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Message from the Editor-in-Chief

Dear Colleagues,

TOJSAT welcomes you. TOJSAT would like to thank you for your online journal interest. The online journal system has been diffused very fast for last ten years. We are delighted that a lot of academicians from around the world have visited TOJSAT. It means that TOJSAT has continued to diffuse new trends in science and technology to all over the world since January, 2011. We hope that the volume 6, issue 3 will also successfully accomplish our global science and technology goal.

TOJSAT is confident that readers will learn and get different aspects on science and technology. Any views expressed in this publication are the views of the authors and are not the views of the Editor and TOJSAT.

TOJSAT thanks and appreciate the editorial board who have acted as reviewers for one or more submissions of this issue for their valuable contributions.

TOJSAT will organize ISTE-2016- International Science & Technology Conference (www.iste-c.net) between July 13-15, 2016 in Vienna, Austria. This conference is now a well-known science and technology event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about science and technology. ISTE-2015 conference book has been published at <http://www.iste-c.net/istecpubs> For any suggestions and comments on the international online journal TOJSAT, please do not hesitate to fill out the [comments & suggestion form](#).

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July 01, 2016

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Message from the Editor

Dear Readers,

Five years ago, we have started to publish the Online Journal of Science, Technology. Audiences and readers of the journal is widening through out the World and increasing especially after the conference series of Science and Technology. Tojsat journal is now indexed with Doaj, Cite Factor and Index Copernicus, Google Scholar and will be cited by Scopus index soon.

The journal favours papers addressed to inter-disciplinary and multi-diciplinary articles shown in the section of scopes. In this issue of on line journal, selected papers such as invastigation of vibration damping in the passenger seat, the determinated combustion properties of FIR wood impregnated with fire-retardents, etc. will be published.

I will thank to the readers for their supports by sending their valuable scientific works to publish in this journal.

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A NEW FUZZY CONTROLLER FOR ADJUSTING OF PITCH ANGLE OF WIND TURBINE

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Abstract: This paper presents a study on the control of the pitch angle of the wind turbine blades. As fuzzy logic control method is preferred. Output power is stabilized by controlling the pitch angle of the wind turbine blade. They were also able aerodynamic braking at high wind speeds. Fuzzy logic control method is selected as the reason; Fuzzy control is independent of changes in system parameters. The fuzzy is also a suitable control method for nonlinear system. Consequently, using the fuzzy controller wind turbine blade pitch angle has been successfully controlled. Thus, the output power stability and aerodynamic braking is achieved successfully.

Keywords: Wind turbine, pitch control, fuzzy control.

Introduction

Wind energy is one of the most important in clean energy sources. Also it helps to protect the environment (Y. Qi & Meng, 2012, pp. 1635). Wind energy is a rapidly growing energy source. In the international wind power market, megawatt wind turbines have become an important product (Jian-jun, Li-mei, Xiao-ning, Chun-lei, & Jian-ren, 2010). Grid-connected wind turbines that high power has more tendencies due to their high capacity, greater efficiency and more reliable. Due to this reason instead of constant pitch angle and fixed-speed turbine, variable speed, variable pitch angle of wind turbines has been more popular in the market both in terms of both sales and in terms of research (Dou, Cheng, Ling, & Cai, 2010, pp. 56). There are several reasons for the variable speed of wind turbines, they are; to reduce the possible mechanical strength, to reduce the volume of noise, to make the output power is stable also to provide aerodynamic braking at high wind speeds (Fard, Rahmani, & Mustafa, 2011). The most effective method is to control the blade pitch angle to aerodynamic loads (Salim, Zohdy, Abdel-Aty-Zohdy, Dorrah, & Kamel, 2011; Scherillo, Izzo, Coiro, & Lauria, 2012).

The control technology of wind power production systems changed from constant pitch angle, to variable pitch angle (Dou et al., 2010). The improvements of control theory and algorithms in wind power and a better understanding of people to wind power, has developed a wind power control technology (Y. Qi & Meng, 2012, pp. 1635). Variable pitch wind turbine is difficult to mathematically model is very complex. Furthermore the wind energy system is non-linear constrained to control method to be used (J. Qi & Liu, 2010).

Conventional PID controllers are not well suited to compensate the disruptive effects of wind power generation system. It is a need for a control system that compensates the non-linearity of systems and changing parameter. Today, the fuzzy control that holds an important place in modern control theory is the ideal control method to resolve the drawbacks (Dou et al., 2010). One of the biggest advantages of fuzzy controller to the traditional control methods; it doesn't need to know mathematical model of the object that want to be control (J. Qi & Liu, 2010).

The importance of controlling the pitch angle of the wind turbine are better understood when large-scale wind turbines currently in development efforts made. The output power at high wind speeds is kept to constant value by adjusting the pitch angle and the pitch angle at very high wind speeds can be used as aerodynamic brakes (Y. Qi & Meng, 2012, pp. 1635).

Variable Pitch Angle Wind Turbine Model

Wind power (P); is proportional to the cube of the wind speed, and is given in Equations 1.

$$P = 0.5\rho Av^3 \tag{1}$$

Wherein ρ = air density (kg/m^3), A = area swept by the blades (m^2), v = wind speed (m/s). In Figure 1 the wind speed is given graph of the change in wind force.

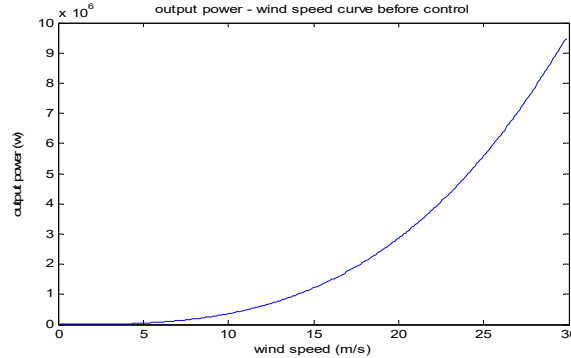


Fig. 1. The wind speed-output power curve without control

Wind turbines can be turned into energy from wind power and is limited to a portion of the Betz limit cannot exceed 59% of (Tong, 2010). The amount of power that can be taken from the wind turbine blades pitch angle (β) and the blade tip speed ratio (λ) a function of the power coefficient of the wind turbine (C_p) is determined by (Hemami, 2011). In Figure 2 the power coefficient (C_p) variation curve is given by the blade tip speed ratio.

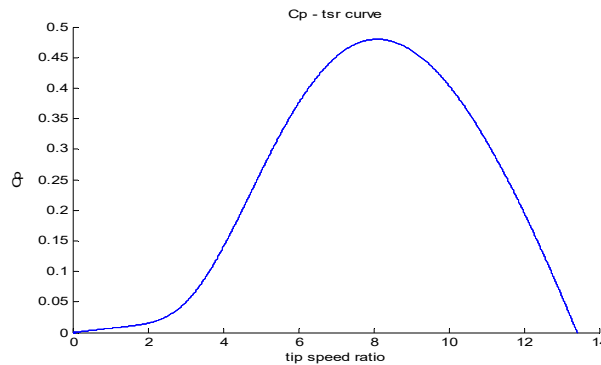


Fig. 2. Power factor (C_p)-blade tip speed ratio (λ) curve

Mechanical power of the wind turbine will be able to get the wind is given in Equation 2.

$$P_{\omega t} = P C_p(\beta, \lambda) \tag{2}$$

Equation 1 to Equation 2, if we added;

$$P_{\omega t} = 0.5\rho Av^3 C_p(\beta, \lambda) \tag{3}$$

Wherein $C_p(\beta, \lambda)$ = turbine power coefficient, β = blade pitch angle, λ = blade tip speed ratio (TSR)

C_p That highly nonlinear and changing with wind speed is given in Equation 4.

$$C_p = 0.5176 \left(\frac{116}{\lambda_i} - 0.4\beta - 5 \right) e^{\frac{-21}{\lambda_i}} + 0.0068\lambda \tag{4}$$

λ_i In Equation 5 is placed into where in Equation 4 is calculated C_p .

$$\frac{1}{\lambda_i} = \frac{1}{\lambda + 0.08\beta} - \frac{0.035}{3\beta + 1} \tag{5}$$

Blade tip speed ratio TSR is ratio of blade angular velocity and wind speed and given in Equation 6.

$$\lambda = \frac{\omega_{\omega t} R}{v} \tag{6}$$

Wherein $\omega_{\omega t}$ = turbine rotor angular velocity (rad/s), R = radius of the wind turbine blade (m).

In Figure 3 the power coefficient (C_p) variation curve is given by the blade tip speed ratio for the different pitch angle β .

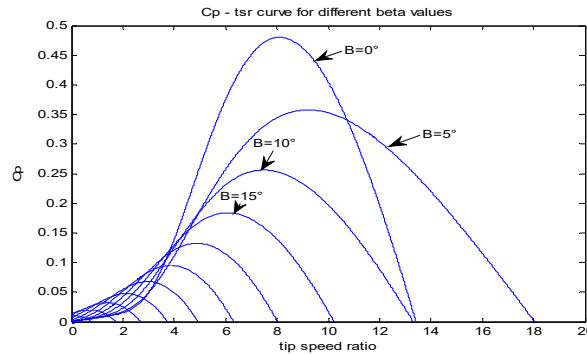


Fig. 3. C_p -TSR curve for different β angles

Any change in the wind turbine rotor speed or wind speed changes the blade tip speed ratio, which changes the power factor. Power factor will change the amount of power derived from the wind. Equation 4 and Equation 5 by C_p changing the angle β , the power factor is changed. Wind turbine power control operates on this principle.

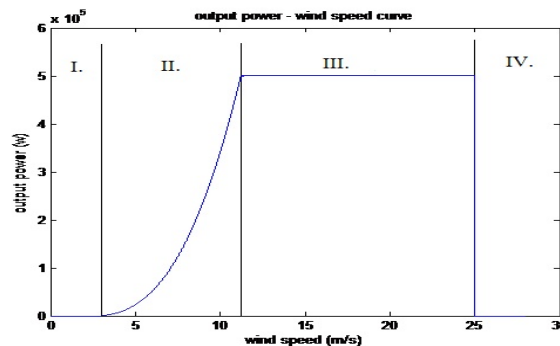


Fig. 4. The operation of the wind turbine

Mechanical power output in a variable-speed wind turbines are also variable (Chen, Hong, & Ou, 2012). As shown Figure 4, variable speed and variable pitch angle wind turbine’s wind speed-output power curve has four operation areas. In the I. region, wind speed is smaller than cut-in value, wherein the output power is zero. II. region is between the cut-in the nominal speed. III. cut-out region is between the nominal speeds. In the IV. region, wind speed is upper than cut-out so that in this region wind turbine is stopped because off safety (Hwas & Katebi, 2012). Maximum power point tracking is desired in the II. region. It should be placed power electronic circuits that operate to hold to frequency on constant value between wind turbine generator and grid (Wenjing & Hongze, 2011). At the beginning of the III. region, while wind speed reaches nominal value wind turbine power reaches the nominal power. if wind speed continues to increase, the output power will also increase. Therefore, system needs a control system which controls to output power between control limits. This control system changes blade pitch angle so that power coefficient and output power are changes (Hemami, 2011).

Actuator Model

Pitch actuator systems can be hydraulically or electrically controlled. In the electric actuator; each blade can be individually adjusted by a servo motor (Jha, 2010). The world's largest wind turbine suppliers, uses electric pitch angle control systems. In this article; dc servo motor is used as an actuator. In the servo motor designing, position control transfer function is written by a simply as Equation 7.

$$G_p(s) = \frac{1}{s(s+1)} \tag{7}$$

Fuzzy Logic Controller Design

The system has been developed based on fuzzy logic control algorithm. Fuzzy control is basically an adaptive control system. Two variables were defined as fuzzy input: error and error change. The Mamdani is used as rule base and fuzzy inference system. Defuzzification method is centroid. Output variable is the amount of change in the angle β . The block diagram of the fuzzy logic controller system is shown in Figure 5.

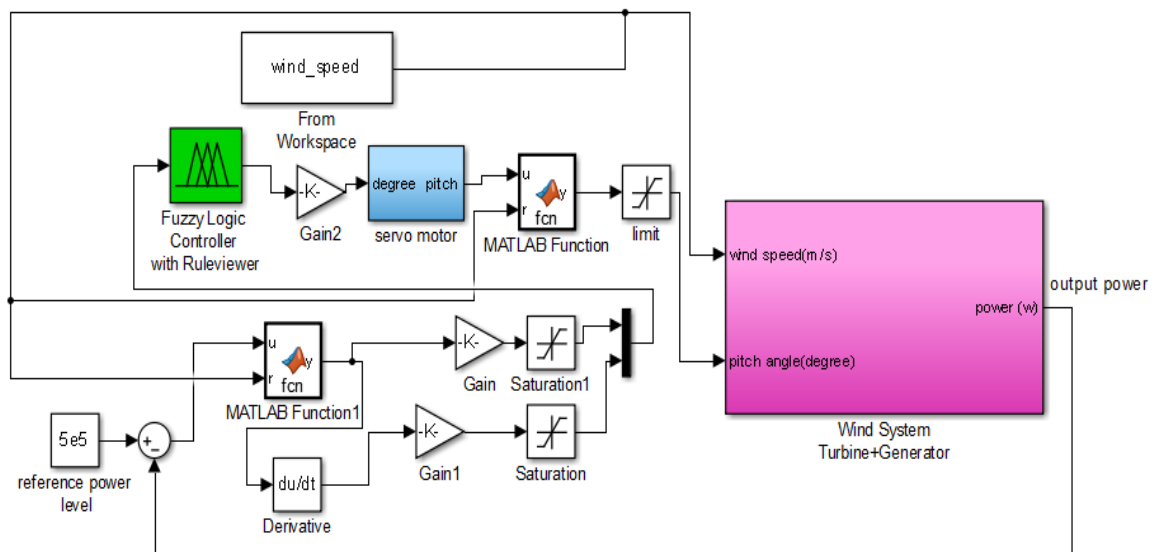


Fig. 5. The block diagram of the fuzzy logic controller system

Error input fuzzy sets in Figure 6, the change error fuzzy sets shown in Figure 7. Output variable fuzzy sets which amount of change in the angle β is shown in Figure 8.

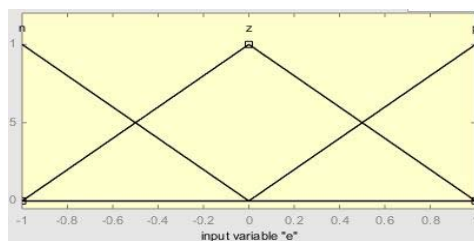


Fig. 6. The fuzzy sets of input variable error

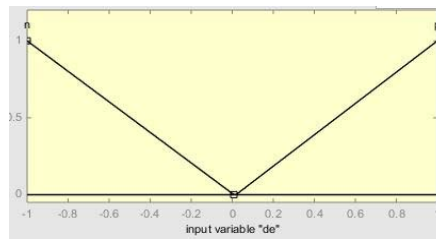


Fig. 7. The fuzzy sets of input variable derivative of error

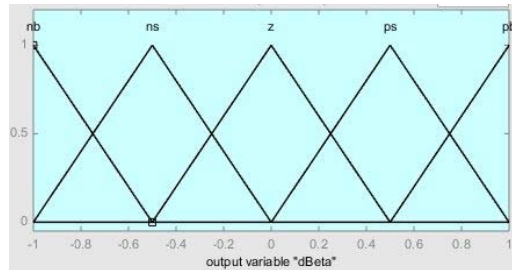


Fig. 8. The fuzzy sets of amount of change in output variable beta angle

Surface showing the relationship between input and output variables graph in Figure 9, while the rule table shown in Table I.

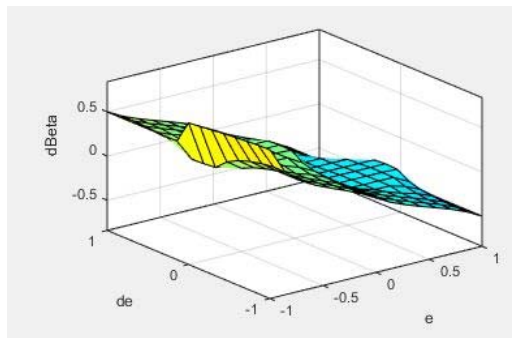


Fig. 9. Fuzzy logic controller input and output variables' three dimensional graphics

Table 1.Fuzzy logic controller rule table

dbeta		derivative of error	
		n	p
error	n	pb	ps
	z	z	z
	p	ns	nb

I. WIND TURBINE MODELING AND SIMULATION WITH MATLAB

Mathematical formulas of the wind turbine are modeled by Matlab / Simulink program. The internal structure of the model is shown in Figure 10. Internal structure; the wind turbine formula is transferred to Matlab / Simulink. Simulated system parameters shown in Table 2.

