoxins appeared. Dodd and Stem-Gillet stayed that "in one brief century we've come a long way toward freeing ourselves from dread diseases and scourges. Many remain still to be conquered".

In his one paper, Pigliucci (2013) stayed that "once man leaves tire surface of the earth the environ mint changes. If he goes downward he comes to pressures. If he goes outwards he comes to a vacuum so extremely empty that nothing on the earth approaches it. And, of course, if he approaches the sun and the stars, temperatures far above anything attainable on earth are incurred". It is the development of the chemistry of the areas as being promising for the future technology and holding benefits which may be turn out to be a "very big and powerful value" (Earp, 2016).

The chemical effects of pressures of a million atmospheres have been studied before. However, chemical effects of high pressures have been widely studied and are noticeable in value (Harris, 2011). He explained that "the first process to produce polyethylene was a high-pressure process using some two thousand atm to force the ethylene to fit into the growing polymer,

and it is nothing derogatory against the high-pressure process that catalysts were developed later. Pressure causes matter to transform and to change its possessions. Thus, we think it not unlikely that at the center of the earth iron may have significantly different chemical properties.

Discussion and Result

Science and Scientist need the liberty to ask, to test, to reason, to envisage the unimagined in every branch of it (Deming 1987; Earp, 2016). He declared that “it cannot purpose inside the random bounds of agreement, nor can it embellishment if it is involuntary to shy gone from stimulating the putative”. Discipline and technology loans by conquering a current example, or at smallest considerably increasing or adapting it to connected knowledge or subject. This mean that there is a sure positive traitorousness built into the methodical initiative, as a new cohort of experts adds the positive influence. Earp stayed “our respect and admiration for Newton are not reduced by the attainments of Albert Einstein. We can esteem both. This continuous regeneration and progression of our methodical empathetic is a vital feature of the methodical initiative”. So, in this perspective, it needs a positive association with the opposite opinion that is settled in arguments judged by the rubrics of indication.

The science (chemistry, physics and biology) and engineering sciences that gave us both life: “grudging” and “life-hosting devices” (Libby, 2004; Earp, 2016; Kortman 1941). According to him, the procedures are at their core evidence-based initiatives. Though, he insisted the information that is produced gets practical through the prism of values and beliefs. We understand from his approach that it is vital that the ways in which these contributors to decision-making effect one another are spoke explicitly in formal education. Also he added that “our failure to do so, either purposely or to circumvent battle weakens democracy, allowing power, demagoguery to rule”.

Science needs levelheadedness and indorses politeness in dissertation. Ad hominem bouts are not putative (Efron, 1987). Discipline treats all people similarly. Experts are worried with the gratified of the methodical effort, not with the being who shaped it, or not the country that presented it. Discipline is open to all, irrespective of population, race, faith, country or sex. These principles of discipline are worldwide principles value protective, not fair to indorse the chase of discipline but to crop a healthier and more caring humanity to create livable world.

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The Adoption Of Internet-Only Bank In Korea

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ABSTRACT

With the advent of internet banking, a large part of the services that are offered by banks can be provided online as well and many banks are closing offline branches and concentrating on improving online channels. Even more banks that use internet as the only channel of banking services has come to exist, which called 'internet-only bank'. Internet-only bank do not have any physical infrastructure resulting in costs savings. Instead, they invest in high end computer infrastructure that allows them to serve their customers in better and faster ways. Internet-only bank is a kind of self-service bank targeting small-scaled retail finance. Internet-only bank is providing services only through the internet and limited call center services are provided without face-to-face channel. As a mean to encourage development of fintech internet-only bank has emerged in Korea. Two internet-only banks in Korea, KaKao Bank and K-Bank have started their operation in 2007. As of August 2017, 3.07 million accounts were opened in Kakao Bank and 490,000 accounts in K-Bank. When it comes to the amount of deposits and loans, Kakao Bank has 1,409 billion Won as deposits and 1,958 billion Won as loans while K-Bank has only 800 billion Won as deposits and 650 billion Won as loans. The introduction of internet-only banks in Korea has decreased the market price of financial products and banking services resulting in causing healthy competition in banking industry.

Several studies analyzed internet banking and mobile banking and associated factors that influence consumers' adoption of it, using a specific adoption theory or an extension of it, such as TAM (Technology Acceptance Model), IDT (Innovation Diffusion Theory), and UTAUT (Unified Theory of Acceptance and Use of Technology). However, they usually focused only on the attributes of banking channel and neglected the customer's subjective perception of benefits which banking services provide. Internet-only bank creates customer value by providing time optimization, immediate and customized information, fun and instant connectivity, great convenience and interactivity. That is, customer use internet-only bank due to the various benefits compared with internet banking and mobile banking which are provided by traditional banks. Benefits are the personal values consumers attach to the product or service attributes and they are often linked to fairly basic motivations of purchasing. Therefore, the primary purpose of this study is to analyze the adoption of internet-only bank in terms of benefits (functional, social, experiential, economic benefits) and differentiated services (customization and service diversity).

Key words: Internet-only bank, Benefits, Differentiated services, KaKao Bank and K-Bank