Table 2. Simulated system parameters

Simulated System Parameters	
Nominal output power	500 kw
Working mode	Network connection
Cut in wind speed	3 m/s
Nominal wind speed	12 m/s
Cut out wind speed	25 m/s
Rotor diameter	48 m
Sweep area	1810 m ²
Blade number	3
Nominal rotor speed	30 rpm
Rotor speed range	10-30 rpm
Gear box rate	01:50
Generator number	2
Generator type	Asynchronous squirrel cage
Generator nominal output	250 kw
Generator nominal cycle	1500 rpm
Generator voltage	690 v

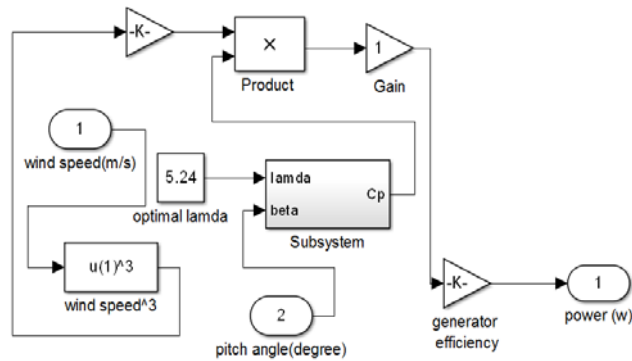


Fig. 10. The wind energy conversion system block diagram of the internal structure

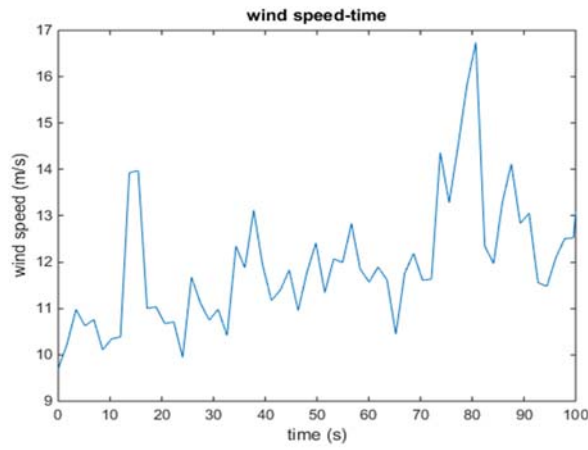


Fig. 11 Wind speed-time diagram

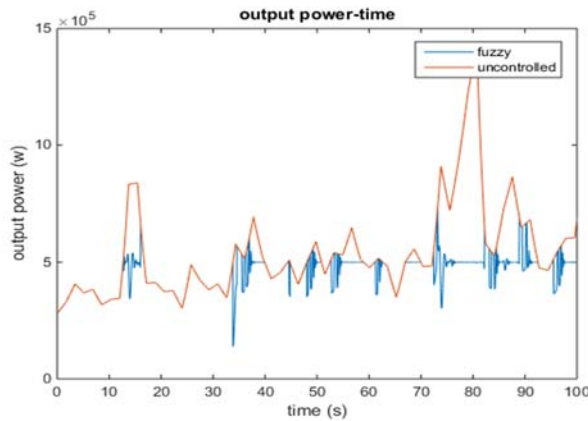


Fig. 12 Output Power diagrams

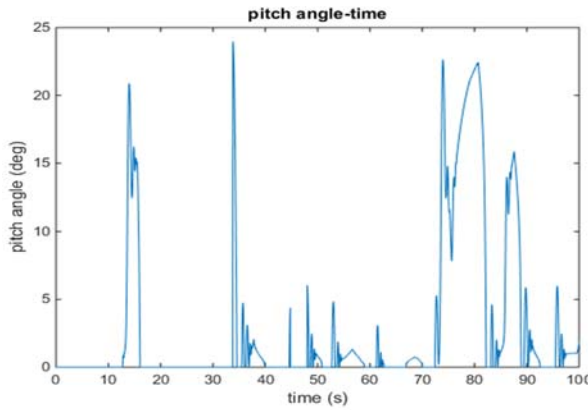


Fig. 13 Pitch angle diagram

Matlab Simulation Results

Modified true wind speed is used in simulation. Figure 11 shows wind speed used in the simulation. Wind energy system has two 250-kW generators that produce energy. Therefore, the rated output power of 500 kW. Rated wind speed 12 m/s. The wind speed of 10 m/s to 17 m/s between the sections were taken because of to see the performance of controller. Because any blade pitch angle

control is not mentioned when the wind speed is lower than rated value. Both the transition of from lower of rated speed to upper of rated speed and the transition of from upper of rated speed to lower of rated speed is seen controller performance. In Figure 12, the output power of the uncontrolled situation in this case generator system will suffer losses due to overload, were compared with the output of the fuzzy controller status. In Figure 12, the fuzzy controller limited output power and prevent damage to the system. In addition, output power has remained stable value. Figure 13 shows the change in pitch angle.

Conclusion

The wind turbine blades pitch angle is controlled by using fuzzy controller. Output power is maintained constant value within certain limits. Thus generator protected from the upper value on rated output power and provided to work longer time by safely. It has also become more stable energy supplied to the grid.

We prefer the fuzzy controller because of fuzzy is good adaptation against to changes in system. Therefore, changes that may occur during the time the system parameters will not affect the performance of the control system. In addition, the fuzzy controller compensate to control difficulties that according to nonlinear system.

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AN OVERVIEW OF MONTE CARLO (MC) SIMULATION METHOD AND BASIC PRINCIPLES IN MEDICAL RADIATION AND RADIATION DETECTORS

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Abstract: Monte Carlo (MC) method is a numerical test to simulate an event by using the numbers from 0-1. Monte Carlo method in studies for optimizing the device to be used in experimental studies, or studies to be carried out before it is used extensively as experimental. Also widely used in the medical imaging field next to the particle detectors in nuclear physics studies. Monte Carlo method extensively in studies for optimizing the device to be used in experimental studies or studies to be carried out before it is used as experimental. In recent years, MC method is widely used to simulate interaction of medical radiation with tissues and environment. In this study we discussed some specific samples along with general information. It can be concluded that MC is a powerful tool for pre-experimental studies.

Key words: Monte Carlo Simulation, Medical Radiation, Radiation Detectors

Introduction

The Monte Carlo (MC) technique has become ubiquitous in medical physics in the last years. There are many different applications of this technique but the major focus of this article will be the use of Monte Carlo to simulate radiation transport and basic principles and roadmap for design a radiation detector by using MC code. MC method was named by Von Neumann. In subsequent periods it was being used in different areas such as medical and nuclear physics (Andreo, 1991). There has been serious developments and evolutions especially all aspects of nuclear medicine, radiation studies, diagnostic radiology, medical physics nuclear physics and radiation protection. Although we had growth in application areas, some technical limitations also occurred. In parallel with the development of technology and computer systems to overcome step by step in this limitations. We know that many laboratories have their own MC staff in recent years (<https://laws.lanl.gov>, 2015). These staff provides the code development and solving the errors in program.

The aim of this paper is to supply an overview of MC simulation principles and basic steps especially on medical radiation and radiation detectors. In this study we introduced the modeling of High Purity Germanium Detector (HPGe) geometry by using MC code. High Purity Germanium (HPGe) is the only radiation detection technology that provides great information to identify radionuclides and medical radiation from their passive gamma ray emits. Since we know that each isotope has their own characteristic energy peak which also called as “fingerprint”, the importance of determining the characteristic energy level increased. The figure 1 is a comparison of three peaks of plutonium and iodine captured by three different detector. Regions are printed as NaI (blue), HPGe (red) and CZT (black) (<https://ortec-online.com>, 2015)

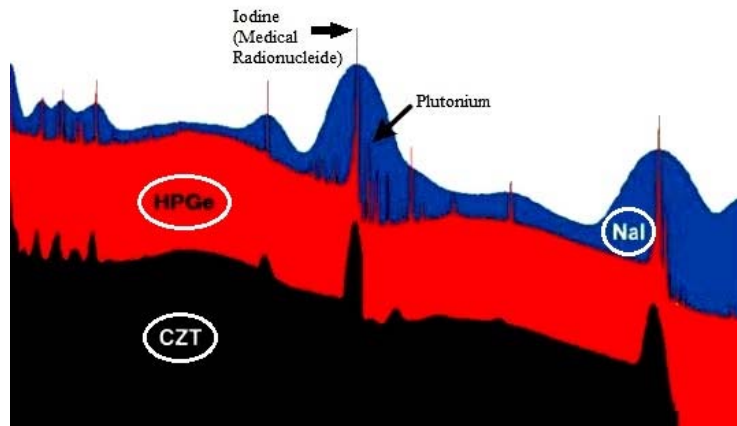


Figure 1: Radioactive material fingerprints viewed with three type detector

The characteristic peaks from iodine and plutonium are very close to one another. However, in the blue (NaI) and black (CZT) graphs, they appear like one peak, whereas in the red graph (HPGe) the peaks are clearly sharp and recognizable. As we see from the sample above, HPGe detectors has a very important place in the field of medical radioisotopes. For that reason the importance of optimization of HPGe detector's efficiency and other features became important working area by using MC codes.

The Study

As a code we used the MCNP program which developed in Los Alamos National laboratory. MCNP is capable to simulate with neutron, gamma and secondary gamma rays production and transport which occur as a result of neutron interactions (Hançerlioğulları, 2006). We developed an input for modeling HPGe detector. Modeling of the detector geometry as cross-sectional view shown in below. In figure 2, there are 2 main environments such as germanium and vacuum.

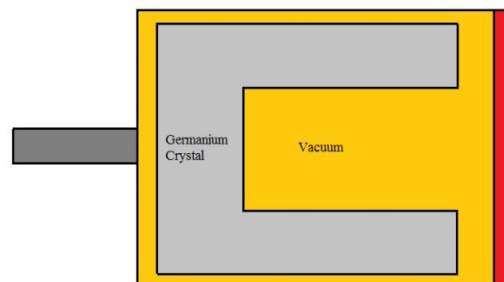


Figure 2: Modeled HPGe detector by using MC code

We introduced each environment physical quantities and requested pulse height distribution data from detector volume cell. To request different information from the MCNP code in output file, we need to introduce different tally. In this study, we used the F8 tally for MCNP output data which gives the pulse height distribution in a cell (Shultis, 2011).

Findings

In this study we made some studies after modeling HPGe detector. As a first step of these studies, we directed 4MeV energy photon beam onto detector volume. We know that an energetic photon beam loses energy in detector volume after some physical interactions with detector materials (Watson, 2009). We can see that in the simulation process this physical rule is taking place and photon energy decreases. We can see in figure 3, the energy-count spectrum

of the photon beam and also we can see the fingerprint energy peak of 4 MeV photon in the spectrum

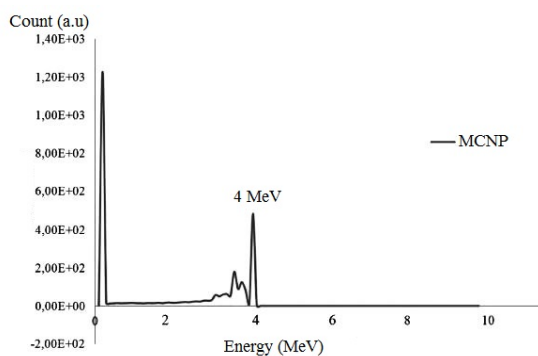


Figure 3: Energy-count spectrum of 4 MeV photon beam

Conclusions

In the field of medical radionuclides the importance of HPGe detectors were discussed. The geometry modeling process and main steps were also introduced. As we see from this work, MC method is an effective method that can simulate the HPGe detectors efficiently. It was found from this work that for future studies such as detector material and volume optimization MC can be used for these studies.

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DESIGNING A SYSTEM WHICH GENERATES ELECTRIC ENERGY FROM WIND FORCE OF CARS

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Abstract: Although studies about solar energy are continuing for 20 years, little studies are done about transforming of wind energy into electric energy of traveling cars (Anonym, 2013, Anonym 2013-1) and almost no application is done in this area. The most important reason of this study is transforming the wind energy of a traveling car into an electric energy and to use it in case of need. The most important feature of this design is procuring energy in all conditions when the car is moving. Considering the reasons, it is obvious that this study will contribute to our country academically and also in commercially speaking.

Keywords: Renewable energy, wind energy, new generation fuel, wind energy on cars.

Introduction

Transportation means transferring an object or a person from one place to another. To get an object moving from one place to another, an absolute energy is used. Thrust power is needed to move a table across. This power can differ according to the size of the table and the friction coefficient of the ground. New sources and new fuels are searched to cover large quantity of power which is needed for transportation and reduction of costs. It is obvious that the energy of the future is in the renewable energy sources. The longest distance covered in energy source for transportation is procured energy of the sun with the help of solar panels (Akfidan T, 2010; Kaymak M E, 2009).

It is possible to procure extra energy of a moving vehicle without affecting the aerodynamic features, in other words without an increase of fuel consumption due to the addition of the designment to wind inlet points. (Gümüslüoü Ü., Çetinkaya T A, ve Albayrak K., 2006; Aka H., 2003; Solmaz H, 2010).

The purpose of this study; to reduce fuel consumption of cars, to power air conditioning, starter motor on cars which need high energy, without using any fuel. Only with the energy of the moving car which creates energy by taking advantage of the wind power. The area of use will differ and the study is applicable on vehicles like trains, buses, ships, cars and motorcycles. Also it can be used as renewable energy sources for electric cars in case of charging to increase the range and lower the costs of charging. One of the attention grabbing features of this designment is that, it can be used longer than solar energy, in other words, in can be used not only under the sun, this energy can be procured in all conditions and hours when the car is moving.

General description about this study is stated in the introduction chapter. Materials and features of this study are approached in the material and procedure chapter. The applicability and the details of the prototype of our study is handled in the application chapter. The advantages of the designment, numeric data, and the applicability are examined in the conclusion chapter.

Material and Procedure

In general, a wind turbine is made up of a tower, generator, speed converters (gear case), electric generator and a propeller. The kinetical energy of the wind is transformed into mechanical energy in the rotor. Transferring it to the generator on the body, by increasing the rotary motion of the rotor shaft. Obtained electric energy from the generator is stored with the help of batteries or transmitted directly to the recipients.(Çokünlü G , 2007). The internal structure of the wind turbine is shown in image 1.

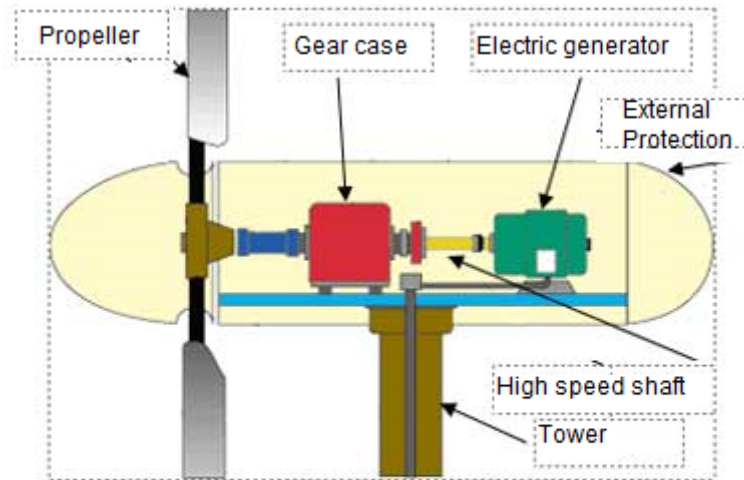


Image 1. Internal structure of wind turbine

The leafed turbine prepared in cylindrical shape (done with stainless sheet material) can transmit the power to the used motor by help of the shaft installed in the center. The motor which will be used, is a DC motor; it is a motor type which can rotate the shaft by giving electricity and also generate electricity with the rotation of the shaft. The shaft of the motor is placed in a stiff plastic gap in the center of the turbine. The rotating turbine with the help of the wind is providing power generation by rotating the shaft of the motor.

Application

Wind turbine is a system which transforms the kinetical energy of the wind into a mechanical energy and then into electric energy. To understand the working principle of the wind turbine, two important aerodynamical power have to be known well. These are, drag and lifting forces.

Drag force takes place on an object in flow direction. For instance, the maximum drag force on a straight plate can occur when the air flow is upright 90° on the object; and the minimum drag force can occur when the air flow is parallel to the surface of the object.

The best example for drag force is parachute. Due to this force the parachute is decelerating.

Lifting force takes place upright in flow direction. It is a reason for the take offs of airplanes.

In the designed system, the inlet and outlet channels of the equipment placed on the car are designed for efficient usage of the intake air and for ease and orientable exit of the air. Electric energy is generated without damaging the aerodynamics of the used car. The wind entries and exits of the designment are shown in image 2 and 3.



Image 2. Wind entry of the designment.



Image 3. Wind exit of the designment.

There are some critical and important factors in our study. The consisted wind reaches high energies on moving cars which requires a material strong enough against this energy. Instead of resisting the consisting wind energy, our study is designed to let the wind pass as easy as possible. Thus, the used thin sheet metal can't be damaged in the face of the wind energy. Image 4 and 5 shows the system placed on the car.



Image 4. Application of the designment.



Image 5. Application of the designment – 2.

Conclusion

The most functional feature of this designed system is that it is applicable on all moving vehicles (car, lorry, train, motorcycle, ship, electric cars, etc.). The mounting on big vehicles is easy. The mounting can be done on vehicles with narrow mounting areas like on cars and motorcycles without damaging the aerodynamic features and with designing the grills of the air intakes.

As long as the vehicle is moving; continuous energy generation is provided with the condition of depending on variables like moving speed, wind direction and speed.

The measuring is performed from our prototype implemented on a car and are stated below in table 1.

Table 1. Measuring results of prototype

speed (km/h)	measured value (v)
50	3,5 - 4
70	5,5 - 6
100	9,5 - 10,5
110	11 - 12,5

The motor we used is a DC motor with 12V and 0.5A. The results are according to this motor. With the help of a second motor on the other side of the propeller, the gain can be doubled and with enlarging the other equipments and two 12V, 5A motors the gain can be quadrupled on the same car.

As a result; although studies about solar energy are continuing for 20 years, it is done little studies about transforming of wind energy into electric energy of traveling cars and almost no application is done in this area. In consideration of the data, it is proven that our system provides fuel economy and extra power gain and will contribute to our country academically and also in commercially speaking.

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EVALUATION OF EXPERIENCE REGARDING THE USE OF MOBILE BANKING: AN APPLICATION ON ACADEMICS

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Abstract: Today, technology the gradually increasing competitive conditions trigger and play role in its development is of course intensively used in banking sector as well. By means of technology, quickly, easily, and cheaply presentation of banking services to consumer provides competitive advantages to the banks. In the recent years, growing of mobile sector and becoming widespread of smart devices have generated some innovations in banking sector, and the concept of mobile banking has emerged. As a result of the developments in mobile communication sector, consumers want that their demands and desires are immediately satisfied and, in most issues, suggest their emotions and thoughts, satisfactions and dissatisfactions quickly and effectively by means of smart phones. Hence, mobile banking is evaluated as the most effective banking application that provides competitive advantages for banks.

In this study, in order to determine the experiences of academic staff of Seljuk University regarding the use of mobile phones, the data collected with the method of face to face survey were analyzed by SPSS program and the results were evaluated under 12 headings as customer satisfaction and loyalty, perceived price level, level of using technology, perceived availability, perceived easiness of use, security and privacy, perceived compliance, trust, social effect, facilitative conditions, perceived cost, and worry.

KeyWords: Mobile Banking, Technology in Banking, Technological Competitiveness

Introduction

As a result of rapid development of technology, banks wanting to keep step with competitive conditions aim to reduce costs, increase customer satisfaction, and reach the potential target customers, presenting technological services. Mobile banking and internet banking serving this aim in banking sector is an important innovation for banking sector. Of mobile technology becoming an indispensable part of the daily life, the abilities of instruments such as particularly mobile phone, and tablet computer improve every passing day and they also create gradually increasing dependency in users. Nowadays, the increase of tendencies of users to save the sensitive information and data in their smart phones and beginning to use them as if they are computers increase much more the importance of security in the smart phones and mobile applications.

Banks present mobile banking applications that are compatible with operation system of phones and tablets, together with web software providing mobile internet experience, to the use of customers. The customers desiring to do their banking operations through mobile branch can sign in the user name and code of Internet Branch and in addition signing in with the information of credit card, can execute their transactions of credit card. With the special software taking place in some brands, for visually impaired users, voiced command system was formed and, thanks to this, it is provided for the users to use it without problems. Via mobile banking, investment transactions, credit card transactions, application transactions, having information about accounts, and paying transactions made through smart phones are quite useful at the point of presenting service, independent from time and space, to customer without needing his going to bank. In this context, in this study, the results of this field study carried out, in order to examine the experiences of academic staff of Seljuk University related to the use of mobile banking, will be evaluated.

Literature Summary

When we regard to the history of banking, banking sector, before meeting internet, must have invested on the other areas. This sector, using both Automated Teller Machine and Phone Banking, began to keep step with the new technologies and innovations emerging as a result of this (Luo et al., 2010:222-234).

In 1990s, after internet revolution, technology has increasingly become a vital element in competitive environment in financial service sector. These developments in the recent times created a new understanding of service and service environment in banking sector. These developments, experienced in information sector, led mobile devices to be used in banking sector (Suoranta, 2003:11-12). The first mobile banking service, introduced by Tiwari et al. (2007), is application called as Short Message Service banking.

Banking sector is one of locomotive sectors in integrating internet and mobile technologies to their own service sectors (Laukkanen, 2005:325-338). Together with that mobile devices are begun to be used of in banking sector, mobile banking has taken its place among the best distribution channels. To generally define mobile banking, it is an application enabling us to reach the main banking services at the moment and in every place we need through the mobile device we have (Hsbc,2015).

Banks, for benefiting from the services mobile internet presents, through smart phones, whose applications are developed, have targeted to present banking service in every time and everywhere (Chung ve Kwon, 2009:539-543). Via mobile banking, it is targeted the customer to be able to reach their bank accounts while traveling, eating, in short, whenever they desire (Lin, 2013:252-260).

Mobile banking is qualified as a sub-branch of electronic banking (Suaranta, 2003:46). In a period, when mobile phone quickly spread, mobile internet network has highly developed and, in addition, together with the change of operation system and service networks of smart phones, use of mobile internet has significantly increased (Çetin,2014:8).

Transformation of banking transactions to mobile banking will reach the much larger dimensions.

This economy, we termed as internet economy, at the moment, forms 1.7% of Turkish economy. While it is foreseen Turkey economy to grow by 9-10 %, the growth rate of internet economy reached 19s %. The reason for this is that Turkey has a young and dynamic population (Kazancı, 2013:13).

As a result, banking sector encourages their customers from the aspect of increasing the service quality, being rid of undue workload, lowering the costs to minimum, providing customer satisfaction and loyalty, and obtaining maximum profit

Methodology of the Study

In this section of the study, in order to examine the experiences of academic staff of Seljuk University related to the use of mobile banking, the information will be given about the aim, method, sample, and findings of the study carried out. In addition, whether the results obtained in the study are statistically significant or not will be evaluated and the results will be discussed in the context of literature.

The Aim of the Study

The main of this study is to determine “the attitudes of academics regarding the factors that are effective in the use of mobile banking”.

Method of Study and Sample

In the study carried out toward determining the attitudes of academics regarding the use of mobile banking, in storing data, survey method was utilized.

In determining the questions in the questionnaire prepared, the relevant literature and similar studies conducted on this subject were considered. The design of survey consists of three sections. In the first section, the demographic questions toward determining the personal characteristics of survey participants were raised; in the second section, the frequency of using mobile banking transactions; and in the third section, the attitudes regarding the factors that are effective on the use of mobile banking. While attitude scales in the survey are formed, the studies utilized are presented in the following Table 1.

Table 1: The Resources Utilized in Forming the Scale

A-Customer Satisfaction and Loyalty	Ganesh et al.,2000 Choi et al.,2008 Deng et al.,2010 Kimiloglu et al.,2010 Çetin, 2014
B-Perceived Price Level	Ganesh et al.,2000 Choi et al.,2008 Çetin, 2014
C-Level of Using Technology / Innovativeness	Goldsmith and Hofacker, 1991 Lassar et al., 2005 Aldas-Manzano et al., 2009 Erkmen, 2009
D-Perceived Availability	Lin 2011
E-Perceived Easiness of Use	Lin 2011 Hanafizadeh et al., 2012
F-Security and Privacy	Pikkarainen et al., 2004 Hanafizadeh et al., 2012
G-Perceived Compliance	Lin 2011
H-Trust	Hanafizadeh et al., 2012
I-Social Effect	Al-Somali vd., 2009 Gu et al.,2009
J-Facilitative Conditions	Zhou et al., 2010
K-Perceived Cost	Hanafizadeh et al., 2012
L-Worry	Chatzoglou et al.,2009

Surveys were administrated face to face with academics. As a result of surveys administered for one week, total 100 questionnaire were completed, but when 15 questionnaires, which are missing and/or the same answers have, and which do not use mobile banking, are excluded, 85 questionnaires were included in consideration.

The answers in questionnaires were coded in accordance with statistical analyses program, called “SPSS (Statistical Package for Social Sciences)” and analyzed.

Results of Study

Demographic Characteristics of Academics

In the scope of study, total 6 questions from demographic aspect were raised to the academics as the case of using mobile banking, gender, age, title, and duration of using mobile banking. The evaluations regarding the demographic structures of academics are presented as follows.

Table 2: The Case of Using Mobile Banking of Academics Participating in the Study

1-Do you use mobile banking?	Number	Percent
Yes	85	85
No	15	15
Total	100	100

85 % of academics use mobile banking. The rate of academics not using mobile banking is 15%.

Table 3: Gender of Academics Participating in the Study

2-Your Gender	Number	Percent
Male	50	58,8
Female	35	41,2
Total	85	100

56.8% of academics are males, and 41.2%, females. In general, it is seen that there is a balanced distribution according to the gender among the participants

Table 4: Ages of Academics Participating in the Study

3-Your Age	Number	Percent
20-25	7	8,2
26-30	43	50,4
31-35	10	11,5
36-45	20	24
46 and over	5	5,9
Total	85	100

50.4 % of academics are in the range of 20-30 ages; 24%, 36-45; 11.5%, 31-35; 8.2%, 20-25; and 5.9%, 46 and over. It is generally seen that the participants consist of young academics. That the participants are young can be interpreted in the way that the level of the adaptation to technological applications, and using them will be more.

Table 5:The Titles of Academics Participating in Study

5-Your Title	Number	Percent
Research Assistant	59	69,4
Asst. Prof. Dr.	5	5,9
Assoc. Prof. Dr.	8	9,4
Prof Dr.	6	7,1
Academic Member	7	8,2
Total	85	100

69.4 % of academics are research assistant; 9.4%, associate professor; 7.0 %, academic member,; 7.1 %, professor; and 5.9%, assistant professor. That large part of academics are research assistant supports the conclusion of being young aged in Table 4.

Table 6: Duration of Mobil Banking Using of Academics Participating in the Study

6-Your duration of using mobile banking	Number	Percent
1 Month	2	2,4
2-6 Months	4	4,7
7-12 Months	17	20
13-24 Months	17	20
24 Months and More	45	53
Total	85	100

53 % of academics have been using mobile banks for 24 months and more; 20%, for 13-24 months; 20%, for 7-12 months; 4.7%, for 2 -6 months; and 2.4%, for 1 months. That a large part of participants uses application of mobile banking will bring together with it the result that their information and experiences are good.

Table 7: The bank through which academics participating in the study use mobile banking

Application of mobile banking of which bank do you use?	Number	Percent
Akbank	9	11
Deniz Bank	1	1,2
Finansbank	1	1,2
Garanti Bankası	3	3,5
İş Bankası	5	5,9
Kuveyt Türk	2	2,4
Vakıfbank	53	62
Yapı Kredi Bankası	4	4,7
Ziraat Bankası	7	8,2
Total	85	100

62% of academics use mobile banking of Vakıfbank; 11%, of Akbank; 8.2%, of Ziraat Bankası; 5.9%, İş Bankası; 4.7% of Yapı Kredi Bankası; 2.4% of Kuveyt Türk; 1.2% of Deniz Bank; and 1.2 %, of Finansbank. That a large part of participants use application of Vakıfbank Mobil Banking can be attributed to that academics receive their salaries from this bank, while that the rate of using İş Bankası and Akbank mobile banking may be related to that these banks have branches in campus; that they follow a policy toward staff; and that access is easy.

Frequency of Using Mobile Banking Transactions of Academics

In the scope of study, in order to determine of the frequency of using the transactions taking place in mobile banking, the frequency of using the transactions of the monetary transfers, payments, control of card or account information, investments, and application taking place in Table 8 were asked.

Table 8: Frequency of Using Mobile Banking Transactions

Mobile Banking Transactions		Never	Rarely	Sometimes	Often	Always
8-Monetary Transfers	Percent	4,6	12,6	14,9	31	36,8
	Number	4	11	13	27	32
9-Payments (Credit card, receipt, credit, etc.)	Percent	2,3	12,6	11,5	32,2	41,4
	Number	2	11	10	28	36
10-Control of Card or Account Information (Balance, Debt, General Information , etc.)	Percent	2,3	6,9	21,8	23	46
	Number	2	6	19	20	40
11-Investment Transactions	Percent	45	27,6	16,1	5,7	5,7
	Number	39	24	14	5	5
12-Application Transactions (Credit, Credit card, etc.)	Percent	58	24,1	9,2	6,9	2,3
	Number	50	21	8	6	2

Attitudes of Academics Regarding Factors Being Effective on the Use of Mobile Banking

In the scope of study, total 50 questions, in the form of 5 point Likert scale, were raised to the academics, in order to determine their attitudes regarding the factors being effective in the use of mobile banking. Scale of 50 items that is related to the factors that are effective on the use of mobile banking consists of 12 sections as customer satisfaction and loyalty, perceived price level, level of using technology, perceived availability, perceived easiness of use, security and privacy, perceived compliance, trust, social effect, facilitative conditions, perceived cost, and worry. Evaluations of academics regarding the factors that are effective on the use of mobile banking are given below.

Table 9: Evaluations on Customer Satisfaction and Loyalty

Customer Satisfaction and Loyalty	Mean.	SD
18-. I can also recommend the application of mobile banking I currently use to the other people.	4,11	0,78
19- I also think of using the other services (transfer, EFT, application for credit card, balance questioning , etc.) of the bank, whose mobile banking application I currently use of application,, in mobile banking.	4,08	0,73
20-. I consider to use the channels, other than mobile banking (branch, internet banking, phone banking, ATM, etc.), of the bank, whose mobile banking application I use	4,07	0,88
15-. In the future, for my banking transactions, I will mostly mobile banking.	3,99	0,82
14-, I am generally pleased with using mobile banking services.	3,95	0,73
21- Because I am pleased with the other services the bank presents, I use mobile banking service.	3,93	0,88
16-, I do not think of exchanging the bank, whose mobile banking application I use.	3,69	0,98
13- All processes of mobile banking are satisfying.	3,51	0,99
17- Even if my bank presents more appropriate offers to me for the other banking channels, I will continue to use the channel of mobile banking	3,47	1,07
Factor of Customer Satisfaction and Loyalty	3,87	0,52
Notes: (i) n=88; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=62.26$: $p<.001$) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.76.		

In related to customer satisfaction and loyalty in the use of mobile banking, the issue academics give importance the most is that they can recommend the banking application they use to the other people. Also using the other services of the bank he/she uses its application in mobile application is a subordinate factor. These results can be interpreted in the way that academics will also begin to use a mobile banking application they enjoy for the different transactions and that they are in tendency to enlarge the use area of bank application as content and number. The issue, to which is given importance the least is that one will continue to use the mobile application even if there are appropriate offers for the other banking channels.

Table 10: Evaluations on the perceived Price Level

PERCEIVED PRICE LEVEL	Mean.	SD
22-The fees received for mobile banking transactions are reasonable.	2,94	1,44
23- The connection fee that should be necessary to be paid for to access to the mobile banking is reasonable.	2,80	1,28
24-. Even if the fee received for the transactions is increased, I continue to use mobile banking.	2,05	1,07
25- Even if 10 % of transaction price is received as transaction fee, I continue to use mobile banking.	1,62	0,82
Factor of Perceived Price Level	2,35	0,84
Notes: (i) n=88; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=74.862$: $p<.001$) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.678.		

In related to perceived price level in the use of mobile banking, the issue academics give importance the most is that reasonable fees is received for mobile banking transactions. That the connection fee paid for accessing to mobile banking is reasonable is a subordinate factor. These results can be interpreted in the way that academics use mobile banking with the appropriate access, connection, and use fees. The issue, to which is given importance the least is that one will continue to use the mobile application even if 10 % of transaction price is received as transaction fee.

Table 11: Evaluations on the Level of Using Technology

LEVEL OF USING TECHNOLOGY	Mean	SD
27- When I hear that a new technological banking service is introduced, I want to try it.	3,26	1,00
28-. I have more information than my friends' about technological banking service.	3,08	1,10
30- I do not hesitate trying the new technological banking services, even if nobody from my friend circle earlier tried it	3,00	1,06
26- I have generally been the person first trying, among my friend circle, technological banking services, recently introduced,	2,99	1,14
29-. I first hear about technological banking services among my friend circle.	2,92	0,99
31- I hear about technological banking services, recently introduced, earlier than most people in my friend circle	2,88	1,05
Factor of level of using technology	3,02	0,90
Notes: (i) n=90; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=25.131$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.921		

In related to level of using technology in the use of mobile banking, the issue academics give importance the most is to try, when a new technology is introduced. Having more information about technological banking service is an subordinate factor. These results can be interpreted in the way that academics have a desire to follow and implement the innovations in banking technology. The issue, to which is given importance the least is a new service is heard earlier than most people.

Table 12: Evaluations on Perceived Availability

PERCEIVED AVAILABILITY	Mean	SD
33- Adopting mobile banking will enable me to more quickly do the transactions realized.	3,99	0,73
32- Adopting mobile banking will enable me to more efficiently do the transactions realized	3,80	0,72
35- Adopting mobile banking is a useful for to manage my financial state.	3,60	0,88
34- Adopting mobile banking is the most appropriate way for me to do banking transactions.	3,50	0,90
Perceived Availability Factor	3,72	0,63
Notes: (i) n=90; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=30.958$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.785		

In related to perceived availability in the use of mobile banking, the issue academics give importance the most is to adopt mobile banking and the increase of speed in transactions. That adopting mobile banking improves efficiency in the transaction is an subordinate factor. These results require academics to adopt mobile banking for becoming more efficient, quicker, and more effective in mobile banking transactions. The issue, to which is given importance the least is that adopting mobile banking is the most appropriate way for banking transactions.

Table 13: Evaluations on Perceived Easiness of Use

PERCEIVED EASINESS OF USE	Mean.	SD
38- It is easy for me to become qualified in the use of mobile banking.	3,77	0,84
37- Interaction with mobile banking does not require much more efforts..	3,63	0,94
36- In order to be able to banking transactions, it is easy to adapt to mobile banking.	3,62	0,95
Perceived Easiness of Use	3,67	0,72
Notes: (i) n=91; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=5.135$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.685		

In related to perceived easiness of use in the use of mobile banking, the issue academics give importance the most is that becoming a qualified user is easy. That interaction with mobile banking does not require an much more intellectual effort is an subordinate factor. These results can be interpreted in the way that academics do not make much more effort to be successful in mobile banking transactions. The issue, to which is given importance the least is that adopting mobile banking is that adaptation to mobile banking for banking transactions is easy.

Table 14: Evaluations on Security and Privacy

SECURITY AND PRIVACY	Mean	SD
41-.The points of security is effective on the use of mobile banking	3,91	0,88
42-. I trust that mobile banking protects my privacy	3,60	0,96
43- I trust on mobile banking like a bank branch.	3,39	1,08
40-.I worry about the reliability of mobile banking	2,87	1,11
39-. Using mobile banking is not financially secure .	2,62	0,91
Factor of Security and Privacy	3,28	0,63
Notes: (i) n=90; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=101.072$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.630		

In related to security and privacy in the use of mobile banking, the issue academics give importance the most is that the element of security is effective. That interaction with mobile banking does not require much more intellectual effort is an subordinate factor. These results can be interpreted in the way that academics prioritize the elements of privacy and security. The issue, to which is given importance the least is that adopting mobile banking is that mobile banking applications are financially secure.

Table 15: Evaluations on Perceived Compliance

PERCEIVED COMPLIANCE	Mean	SD
46- I believe that my phone is complied with mobile banking technology.	4,04	0,87
44- Mobile banking is compatible with my life style.	3,88	0,95
45- Mobil banking is highly compatible with the way I want to manage my financial state	3,84	0,79
Factor of Perceived Compliance	3,92	0,65
Notes: (i) n=91; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=4.385$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.698		

In related to perceived compliance in the use of mobile banking, the issue academics give importance the most is that mobile phones are complied with mobile banking technology. That mobile banking is compatible with the life style is an subordinate factor. These results can be interpreted in the way that academics prioritize the processes and techniques to be compatible with the daily life The issue, to which is given importance the least is that mobile banking applications are compatible with the style to manage the financial condition.

Table 16:Evaluations on Trust

TRUST	Ort.	S.S
48- I trust to the producer of mobile phone that it produces phones in accordance with mobile banking.	3,86	1,01
47- I believe that my bank presents mobile banking in trustable way.	3,85	0,80
49-. I trust to my operator about it provides secure data connection to materialize mobile banking	3,47	0,94
Trust Factor	3,73	0,74
Notes: (i) n=91; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=18.393$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.736		

In related to trust in the use of mobile banking, the issue academics give importance the most is about producing phone in complied with mobile banking technology, they trust to the producer of mobile phone. That bank presents secure mobile banking application is an subordinate factor. These results can be interpreted in the way that academics prioritize the element of trust in the process and techniques in the mobile banking transactions. The issue, to which is given importance the least is that mobile banking applications is to trust to operator for the reliable connection in mobile banking applications.

Table 17: Evaluations on Social Effect

Social Effect	Mean	SD
50- I consider to use mobile banking, if somebody recommends it to me	3,8	1,01
52-. Many people, to whose thoughts I give importance think of that I should use and continue to use	3,51	0,89
51- While trying a new technology, I give importance my own instincts rather than others' recommendations.	3,48	1,10
53-. Since many people use mobile banking, I also use mobile banking.	3,09	1,10
Factor of Social Effect	3,47	0,62
Notes: (i) n=90; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=29.332$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.620		

In related to social effect in the use of mobile banking, the issue academics give importance the most is that they use mobile banking with recommendation. That the people, to whose views they give importance support the use of mobile banking is a subordinate factor. These results can be interpreted in the way that academics prioritize the views of people in their circles . The issue, to which is given importance the least is to use mobile banking applications since many people use them.

Table 18: Evaluations on Facilitative Conditions

FACILITATIVE CONDITIONS	Mean	SD
55- I need information for using mobile banking	2,84	1,27
56- While using mobile banking, there is a professional to help me.	2,80	1,11
54-. I need resource for using mobile banking.	2,69	1,10
Factor of Facilitative Conditions	2,78	0,89
Notes: (i) n=90; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=1.724$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.653		

In related to facilitative conditions in the use of mobile banking, the issue academics give importance the most is that one needs information in the use of mobile banking. That there are specialists to give support in the use of mobile banking is a subordinate factor. These results can be interpreted in the way that academics need the support of specialist and information . The issue, to which is given importance the least is to need the resources in the use of mobile banking.

Table 19: Evaluations on Perceived Costs

PERCEIVED COST	Mean	SD
59-. There are financial barriers (internet connection fee, specialized phone, etc.) for me to use mobile banking.	3,08	1,36
58-. I think that the necessary internet connection for me to use mobile banking is very expensive.	2,81	1,27
57-I pay for too much to use mobile banking.	2,36	1,13
Perceived Cost factor	2,75	1,07
Notes: (i) n=91; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=25.144$: p<.001) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.803		

In related to perceived cost in the use of mobile banking, the issue academics give importance the most is that there are some financial barriers in the use of mobile banking. That the necessary internet connection is expensive in mobile banking application is a subordinate factor. These results can be interpreted in the way that academics taking the cost into consideration in mobile banking application. The issue, to which is given importance the least is to pay for too much in the use of mobile banking.

Table 20: Evaluations on Worry

WORRY	Mean	SD
60- I have some worries about using mobile banking.	2,69	1,04
61- Since I am afraid of the mistakes I cannot correct, I am indecisive about the use of mobile banking.	2,02	0,91
62-. Mobile banking is something that frightens me	1,93	0,90
Worry Factor	2,22	0,81
Notes: (i) n=91; (ii) In the scale, 1 means "I absolutely disagree with it" and 5, "I absolutely agree with it" (iii) According to two ways ANOVA test of Friedman ($\chi^2=68.16$: $p<.001$) the results are statistically significant. (iv) Cronbach Alpha value of scale is 0.813		

In related to worry in the use of mobile banking, the issue the academics give importance the most is that they worry about the use of mobile banking. The fear that one makes mistakes not to be able to correct is a subordinate factor. These results can be interpreted in the way that the academics behave highly careful in the use of mobile banking. The issue, to which is given importance the least is that mobile banking is frightening

Conclusion

Interned emerging as a result of rapid changes occurring in 21st century, nowadays, became an indispensable part of banking . In this direction, that banks present their products and services to their customer through internet in accordance with the law and regulations will increase the competitive power of banks. Technological services, besides ,that they are successfully applied by the banks and that they aim to easily and effectively reach their customers in lower costs ,also affect the image of banks on the customers.

The banks, as a result of changes occurring in the branch networks, supported the branch networks with new several networks and, as a result of these networks, aimed to increase the profit, nd reduce the cost to minimum. In this process firstly beginning ATM and phone banking, later, the networks of internet banking and mobile banking were included in the process and, thanks to this, it is targeted to reach the different customers in different moments .

In this study carried out to evaluate the experiences of the academics regarding the factors affecting the use of mobile banking, the data collected with the method of face to face survey were analyses by means of SPSS program. The results of analysis are summarized in Table 21.

Table 21: Factors According to the Degree of Importance

	Mean	SD
Perceived Compliance	3,92	0,65
Customer Satisfaction and Loyalty	3,87	0,52
Trust	3,73	0,74
Perceived Availability	3,72	0,63
Perceived Easiness of Use	3,67	0,72
Social Effect	3,47	0,62
Security and Privacy	3,28	0,63
Level of Using Technology Use	3,02	0,90
Facilitative Conditions	2,78	0,89
Perceived Cost	2,75	1,07
Perceived Price Level	2,35	0,84
Worry	2,22	0,81

As seen in Table 21, when the means are calculated regarding each factor, academics, in applications of mobile banking, prioritize the most the factors of perceived compliance, customer satisfaction and loyalty, and trust. Besides this, the factors of perceived cost, perceived price level, and worry are the ones given importance the least in the use mobile banking.

For the next studies, it is suggested to be examined the factors that stand out and that are effective the most in the use of mobile banking in more detail and to be developed the practical solutions, which for practitioners, will make more effective, quicker, and which will increase customer satisfaction and loyalty.

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INDEPENDENT COLLEGE, A UNIQUE INNOVATION, IN THE HISTORY OF CHINESE HIGHER EDUCATION- THE TEN YEAR PRACTICE AND EXPLORATION OF NANKAI UNIVERSITY BINHAI COLLEGE

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Abstract: Independent college is widely regarded as a unique innovation in the history of Chinese higher education with its advantages of “excellent education, independent administration and private ownership”. Born and developed in the popularizing process of Chinese higher education, independent college has made remarkable achievements and outstanding contributions to Chinese higher education after 15-year hard work and great efforts. With the deepening of all-round reform in Chinese education, independent college now faces a grave challenge to its existence and development. Catching the opportunity when government introduces new policies, living up to the expectations of students and their parents, deepening the reform and innovation, realizing the goal of building high-level independent college through reform and innovation—all have become important tasks for us to study and solve. This thesis is based on the ten-year practice and exploration of Nankai University Binhai College and the rational analysis of founding background, types and existing problems of independent colleges. It studies the university-running model, which features the cooperation with Chinese government, prestigious universities listed in 211 Project and 985 Project, the government of economically developed areas and leading enterprises. Therefore the sustainable and healthy development of independent college will be unswervingly promoted.

Key words: Independent college, Chinese higher education, A unique innovation

Introduction

Independent College was born and developed in the popularizing process of Chinese higher education and the deepening of Chinese educational reform. It became a unique existence in the history of Chinese higher education with its advantages of “excellent education, independent administration and private ownership”. As an important accomplishment in the reform and innovation in Chinese higher educational system, independent college has attained rapid development and made remarkable achievements after 15-year great efforts. The rapid expansion of school scale and the continuous improvement of its educational quality have made remarkable contribution to the scale-up of Chinese higher education, the development of private higher education, the adoption of social educational resources and the cultivation of competent and well-trained people. Independent college has become

an important growth engine of Chinese education and played an important role in promoting educational reform. Now, with the comprehensive reform in Chinese education deepening and the trial running of independent colleges coming to an end, independent college is ready to bring out its full potential in its development and administration despite the grave challenge to its existence and development. The issue of Decree No. 26, i.e. *The Measures for Setup and Management of Independent College* has pointed out the direction for its development. Catching the opportunity when government introduces new policies, living up to the expectations of students and their parents, choosing correctly the development path, realizing the goal of building high-level independent college through reform and innovation—all have become important tasks for us to study and solve. During its ten-year practice, Nankai University Binhai College seeks further cooperation with Nankai University which boasts its advantageous educational resources and Tianjin Binhai New Area which is known as “a new pole of economic growth in China”, and strives to draw social resources into its cooperative university-running model. It successfully finds a sustainable and healthy development road for independent college.

I. The Founding Background and Types of Independent Colleges

Reviewing the founding background and history of independent colleges, analyzing government’s original intention of establishing them are beneficial to making rational judgment about their prospects and making choices to achieve their sustainable and healthy development. Independent college is to meet the demands of the institutional reform and popularization of Chinese higher education, to fulfill people’s requirement for higher education and to overcome the shortage of educational resources. The development history of independent college can be divided into three important stages from the analysis of the founding background.

A. Free Development Stage

Independent college grows out of private affiliated college, and the first one was founded in 1999. At that time, in order to meet the need for the scale expansion of higher education, some regions and universities began to establish private affiliated colleges, represented by Zhejiang University City College, jointly founded by Hangzhou Municipal Government and Zhejiang University. In the initial period from 1999 to 2002, independent college existed and developed in its own unique way.

B. The Pilot Stage

In the latter half of 2002, the Ministry of Education, on the basis of repeated researches, has made assessment about private affiliated colleges, holding that the running mode of private affiliated college has demonstrated advantages after four-year practice. In order to encourage, guide and specify the social funds being introduced into higher education, the Ministry of Education issued document No.8 in 2003, i.e. *On Standardizing and Strengthening the Management of Independent College Run in New Mechanism and Mode by Universities*. This document for the first time renamed the private affiliated college ‘independent college’, specified its nature, guiding principles, and established the university-running principle of “excellent education, independent administration, private ownership”. To be specific, excellent education puts emphasis on bringing in excellent educational resources; independent administration stresses the legal and institutional independence; private ownership underlines the private attribute of independent college. Starting from Document No.8, independent colleges made the transition from free development to standard operation with the support of the national policies. Simultaneously, in the latter half of 2003, the Ministry of Education inspected, cleaned up and rectified over 360 private affiliated colleges. This measure closed down more than 100 independent colleges and had 249 independent colleges re-registered and put on file. Since then, independent college won the wide acclaim from the society for its three characteristics .

C. Standard Operation and Self-development Stage

Since the implementation of Document No.8, there was a large-scale and high-speed development in independent colleges. However, driven by the pursuit of profits, some independent colleges raised serious concerns for its non-standard operations, The Ministry of Education attached great importance to this phenomenon, after investigating and soliciting opinions from all sides, it issued Decree No. 26 in 2008, i.e. *The Measures for Setup and Management of Independent College*, in which policies and systems related to independent college are modified, attribute of independent college defined, rights and interests of independent college, applying universities and relative sponsors clearly explained. From the issue of Decree No.26, independent colleges started the standard operation and self-development. At this stage, Ministry of Education proposed a five-year transitional period of Inspection & assessment, and offered 5 choices for independent colleges. First, continue to operate in the mode of independent college; second, step back to apply to run public college; third, be changed into private ordinary college; fourth, be incorporated into other private colleges; last, be closed down.

Looking closely at the founding background and development history, independent colleges lack uniform mode in practice, which resulted in the diversified types of independent colleges. They can be roughly divided into 4 types in terms of the funding resources and cooperative patterns.

A. Independent Colleges Sponsored by Public Universities and Private Funds.

This type agrees with the cooperative university-running mode stipulated in Decree No.26 issued by Ministry of Education, and accounts for 1/5 of all independent colleges. This type is more likely to make the mistake of sacrificing educational quality due to excessive pursuit of profits.

B. Independent Colleges Affiliated to Public University with Non-governmental Investment

This type of college is established independently, with all the funds coming from private investment. It is supported by public universities only in its teaching faculty and teaching administration. The proportion of these “borrowing shell” colleges is relatively low.

C. Independent College Solely Sponsored by Public University

It is the so-called “school within a school” mode, accounting almost half of all independent colleges. Usually, the school conditions and standard are limited by that of host universities.

D. Independent College Sponsored by Public University, Government and Private Investors.

This type draws investments from public university, local government and private enterprises. Although this type at present does not have a large percentage, it enjoys a stable development, an optimistic growing trend, an excellent educational quality and a high social identity, thanks to the stable private funding resources negotiated and invited by local government.

By analyzing the founding background and the types of independent colleges, it can be concluded that: First, as a new emerging force, it aroused great concern of Ministry of Education, which issued a series of official documents to standardize and regulate its operation; second, despite the alive and flourishing prospect, independent college faces long-term and arduous tasks; third, independent college should advance toward the goal of “improving quality, standardizing the administration”, it is required by Decree No. 26 to choose one appropriate university-running mode out of the five options, and also to bring out its full potential to realize its characteristic development.

II. Major Achievements and Problems of Independent Colleges

A. Major Achievements.

In recent years, under the guidance of Ministry of Education and local educational administrative departments, with continuous rectification and self-improvement, independent colleges have made historic

contribution to China's educational development by advancing its educational quality, upgrading its teaching facilities, improving educational mechanism and standardizing university-running process.

There are three outstanding achievements from a macro perspective.

1. Independent colleges provide the people with more opportunities to receive higher education.

Independent college meets people's diversified demands for higher education, and promotes educational equity and social stability. It has, to a large extent, advanced the popularizing process of Chinese higher education, expanded the scale of higher education, and explored the path to develop higher education with Chinese characteristics.

According to the educational statistics issued by Ministry of Education in 2013, there were 1170 universities and colleges nationwide, among them, 292 were independent colleges, accounting for 24.96%, and undertaking 1/3 undergraduate enrollment expansion responsibility. Since the founding of Binhai College, it has maintained a sound momentum in recruiting students. In terms of the number and quality of the enrolled students, the college ranks among the top colleges in the same category in China.

2. Independent colleges foster competent, highly-skilled people. Over the past 15 years, independent colleges have fostered over 3 million graduates for the society, partly meeting the demand of regional economic and social development for competent and well-trained people. The initial employment rate of the independent college graduates is the fourth highest compared with that of other universities and colleges of various types. Taking our college as an example, up till now, 15,262 students have graduated, with an average graduation rate of 96.97%, employment rate of 94.01%, The Major of Auction and Pawn has an employment rate of 100% for several years. For ten years, nearly 1,000 graduates from our college have been admitted to the postgraduate programs of universities at home and abroad, among them, more than 100 graduates admitted to such key universities of 985 Project and 211 Project as Peking University, Nankai University and Tianjin University. Some students have even pursued their further studies in New York University, the University of Edinburgh and other prestigious universities abroad. Each year, a large number of graduates are employed in Bank of China, China Railway Group, Yili Group, China Electronics Technology Group and other well-known enterprises and institutions. The graduates from Binhai College have been widely acclaimed by their employers for their competence.

3. Independent colleges activate social educational resources. Independent colleges fully mobilize non-governmental sectors to jointly run the school, and absorb abundant non-fiscal educational input. They have successfully solved the problem of people's growing demand for higher education with insufficient higher educational resources. At present, the social funds drawn by independent colleges have amounted to 60 billion Yuan, accounting for over 11% of national higher education expenditure. Given all that, independent colleges are the precious treasure of Chinese higher education, which should not receive marginalized management. The establishment of high-level independent colleges has become the call of the times.

B. Major Problems

In recent years, China has attached great importance to the development of independent colleges, which has in turn greatly promoted the healthy development of these colleges. However, with the all-round reform in higher education deepening, some deep-seated problems existing in independent colleges are emerging, and the pressure of existence facing them gradually increased. The problems existing in administration, mechanism and distribution of educational resources hindered the strength of independent colleges being fully unleashed.

1. The Board of Trustees in independent colleges is not effective. Some independent colleges have no board of trustees, some, though installed with one, do not have standard discussion methods, the board could neither meet and discuss as required nor carry out their duties in earnest. As these boards of trustees fail to bring the functional roles into full play, the decision-making and the executive are uncoordinated, President-directed system under the leadership of the board cannot be implemented, which harm the initiative, spontaneity and

creativity of independent colleges.

2. Independent colleges lack standard administrative mechanism. Some independent colleges still follow the administrative mode of their host universities, with members of the administration appointed by host universities, therefore over-centralization weakens the initiative and innovation of the president of independent college when running the school. Some colleges are overly dependent on their host universities, and refer all the important decisions to them for instructions, such submissiveness suppresses their initiative and flexibility, restrains the university-running features from forming. Some suffer rigid internal management and over-stuffing, the effective recruitment system and competition mechanism are not in place, which fail to prepare the faculty and staff members for both promotion and demotion, both employment and dismissal, therefore the developing vitality undermined.

3. Property rights are not clear. As to the structure of ownership, many independent colleges don't have qualified stakeholders but virtual cooperators. Till now, some independent colleges still face the problem of not having their property transferred under their names. Some cooperators lack the correct understanding of "non-profit" feature of education, overtly pursuing profits in its running process, keen on the infrastructure construction, ignoring the investment in education, therefore the teaching quality is affected and the sustainable development inhibited. Some independent colleges are obsessed with the development of popular disciplines and majors, they ignored the basic disciplines and humanities, accordingly, the intensive construction is weakened, and the educational quality is sacrificed.

4. Regulatory policy and assistance from the government are not in place. The government does not offer financial support or implements too "rigid" college enrollment policy to independent colleges, thus resulting in the struggling difficulties facing them.

III. Practice and Exploration of the University-running Cooperation between Famous Universities Listed in Project 985 and Project 211 and Local Government

We realized from our practice that the key to retain the great vitality of independent colleges lies in the solution of problems in university-running mode, administrative mechanism and educational resources. With multiple modes open to selection, we show our bold innovation in finding the most suitable one geared to our individual reality. We managed to reach all standards asked of independent colleges. We pride ourselves on sufficient funds, abundant educational resources and clear property rights. Our college fully demonstrates the features of "excellent education, independent administration and private ownership".

Located in the core of Beijing-Tianjin-Hebei City Agglomeration, Binhai College stands in Dagang Ecological Park of Higher Education in Tianjin Binhai New Area District. In order to solve the problems in university-running modes, mechanism and educational resources, during its early years, Binhai College collaborated closely with the prestigious Nankai University and the government of Tianjin Binhai New Area, and has formed its own unique characteristics. Now Binhai College still sticks to the university-running principle of "building first-class college with distinctive characteristics from a high starting point", and intensifies its efforts to cooperate with strong institutions and complement each other's advantages. The college has been awarded by National Institute of Education Sciences (NIES) and other institutions as the most competitive independent college in China and one of the top ten independent colleges in China. It has also been awarded by Tianjin Education Committee and Tianjin Personnel Bureau as an outstanding institution in Tianjin's education system.

We learned from our practice that the adoption of the model of joint cooperation between famous universities and local government not only conforms with the regulation proposed by Ministry of Education, – establishing independent colleges by universities and social organizations using non-governmental financial funds, but also demonstrates the innovation in cooperative modes. The local government participates in the university-running process by performing its function in organization, coordination and supervision, this socially-acclaimed

model effectively prevents the educational quality being harmed by the pursuit of profits by investors, and reduces the possibility of administration interfering educational independence, and ensures the non-profit feature.

A. Sticking to the Principle of Running the University by Law, Ensuring the Implementation of the Regulations Concerning Independent Colleges Proposed by Ministry of Education.

For ten years, Binhai College has been upholding the principle of running the university by law and practicing scientific administration. With the support from and cooperation with Nankai University and the government of Binhai New Area, Binhai College from the very beginning gained its independence in the following 7 aspects: It has its own campus and teaching facilities; it enrolls students independently; it grants students graduation certificates of Nankai University Binhai College; it conducts independent financial accounting; its fixed assets now has reached 569 million yuan and has been completely transferred under the name of Binhai College; thus realizing its goal of clear property rights.

B. Keeping up its Non-profit Feature, Ensuring the Continuous Improvement of Teaching Facilities.

Excellent school conditions are the basic guarantee for the sustainable and healthy development of Binhai College and the improvement of teaching quality. Some independent colleges, driven by the market, blindly pursues profits, ignores its non-profit feature and social responsibility, which in turn undermined their educational quality. Sponsors of our college believe that although independent college is non-governmental organization, it is by no means the product of market economy; it was founded with the social funds drawn by excellent universities, and for the purpose of meeting the requirements for the popularization of higher education. As the complement to higher education, independent college should represent its non-profit feature. Currently, independent college is in its infancy, requiring the input of nutrition. It should develop from a high starting point, improve its teaching quality, foster more competent people, and make efforts to build its own brand. For this purpose, all the sponsors of Binhai College have rendered their full support in such areas as human resources, funds, land, facilities etc., which greatly improved our college condition and our university-running ability. Binhai College has over 10,000 students on campus, and it occupies an area of 67 hectares. Over the years, there has been a substantial increase in the floor space of school building, the total value of teaching and research facilities, and the number of paper books and e-books.

The “zero-payback” decision made by all sponsors is rarely seen in other independent colleges across the nation, it strengthens the non-profit feature of Binhai College. It is proved that independent college and its cooperators from prestigious universities, local government and social organization have complementary advantages which will help improve our school condition and teaching quality.

C. On the Basis of the Advantages of Nankai University and Binhai New Area, Binhai College has Formed its Own Unique Educational and Teaching Features.

We learned from our practice that the independent college sponsored by key research-oriented university enjoys more advantages in improving its ability to foster competent, well-trained people. The opening-up and development of Binhai New Area is an important national development strategy, this strategy provides a broad platform for the curricula design, the adjustment of enrollment, the construction of students’ training base, and the employment of students etc.. For ten years, Binhai College embraced continuous development and innovation by making the best of the quality teaching and educational resources of Nankai University and the geographic advantage of Binhai New Area.

Nankai University is a key comprehensive university directly under the jurisdiction of the Ministry of Education. It is one of the 211 Project and 985 Project universities in China. Nankai University was a non-

governmental university, it was founded in 1919 by patriotic educators Zhang Boling and Yan Xiu. It is the alma mater of Zhou Enlai, the first premier of the People's Republic of China. It has fostered a large number of outstanding people such as Chern Shiingshen, Wu Dayou and Cao Yu. In the past one hundred years, Nankai University enjoys a high reputation both at home and abroad by its long history, glorious tradition and prudent school ethos, and it has made great contributions to the revival and prosperity of China. For the past ten years, Binhai College made great efforts to develop Binhai College into a first-class independent college by inheriting the excellent school tradition of Nankai University and fostering competent people for the society.

Binhai New Area was established in November 2009 with approval from the State Council. It lies on the east coast of Tianjin, at the joint between Bohai-rim Economic Belt and Beijing-Tianjin-Hebei City Agglomeration. In the 21st century, as part of the national development strategy, Binhai New Area will play an even greater role in promoting economic revitalization in Beijing-Tianjin-Hebei and Bohai-rim Region, the interaction between the east and the west, and the coordinated development of the national economy. Nankai University Binhai College is located in Dagang Higher Education Eco-Park in Tianjin Binhai New Area, adjacent to Tianjin Port, TEDA, Dongjiang Bonded Port, Airport Economic Area, Harbor Economic Area, and Nangang Industrial Zone. The development and opening-up of Binhai New Area with remarkable geographic advantages offered a historic opportunity for the development of Binhai College.

1. Scientifically defining development direction and setting cultivation objective. Direction and cultivation objective determine the future of a college. Establishing a high-level independent college needs to make suitable choice in multiple social needs. Our development direction and cultivation objective are as follows: To meet the needs of economic and social development and the students' diversified demands, Binhai College strives to foster competent, well-trained people by promoting the development of students' all-round capabilities and the improvement of their moral integrity, intellectual ability, physical strength and aesthetic values. Efforts are also made to develop the college into one with its particular characteristics, with the application-oriented undergraduate education as its basis, the improvement of educational quality as its guideline, the scientific research and internationalization as its support, and the offering of service to the society as its obligation. Moreover, we collaborate closely with Nankai University in curricula design, teaching facilities construction, faculty and staff training, thus promoting greatly our university-running ability.

2. Strengthening the cultivation of faculty and staff. Faculty is an important guarantee for improving educational quality and enhancing the core competitiveness of college. The college strives to build a strong faculty of outstanding teachers with professors from Nankai University as the core, its own full-time teachers as the backbone and excellent part-time teachers as a supplement, so as to maintain the sustainable development of the college. Binhai College has nearly 600 full-time faculties. The deans of the departments in the college are from Nankai University, and they are the professors or experts with rich experiences in teaching and management.

The college also has a perfect teaching supervision system. Professor Chen Hong, former executive vice president of Nankai University and chairman of Tianjin Federation of Literary and Art Circles, is the head superintendent of Binhai College. Professor Che Mingzhou, former superintendent of Nankai University, and other experts and scholars have also been hired to supervise the education in the college. In addition, Feng Daxuan, the eminent former vice president of Taiwan Tsinghua University, was appointed as honorary professor of Binhai College, Miyaoka Naoki, head of Nippon Color and Design Research Institute, was appointed as visiting professor of Binhai College. These measures provide effective support for the improvement of teaching and management in the college. All these above-mentioned advantages formed the unique features of Binhai College.

3. Developing characteristic majors. Major construction is closely linked to the existence and development of the college. The curricula design is closely related to but not a simple duplicate of the advantageous disciplines of Nankai University, our college highlights its characteristics in setting up majors and

aims especially to foster well-trained people to serve the development and opening of Binhai New Area. By doing so, Binhai College successfully avoids major similarities with other universities and colleges. It is committed to cultivating urgently-needed, highly-skilled people for regional development. At the same time, Binhai College actively searches for its development direction and locates the growing points in its major construction. Binhai College sets up and reforms majors in accordance with the market requirement, establishes majors together with enterprises or foreign universities and strengthens the key discipline construction. It set up new majors such as Internet of things technology, financial engineering futures dealing and management, industrial engineering, communication engineering, digital media technology, etc., Which are warmly welcomed by students and relevant enterprises. Now, there are 40 majors in its 9 departments (economics and management, finance, foreign languages, law and government, arts, information management, computer science, electronic science, environmental science and engineering), which fall into 7 disciplines.

4. Extensively carrying out the international university-running principle. The key to the existence of independent college is to have abundant educational resources at its back. Taking international university-running path, elevating the international university-running capacity is an urgent requirement for the Chinese higher education as well as for optimizing educational resources. For this reason, Binhai College takes international university-running cooperation as an important strategy, and draws experience from Nankai University's international cooperation, and explores the effective channels to foster competent well-trained people together with international(regional)universities. Binhai College carries out exchanges and cooperation with foreign institutions of higher-learning and puts cross-cultural concept into its teaching and campus culture so as to embody its university-running idea of being international and opening to the outside world. Binhai College has established cooperative relationships with more than 10 international (regional) universities and research institutions, including St. Cloud State University, the University of Huddersfield, BPP University, Northumbria University, Josai International University, Hakodate University, Heian Jogakuin University, Nippon Color and Design Research Institute, Edith Cowan University, Mingdao University, Nankai University of Science and Technology. Binhai College has kept improving its undergraduate "2+2" joint training projects in finance, software engineering, environmental management, psychology, accounting and other professional fields. It also actively promotes Sino-foreign cooperation in its major development, recommends its graduates to pursue further studies or participate in short-term exchanges abroad, encourages its teachers and staff to receive trainings abroad, and co-sponsors international conferences.

For ten years, thanks to the supports from various circles, Binhai College has made a marked advance in university-running and has won wide acclaim. In 2013, the college won the second prize at the 7th teaching achievement contest for institutions of higher learning in Tianjin. Binhai College has been named twice as a pilot unit for patent work in Tianjin by Tianjin City Intellectual Property Office. The college attaches great importance to arousing students' interest in learning and stimulating their creativity. In recent years, the students have worked out more than 5,000 innovative designs and successfully applied for 405 national patents. In 2012, with the accreditation of its "College Students Business Incubation Base" by Tianjin Municipal Science and Technology Commission, the college became an incubator for technology enterprises under the leadership of the commission. As the first model base in Tianjin for college students' business incubation, it has attracted 13 projects of which 5 companies that were registered and operated on the campus only have developed into independent incorporated companies registered at the industrial and commercial departments to engage in operation and management. The business of the registered companies in the incubation base covers a wide range of fields: IT, processing and production, energy development, manufacturing, new materials research and development, and biotechnology, etc.

In academic competitions, our students competed with students from key universities, they made

outstanding achievements and won nearly 100 key awards at the national or municipal level, such as first prize at the National University Logistics Design Competition, first prize at the national contest on professional software development and design, second prize at the National Undergraduate Electronic Design contest, third prize at the first International College Mathematical Modeling Invitational Tournament (in China Division), and third prize at the national information technology application competition. Jin Ke, a student from the Department of Foreign Languages of Binhai College, won the first prize at the 2013 National English Contest for College Students (in Beijing and Tianjin Division).

The Dragon Boat Team of Binhai College has several times won prizes in the International Collegiate Dragon Boat Invitational Tournament, World University Dragon Boat Championships, National College Dragon Boat Championships, and Tianjin Haihe River Dragon Boat Festival. In 2012, the Rowing and Dragon Boat Branch of Chinese College Students Sports Association granted the highest honor to Binhai College, as one of the top ten colleges in China that have made outstanding contributions to the sport.

In 2012, 267 volunteers from the college provided services to TWAS General Meeting, the Ninth National University Games, Tianjin Summer Davos Forum and other exhibitions and events, which were covered on the mainstream media. Their services won wide acclaim from the organizers. At the Ninth Universiade, the volunteers won two honorary titles from the Organizing Committee and Tianjin Television Station. In October 2013, when the East Asian Games was held in Tianjin, students of the college volunteered to provide services to the badminton games.

It shows that independent college jointly established by key universities and local government have huge potential and a bright future. On the basis of our ten-year achievements, we will live up to the expectations of the country, the society, the students and their parents, deepen the reform and improve the administrative scheme and ability, and establish new university system. We will forge ahead to develop Binhai College into an outstanding independent college with distinctive characteristics, and promote the globalization of education.

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INVESTIGATION OF EVAPORATIVE COOLING EFFECTIVENESS ON THE PERFORMANCE OF AIR – COOLED CHILLERS

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Abstract: The cooling performance of air – cooled systems highly depends on ambient air conditions. It is widely known that, the performance of the system decreases when the inlet air temperature increases. This effect especially occurs in summer when the ambient air temperature is high and the cooling load is at its peak value. In order to decrease the inlet air temperature, evaporative cooling can be used. Evaporative coolers can be well combined with air – cooled chillers to decrease the inlet air temperature of condenser. Evaporative cooling is simple and economical way to cool the inlet air since it does not require any mechanical refrigeration and consumes very low power by fan and pump. Therefore combining these two systems can be considered as energy efficient method. As known, evaporative cooling performance strongly depends on the effectiveness of the evaporative cooler. In this study, studies on air cooled chillers with evaporatively cooled condenser have been assessed and the evaporative cooling effectiveness on the performance of air – cooled chillers is investigated.

Keywords: evaporative cooling, effectiveness, air-cooled chillers

Introduction

A chiller is a heat transfer unit which uses mechanical refrigeration to remove the heat from a process and transfers it to the environment. There are two types of chillers which differentiate by the method they use to condense the refrigerant as it leaves the compressor in cooling cycle. Air – cooled condensers use the ambient air for this operation. Second type, which is called water – cooled condenser uses a pump to circulate the water and sends the water to a cooling tower. Air – cooled chillers are easy to maintain and do not require a cooling tower or condenser water pump compared to water – cooled chillers. However air – cooled chillers are generally capable of cooling small sized air conditioning systems such as residential split heat pumps (Hajidavalloo 2007, Hwang et al. 2001). Being simpler than a water – cooled chiller has its advantages but at the same time it comes with certain limitations. Since the cooling is done by air, the performance of the system rely on the air temperature. According to the available research in the literature, when the air temperature approaches to 50°C or higher, the performance of the condenser drops down and the compressor is forced to work under high pressure ratio resulting in more power consumption (Hajidavalloo, 2007). But at the same time if the proper conditions are provided, it is possible to increase the cooling capacity and Coefficient of Performance (COP) of the air – cooled chillers. Hwang et al. (2001) compared an evaporatively cooled condenser and a conventional air – cooled condenser for a split heat pump system. Their results showed that, evaporative condenser had higher capacity than air – cooled condenser by 1.8 to 8.1% and a higher COP by 11.1 to 21.6%.

Several research has been done to reduce the inlet air temperature of air – cooled chillers. Wang et al. (2014) performed an experimental investigation on an air conditioning system. They tried to increase COP by locating an evaporative cooling unit upstream from the condenser. They measured several thermal parameters such as relative humidity (rh), dry and wet bulb temperature to evaluate the effect of evaporative cooling on COP. Pre-cooling the air by using evaporative cooling increased the COP from 6.1% to 18% along with a power reduction on compressor by 14.3%. Camargo et al. (2005) studied the direct evaporative cooling from thermal comfort point of view and presented a mathematical model. They claimed that evaporative cooling is more efficient where the climate is hot and dry. Their results confirmed this statement by obtaining higher efficiency with higher temperatures. They also investigated the electric power consumed by the evaporative cooler as a function of the air flow. It showed that the equipment consumed approximately 200 W at the maximum air flow which is a very small amount of consumption compared to conventional air conditioning systems.

Sarntichartsak and Thepa (2013) have done the modelling and experimental analysis of an inverter air conditioner with evaporatively cooled condenser. Their main objective was to determine the proper operating strategies, capillary tube length and optimal amount of refrigerant for the system. The results revealed that lower flow rates can increase the COP more due to the lower total power consumption. For instance, COP increased by 18.32% and 31-35% at spraying rate of 200 l/h and 100 l/h, respectively. In addition, researchers also tried to reduce the

refrigerant charge in evaporative cooling and found out that 1.1 kg charge could be obtained as optimum amount. In another study, the energy performance of an indirect and direct evaporative cooler assisted outdoor air system is investigated (Kim & Jeong, 2013). The experimental analysis is performed on a pilot unit that installed in a campus building and both cooling and intermediate seasons are evaluated. In order to make a comparison, the researchers were also installed a conventional variable air volume (VAV) system. They have reported that the proposed system shows 51% energy saving in the intermediate season but 36% more energy consumption in cooling season over the conventional VAV system. Researchers claimed that the reason behind the increased consumption was the limited performance of evaporative coolers in hot but humid climate.

It is clear from the previous research that evaporative cooling is a highly preferred method for reducing the inlet air temperature of air – cooled condensers, thus increasing the performance of the system. In addition, providing optimum conditions for evaporative cooling will have a positive effect on air – conditioning systems which naturally become the main objective of the many studies. However along with the inlet air temperature and humidity, evaporative cooler performance is strongly dependent on its own effectiveness. Therefore in this study, 3 different evaporative coolers with 0.6, 0.7 and 0.8 effectiveness are compared. Various inlet air temperature values (26, 28, 30, 32, 34 and 36°C) and 4 levels of relative humidity (30, 40, 60 and 80%) are taken into consideration during the analysis. Depending on these parameters the change in the evaporative cooler outlet air temperature is calculated. Air – cooled chiller performance is evaluated by COP values of the air conditioner for each case.

The Study

Evaporative cooling process depends on the thermodynamic principle of adiabatic humidification of air. The required energy for evaporation from either a wet surface or a misting system is absorbed from the air thus providing the cooling effect. At the end of the process, the cooled air gains humidity as a result of evaporation. This process is called direct evaporative cooling and can be seen on a psychrometric chart in Figure 1. On the chart, cooling occurs on the wet bulb temperature line of inlet air. The highest point on the line (2x) indicates the saturated state which is impossible to reach in practice. The real point where process usually ends (2) has around 10-30% lower relative humidity. The exact place of this point depends on the effectiveness (ϵ) of evaporative cooler and determines the outlet temperature (T_2).

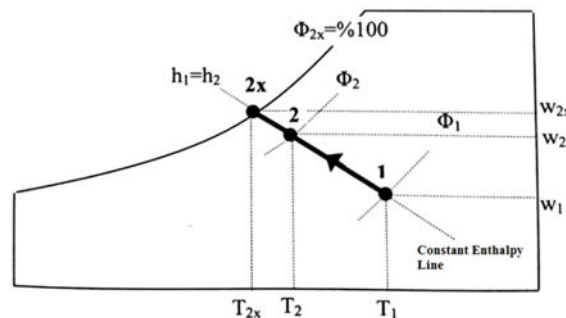


Figure 1: Adiabatic humidification of air

The following equation allows calculating the properties of outlet air;

$$\epsilon = \frac{T_1 - T_2}{T_1 - T_{2x}} = \frac{w_1 - w_2}{w_1 - w_{2x}} \tag{1}$$

where, T_1 is inlet and T_2 is outlet dry bulb temperature, T_{2x} is outlet wet bulb temperature, Φ is relative humidity and w is specific humidity values of corresponding points.

In this study, the effects of evaporative cooling on the chiller performance is analyzed. As it is stated by other researchers, the COP of an air conditioning system can be increased by reducing the inlet air temperature of the air – cooled condenser (Sarntichartsak & Thepa 2013, Wang et al. 2014). One of the ways to be able to reduce this temperature is to use evaporative cooling. However the evaporative cooler performance is highly dependent on its own effectiveness thus, the key consideration of the study is the comparison of effectiveness. Therefore 3 different evaporative coolers with 0.6, 0.7 and 0.8 effectiveness are investigated.

The condition of the air is also an important factor for evaporative cooling performance. It is known that evaporative cooling is more favorable in hot and arid areas (Liu et al., 2015). For this reason, along with the various

inlet air temperature values (26, 28, 30, 32, 34 and 36°C), 4 levels of relative humidity (30, 40, 60 and 80%) are taken into consideration. Depending on these parameters the change in the evaporative cooler outlet air temperature is calculated.

The primary objective here is to reduce the outlet air temperature as much as possible because this air source will be the inlet air of the condenser. In order to make a performance analysis and to evaluate the effect of the inlet air temperature, the following equation (Koçak Soylu & Atmaca, 2015) is used;

$$COP = 0.0013 T_{in}^2 - 0.1664 T_{in} + 7.1605 \quad (2)$$

$$20^\circ\text{C} < T_{in} < 50^\circ\text{C}$$

In this equation, T_{in} is the inlet temperature of the condenser which is equal to T_2 .

Findings

In this section, the results of the calculations will be presented. First of all, in order to accomplish main objective of the study, the effectiveness of the evaporative cooler is investigated. The outlet temperatures obtained for 3 different evaporative coolers with 0.6, 0.7 and 0.8 effectiveness is presented in Figures 2, 3 and 4, respectively. During these calculations, remaining ambient conditions for the inlet air was considered identical for all 3 situations.

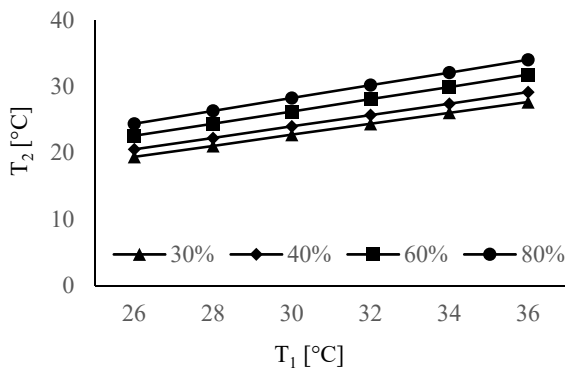


Figure 2: Outlet air temperature change at different relative humidity levels for 0.6 effectiveness

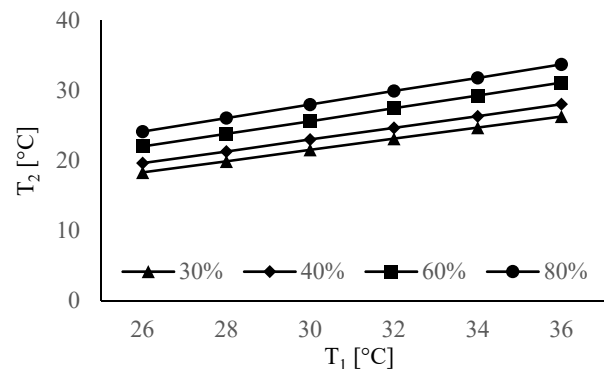


Figure 3: Outlet air temperature change at different relative humidity levels for 0.7 effectiveness

It is clear from all 3 figures that when the effectiveness increases, the outlet temperature decreases. For instance, 26°C inlet air at 30% relative humidity came out as 19.4°C, 18.3°C and 17.2°C for 0.6, 0.7 and 0.8 effectiveness, respectively. Even on the worst case scenario when the temperature is low and the relative humidity is high, the evaporative cooler with highest effectiveness still had the lowest outlet temperature compared to other two.

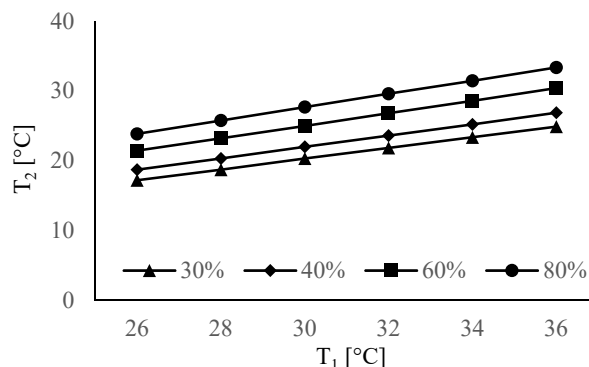


Figure 4: Outlet air temperature change at different relative humidity levels for 0.8 effectiveness

On the other hand, even with the most effective evaporative cooler, it was harder to cool the air when the humidity is increased. The evaporative cooler with 0.8 effectiveness cooled the air from 36°C to 24.9°C at 30% rh while it could only make it to 33.4°C at 80% rh. This result proves the importance of inlet air conditions and especially the relative humidity.

Performance analysis of the air – cooled chiller is evaluated by COP calculations due to the change in condenser inlet air temperature. The obtained evaporative cooler outlet temperature values are used as inlet air temperature in equation 2 and COP values for each case is calculated. The results are given in Table 1. In Table 1, each row represents the COP value obtained from the evaporative cooler outlet temperature when the inlet temperatures were again 26, 28, 30, 32, 34 and 36°C. These results are in accordance with the fact that the condenser inlet air temperature is inversely proportional with COP. In addition it is generally believed that the COP of an air conditioner decreases about 2-4% by increasing condenser temperature for 1°C (Hajidavalloo, 2007). This situation is also apply for our cases. For instance, decreasing the effectiveness from 0.7 to 0.6 increased the condenser inlet temperature from 18.3°C to 19.4°C at 30% relative humidity. This almost 1°C change in inlet temperature resulted decreasing the COP from 4.55 to 4.42 which is approximately 2.94%.

Although it should be kept in mind that significant amount of COP increase can be achieved if the evaporative cooling is applied at proper climate conditions. In Table 1, for the same inlet temperature in each row, the highest COP achieved when the relative humidity was lowest and it started decreasing while the humidity increased. As an example, for 0.7 effectiveness in the first row the COP decreases from 4.55 to 3.90 while relative humidity increases from 30% to 80%.

Table 1: The results of the COP calculations for each case

ϵ	0.6				0.7				0.8			
	30%	40%	60%	80%	30%	40%	60%	80%	30%	40%	60%	80%
COP	4.42	4.29	4.07	3.88	4.55	4.40	4.13	3.90	4.68	4.50	4.19	3.93
	4.24	4.10	3.87	3.68	4.37	4.21	3.94	3.71	4.50	4.32	4.00	3.74
	4.05	3.92	3.69	3.50	4.18	4.02	3.75	3.52	4.32	4.13	3.82	3.55
	3.87	3.74	3.51	3.32	4.01	3.85	3.57	3.35	4.15	3.96	3.63	3.37
	3.71	3.58	3.35	3.16	3.84	3.68	3.41	3.19	3.98	3.79	3.47	3.21
	3.55	3.41	3.18	3.00	3.69	3.52	3.24	3.03	3.83	3.63	3.30	3.06

Conclusions

The main objective of this study was to evaluate evaporative cooling effectiveness on the performance of air – cooled chillers. In order to achieve this goal, 3 different evaporative coolers with 0.6, 0.7 and 0.8 effectiveness are compared. Performance analysis also included the ambient air conditions in terms of temperature and humidity. The analysis results revealed that with high effectiveness and at hot and arid regions, evaporative cooling is a very useful method for decreasing inlet air temperature of condensers. Air – conditioning systems can benefit from evaporative coolers with their increased capacity and lower energy consumption compared to conventional air – cooled chillers.

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INVESTIGATION OF PHYSICAL COMFORT CONDITIONS AND USERS' SATISFACTION IN COTTAGE HOSPITALS: THE CASE OF NILUFER / BURSA, TURKEY

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Abstract: Health structures are institutions; which is designed to contribute to the health of a society and included necessary diagnosis and treatment units in this regard. Family health centers as known as cottage hospitals are established in the first step of these organizations in Turkey. Today, public family health center buildings provide the climatic, audial and visual comfort in some standarts. However, users are not satisfied from provided conditions and they always voice some problems. In this study is aimed assessment of indoor comfort conditions with the opinion of users regarding dimensional use, indoor temperature, thermal comfort, indoor air quality, audial comfort, natural ventilation and natural lighting condition. to determine user satisfaction during using buildings is a commonly used method in terms more efficient use of current buildings and to direct to future desings.

Research methods of this study; literature review of the subject which is analysed and reviewing on the information fields related to indoor space requirements, preparing a questionnaire for the user experience's feedback in designed area, evaluating the survey stage in order to understand the degree of satisfaction of space performance requirements was defined. Nilüfer is selected area for survey, is the province of Bursa which is the Turkey's 4th largest city. Selecting the most heavily used in 10 of a total of 26 family health centers in Nilufer district, 100 people of each center's as total 1,000 people were interviewed. 14 questions were asked to users. The data obtained from the questions which is related demographics features, dimensional use, indoor temperature, thermal comfort, indoor air quality, natural ventilation and natural lighting condition, audial comfort is evaluated by the chart. The obtained data under this study will open new horizons to design the new health centers and would help the designers and authorities about current arrangements is being considered.

Keywords: health building, cottage hospitals, comfort conditions, indoor air quality, natural lighting, thermal comfort, audial comfort

Introduction

Health establishments are structures, which are designed to contribute to the health of communities and contain diagnosis and treatment units. Because of their functions they are visited by many people every day. Because the users of health establishments are mostly people with health problems it becomes more important for the structures to ensure that they do not have a negative impact on the physical and mental health of the patients and at the same time provide physical comfort. Comfort in this case means ease that is made possible in a person's lifestyle with science and technology (Sirel, 1994).

The buildings where people live need to provide optimum comfort conditions to ensure that people live healthy and be productive. The factors which create these comfort conditions are examined by carrying our physical environment control research. When international studies related to physical environment controls that involve health establishments it was seen that some of them examine thermal comfort conditions (Hwang et.al, 2007; Balaras et al. 2007; Czarniecki et al. 1991; Skoog et al. 2005), some of them examine both thermal comfort conditions and also energy preservation and consumption (Santamouris et al. 1994). There are also many studies related to another aspect of physical environment control research, which is internal air quality and ventilation (Argiriou et al. 1994; Mendez et al. 2008; San Jose-Alonso et al. 1999; Wang et al. 2006; Cheong et al. 2006; Qian et al. 2008; Rui et al. 2008). Also there are studies on technical services such as power supply, heating, air conditioning installation in the literature (Sodha et al. 1985; Renedo et al. 2006; Schijndel, 2002; Smith and Rae, 1977). Also it can be seen in the literature that the importance of daylight and natural lighting are also some of the aspects studied in relation to optimum comfort conditions in health establishments (Ne'eman et al. 1976). Also

there are also studies that show the negative effect on patients of some factors that harms comfort conditions in health establishments such as crowd, noise, lack of privacy, improper lighting levels, color and fabric of materials (Winkel, 1986).

The smallest unit that provides health services in Turkey is family health centers, which are also known as cottage hospitals. Cottage hospitals defines risks and problems about health, makes and implements or enforces plans to resolve these problems; organizes primary healthcare services to protect, cure and rehabilitate people and that monitors, evaluates and supports these services to ensure they are effectively delivered, and provides coordination between health institutions and other institutions in its region with the aim of improving and protecting the health of the people. Cottage hospitals are located in residential areas or at places where people can easily reach them. These cottage hospitals provide preventative health services, primary diagnosis, treatment and rehabilitation services. Family health centers are classified as Type D for a population of 20.000; Type C for a population between 20.001 – 50.000; Type CB for a population between 50.001 – 100.000; and Type A for a population between 100.001 and more (Ministry of Health, 2014).

Cottage hospitals in our country are generally the first touch point for people, who are referred to hospitals if needed. Therefore it is important to create comfort conditions also in cottage hospitals. The minimum physical conditions for cottage hospitals are defined in article 19 of the Family Health Centers Implementation Regulations dated May 25, 2010. According to this article the minimum conditions required for cottage hospitals are as follows: An easily accessible and secure building with proper ventilation, heating and lighting conditions; necessary measures for ensuring easy entry and exit of elderly patients and patients with disabilities. The total area needs to be 60 square meters for a single family physician and should be increased 20 square meters more for each additional family physician. The examination room should be at least 10 square meters for each family physician. Waiting hall and registration desk, medical intervention room (with a suitable examination and intervention location for vaccination, injection, and minor operations, emergency care materials, gynecologic examination couch and equipment for disinfection and sterilization), an office or division to keep health records, and a lavatory and sink are also required for cottage hospitals. If the laboratory services will be delivered in the cottage hospitals by the family physician a suitable location for these services is also required.

Even though the requirements for cottage hospitals are explicitly defined, climatic, audiovisual comfort conditions are generally not provided fully and therefore cannot always satisfy users. However prolonging the treatment of patients due to lack of adequate comfort conditions in buildings where health services are provided is undesired. Therefore it is necessary to examine the internal comfort conditions in cottage hospitals. In this framework a study was carried out to find out if the cottage hospitals meet the desired physical comfort conditions by evaluating the opinions of the users on internal comfort. The data collected in the study was analyzed. It is believed that the results of this study will contribute to the improvement process of existing cottage hospitals and to the design processes of cottage hospitals which may be established.

The Study

The Scope and Purpose of the Study

This study aims to define the current comfort conditions in cottage hospitals and issues that need to be taken into consideration to provide optimum comfort conditions. To reach this goal a method was used in the study based on the following steps:

- Research on the literature related to the subject being analyzed and also review of the literature related to indoor requirements
- Preparation of a survey form to be used in the evaluation of the physical comfort conditions
- Transferring collected data into charts to understand users' level of satisfaction of comfort conditions in selected cottage hospitals
- Interpreting the outcomes of the surveys related to structural dimensions, indoor temperature and thermal comfort, indoor air quality and natural ventilation, natural lighting, audial comfort

Data Collection Tool

A survey form was prepared to collect user views with the aim of defining the current indoor comfort conditions in cottage hospitals in our country and to increase user satisfaction. 14 questions were asked to the users with the survey. The questions at the first part of the survey were designed to understand the demographic features of users. The second part of the survey asks the users to evaluate each of the cottage hospitals covered in this study for their spatial adequateness, indoor temperature and thermal comfort, indoor air quality and natural ventilation, daylight and natural lighting, and audial comfort. The perception of is comfort both influenced by personal and environmental factors and also psychosocial environment. However this is not included in the research. It should also be noted however that the persons covered in the survey have minor health problems.

Sample of the Research

The region selected for the survey was the Nilüfer District of Bursa, which is the 4th largest city in Turkey. There are 26 cottage hospitals in Nilüfer district as of 2015. According to the directive of the Ministry of Health related to the establishment and operation of cottage hospitals in cities where pilot cottage hospitals are established, the cottage hospitals in Nilüfer District of Bursa were designed based on the type D criteria. 10 of the most used cottage hospitals were selected as the sample for this research.

Analysis of Data

The data collected in the study was evaluated by compiling percentages from answers provided by users. The perception comfort in cottage hospitals was evaluated under six topics, which are spatial adequateness, indoor temperature and thermal comfort, indoor air quality and natural ventilation, daylight and natural lighting, and audial comfort.

Findings

Demographics

A total of 1000 persons were interviewed in 10 selected cottage hospitals (100 persons in each one). The 10 selected cottage hospitals give services to a total of 3500 people each day, 54% of the 1000 participants of the survey were women and 46% were men. 30% of the participants were aged between 35-50, 24% were 50 and over 24% were between 25-35, 15% were between 18-24 and 7% were younger than 18. 36% are high school graduates, 33% are primary school graduates, 31 % are university graduates. 47% use health services in these cottage hospitals once a month, 40% once a year, 13% once a week.

Spatial Adequateness

The spatial features, number of personnel and usage frequency of the cottage hospitals covered in the field survey are given below. (Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

Sample 1: There are 7 examination rooms, 1 vaccination room, 1 laboratory, 1 lounge, 1 family planning section in the 125. Yıl Atatürk Cottage Hospital there are 7 doctors, 7 nurses and 1 personnel employed. The usage area is 600 m². 250 patients use this cottage hospital every day. (Figure 1)



Figure 1. Sample 1

Sample 2: There is a reception, immediate treatment room (injection and medical dressing room), family planning room, breast feeding room, 1 doctor’s room, toilet for women, men and people with disabilities, storage at the ground floor, and there are 6 doctor’s rooms, pregnancy and baby monitoring room, kitchen ve staff room at the first floor in Hamitler Cottage Hospital. The cottage hospital has 16 personnel namely 7 doctors, 7 midwives-nurses and 2 cleaning personnel. It serves 300 patients every day. (Figure 2)



Figure 2. Sample 2

Sample 3: There are 5 examination rooms, 1 vaccination room, 1 blood-letting room, 1 family planning room, 1 patient observation room and 1 toilet at Ataevler Cottage Hospital. The building has two stories but only the ground

floor is used as a cottage hospital. The ground floor has a cafeteria serving the last station at the back of the building. There are a total of 11 employees including 5 doctors, 5 nurses and 1 cleaning personnel. It serves approximately 550 patients daily. (Figure 3)



Figure 3. Sample 3

Sample 4: Fethiye Bulvar Cottage Hospital is a 2 story building. At the ground floor there are 4 examination rooms, a vaccination room, a pregnancy service room, a medical intervention room, and toilet for men, women and people with disabilities. At the first floor there is a secretary room, waiting room, vaccination room, 4 family physician rooms, family planning room, meeting and training hall, breast feeding room, toilet for men and women, and a kitchen. 7 doctors, 8 nurses, 1 medical secretary and 2 cleaning personnel work in this facility. A total of 400 people use this cottage hospital every day. (Figure 4)

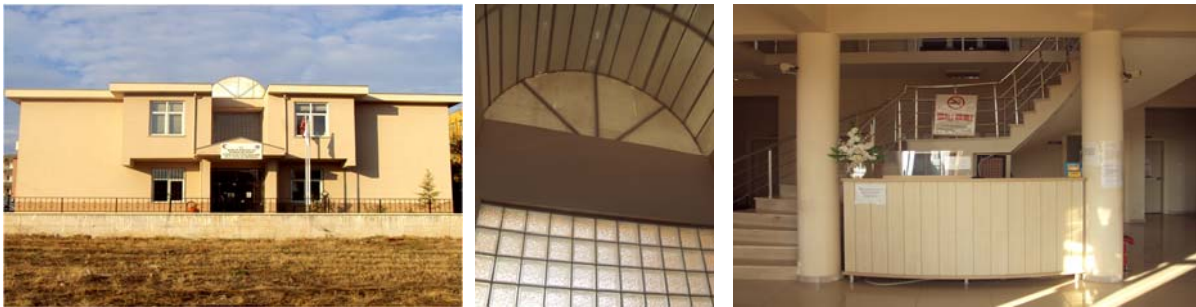


Figure 4. Sample 4

Sample 5: Beşevler Cottage Hospital is a two story building and has a galleried plan. The opening of the gallery is a waiting hall. At the ground floor there are 3 examination rooms, a vaccination room, a pregnancy service room, a medical intervention room and a laboratory. At the first floor there are 4 examination rooms, a pregnancy service and vaccination room, medical intervention room, family planning room, archive and toilets. 5 doctors, 4 nurses, 1 midwife, 1 laboratory assistant, 2 receptionists, 1 secretary and 1 attendant are employed in cottage hospital. It serves approximately 300 patients daily. (Figure 5)



Figure 5. Sample 5

Sample 6: Konak Cottage Hospital is also a two story building, health services are not given at the second floor. There is a waiting and registration, 4 examination rooms, one being at the ground floor and 3 at the first floor, a medical intervention room, an immediate treatment room, a sink for patients and a toilet. It serves 200 patients every day. (Figure 6)



Figure 6. Sample 6

Sample 7: Üçevler Cottage Hospital building is recently built and belongs to the municipality. The upper floor is used by emergency service personnel. The building is heated by natural gas and air conditioners. There are 4 doctors, 5 nurses, 1 attendant. It serves approximately 250 patients daily. (Figure 7)



Figure 7. Sample 7

Sample 8: Esentepe Cottage Hospital building has a ground floor and 4 stories; the ground floor and the first floor are used by the cottage hospital. The second and third floors are used by Nilufer Public Health Institution and the 4th floor is used by public health institutions. At the ground floor there is a room for elderly people and people with disabilities, 3 examination rooms, 1 breast feeding room, 1 examination room, storage and at the first floor there are 4 examination rooms, 1 pregnancy monitoring room, 1 injection room, 1 laboratory, 1 infant care - vaccination room, 1 staff toilet and 1 patient toilet. There are 16 employees in total; 7 doctors, 7 nurses and 2 personnel. It serves 300 patients every day. (Figure 8)



Figure 8. Sample 8

Sample 9: In Görükle Cottage Hospital there is a waiting hall, a patient-personnel toilet, medical intervention and vaccination room, 3 doctor rooms, a pregnancy service room, 2 archives, one laboratory, storage and medical dressing room. Approximately 300 patients are treated every day. (Figure 9)



Figure 9. Sample 9

Sample 10: Cumhuriyet Cottage Hospital has a waiting room, family physician units, registration and reception room, pregnancy monitoring and family planning room, medical intervention room, vaccination room, toilets and washbasins. Because the building was previously used as a neighborhood authority building it was not designed as a cottage hospital and therefore has some spatial shortcomings. Some of the important spatial shortcomings are the absence of a patient observation room, injection room, and laboratory. Because there is no laboratory, this service is provided from another center. There are 10 employees in total; 5 doctors, 3 nurses and 2 personnel. It serves approximately 200 patients daily. (Figure 10)



Figure 10. Sample 10

User views, which were used to define the spatial adequacy of the examined cottage hospitals are given in Figure 11. According to the user views examination rooms and waiting halls of cottage hospitals number 3 and 9 are seen as inadequate and worse than the average. The ratio of the size to the number of users in these two cottage hospitals is smaller when compared to the other cottage hospitals. It can be argued that the most important factor behind dissatisfaction of users from the spatial adequateness point of view is due to services given above the capacity of the cottage hospitals.

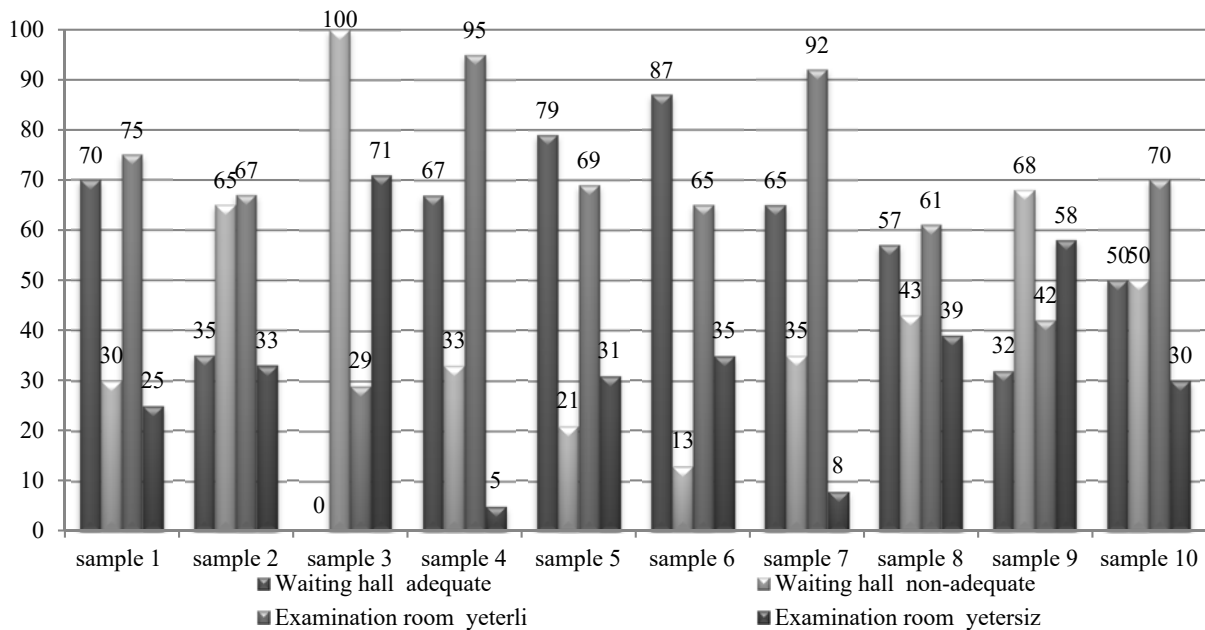


Figure 11. Satisfaction levels of the users' on spatial adequacy

Internal Temperature and Thermal Comfort

Thermal comfort indicates the satisfaction from the thermal environment [Ashrae, 2003]. Providing thermal parameters that makes a person healthy and productive is defined as thermal comfort. Thermal comfort at the same time is a condition that ensures 37 °C body temperature with gained and consumed energies of a person. It is possible to examine the factors that have an impact on thermal comfort in two groups, one being personal factors and the other being factors related to the indoor conditions [Fanger, 1970]. Personal factors are related to the dressing style and level of activity. Dressing creates a resistance against heat exchange. Activity level is the driver of metabolic speed based on the conversion of food and energy level produced in a unit of time. Indoor factors influencing thermal comfort are environment temperature, radiant temperature, air movement and moisture. Environmental temperature unit is dry bulb temperature expressed in °C or Kelvin. Average radiant temperature is the average of the surface temperature and the existing space. Increasing surface temperature is possible with correctly implemented heat insulation. Air movements also have an impact on the heat exchange between persons and the environment. Especially the location of air vents and their size affect the air movement speed in a closed environment. When the air movement increases the thickness of the stationary air layer around a person is reduced and which in turn increases cold feeling. Figure 12 and Figure 13 shows the satisfaction levels of the users of the internal temperature of cottage hospitals in winter and summer. According to the results of the survey users find temperature levels acceptable in summer months; however a large part of the users (90%) of the sample 5 have indicated that the indoor temperature is cold in the winter. The high level of dissatisfaction shows that there is a problem in the heating system.

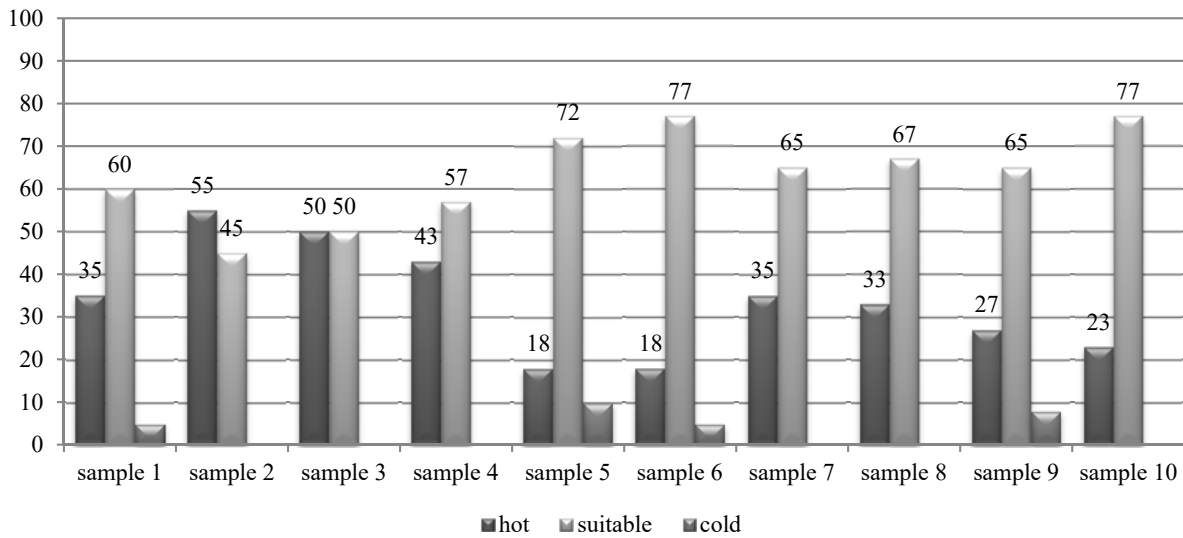


Figure 12. Satisfaction levels of the users’ on internal temperature in summer

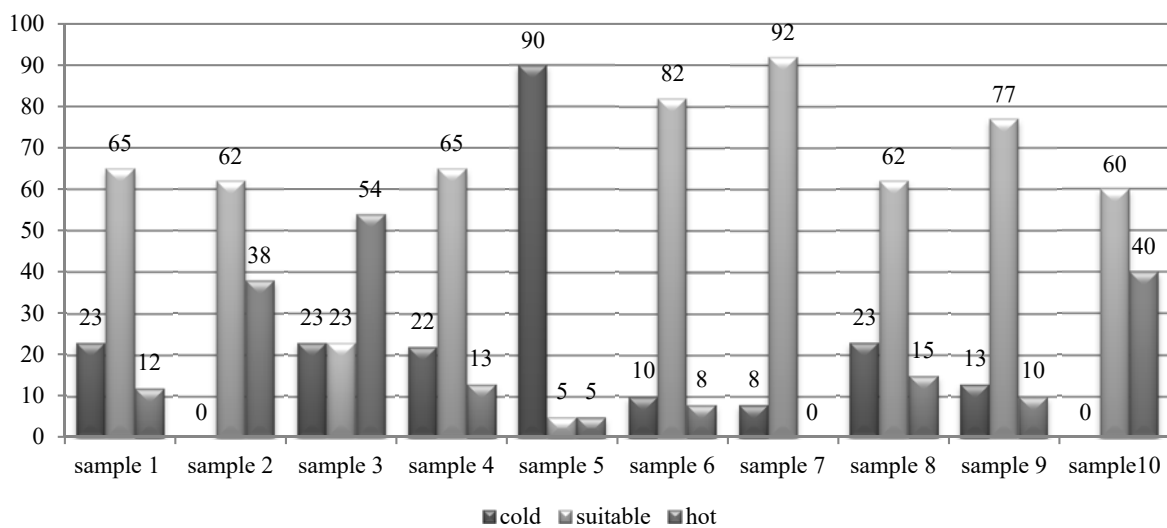


Figure 13. Satisfaction levels of the users’ on internal temperature in winter

The buildings in the scope of this work are heated with natural gas powered radiators in the winter. Because thermal comfort is not achieved the consumed fuel heats the atmosphere rather than the building, which means redundant fuel consumption. Therefore in our world, which has limited energy sources, cottage hospitals should be uniquely designed as health structures that reduce energy consumption and increase thermal comfort and should be correctly insulated. Almost all physician rooms have an air conditioner to reduce heat in the summer. Thermal comfort and energy consumption should be evaluated separately for summers and winters.

Indoor Air Quality and Natural Ventilation

Indoor air quality is defined by the level of dissatisfaction (odor and sensory discomfort) of the users [CEN, 1998]. Good air quality is considered as achieved if there are no harmful contaminating concentrations and the majority of the people (80%) are satisfied [Frontczak, 2011]. When the indoor air quality is adequate it has a positive impact on human health but when it is not adequate it may create health problems in the long and short term. Health problems related to the indoor air quality can be divided based on its biologic and psychologic impact. Biologic impact can be irritation in the eye, nose and throat, irritation in the skin, itching, dryness, pain, unexplained oversensitivity, asthma and similar symptoms, changes in the sense of smell and taste; and psychologic impact can be headaches, dizziness, nausea, vomiting, mental fatigue, loss of memory and lack of concentration.

Inadequate daylight and natural ventilation also negatively affect indoor air quality in cottage hospitals. The size of the waiting halls of all cottage hospitals subject to the survey was small and had direct connections to all physician rooms. Some of the waiting halls in the cottage hospitals had no connections with the building façade and these also had no natural ventilation and lighting. It was observed that the cottage hospitals which were adjacent to neighboring buildings or very close to them had limited natural ventilation and lighting conditions.

Limited size of waiting rooms in the cottage hospitals increases the density of users and reduces the quality and quantity of the breathed air. There are no separately located dining halls. Because there are no separate dining halls, food scent is spread to the cottage hospitals at certain hours. The small size and uselessness of windows at examination rooms negatively impact furnishing medical appliances and also create bad air quality due to medicine located in the rooms.

Users that participated in the survey indicated that indoors of sample 2, 3, 6, and 9 are inadequate in terms of natural ventilation (Figure 14). Users of sample 2 and 3 indicated that the cottage hospitals are inadequate in terms of clean air (Figure 15). According to this it has been concluded that when health structures are designed it has to be taken into consideration that they will be used by many people and therefore there is a need for adequate windows, which will provide sufficient natural air. Height of building stories directly related to the air amount inside a building and 78% of the participants surveyed indicated that 3 - 4 meters story height was suitable.

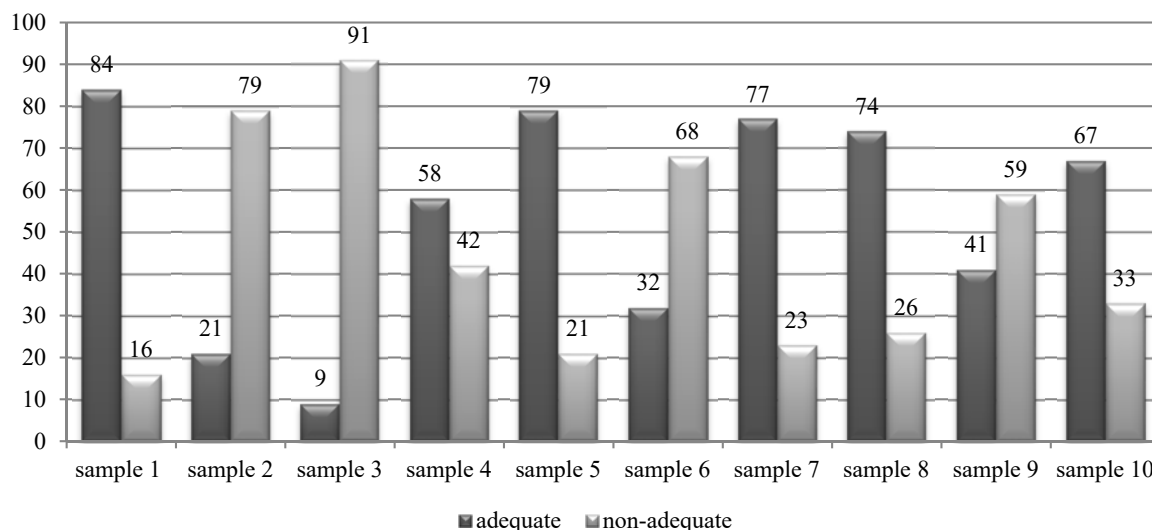


Figure 14. Satisfaction levels of the users' on natural ventilations

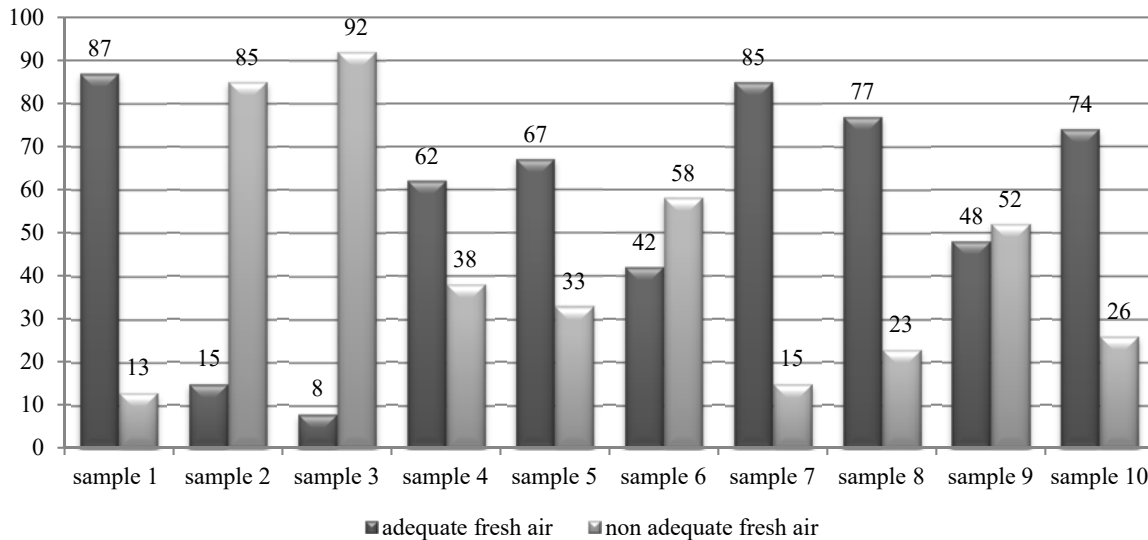


Figure 15. Satisfaction levels of the users' on indoor air quality

Daylight and Natural Lighting

Visual comfort is defined as a subjective condition depending on the stimulants of the environment. This definition takes into consideration the psychologic dimension of comfort and includes physical features which have an impact on visual comfort. Visual comfort parameters are the amount of daylight, distribution of brightness, amount of flares, color of light, and flickering rate of light and the level of light [Frontczak and Wargocki, 2011]. One of the most important conditions to achieve visual comfort is designing a building that is sustainable and ecologic and has a natural lighting level. Maximum usage of daylight, using natural ventilation as much as possible, using the least harmful technologies if natural ventilation and lighting is not adequate can be listed as important parameters for cottage hospitals.

The status of windows, which are an important factor in visual comfort, can be seen in Figure 16. According to view of users 77% of the users of sample 2, and 57% of the users of sample 3 indicate that the windows are not large enough. However considering that the size of windows of all cottage hospitals in the scope of the study is similar, the negative views may be related to their locations, directions and shadows.

Inadequate daylight and natural ventilation also negatively affect indoor air quality in cottage hospitals. The size of the waiting halls of all samples subject to the survey was small and had direct connections to all physician rooms. Some of the waiting halls in the cottage hospital had no connections with the building façade and these also had no natural ventilation and lighting. It was observed that the cottage hospitals which were adjacent to neighboring buildings or very close to them had limited natural ventilation and lighting conditions. This also has a negative impact on audial comfort.

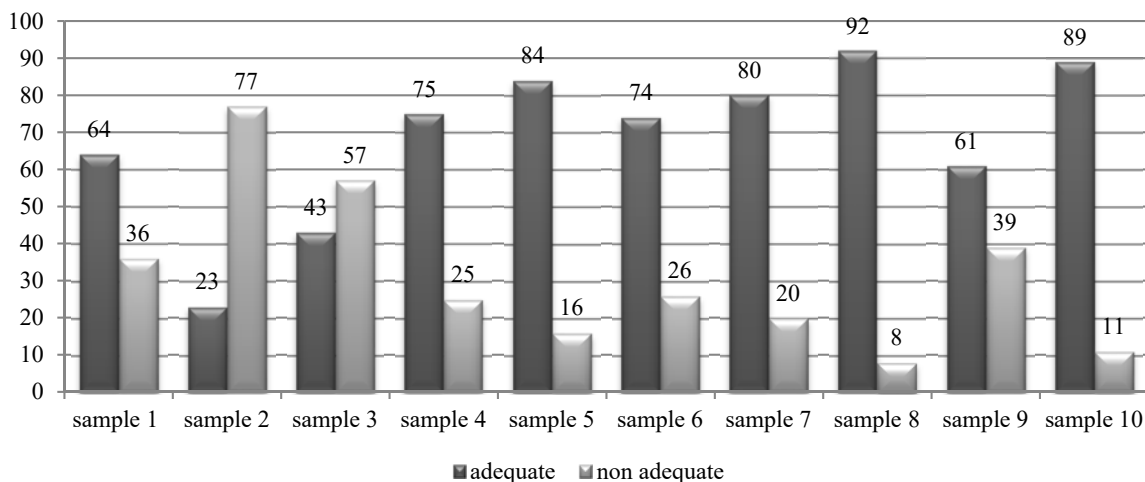


Figure 16. Satisfaction levels of the users' on daylight and natural lighting

Audial Comfort

Audial comfort is defined satisfaction from acoustic conditions [Navai and Veitch, 2014]. Audial comfort is not achieved only with creating a “good acoustic environment”; it also includes detecting all factors that “prevent acoustic comfort”. The views of users of the cottage hospitals on audial comfort are given in Figure 17. According to the data collected many of the cottage hospitals have a noise problem. This may be attributed to a large extent to the crowdedness of the waiting rooms and their inconvenient arrangement. At the same time it has been seen that mostly reflective materials are used in these locations. In new arrangements to be made in these location materials that absorb rather than reflect noise should be used to improve audial comfort conditions of users to a certain extent. Also good sound insulation can be used to reduce noise from outside. Audial comfort is a subject that needs to be taken into consideration when selecting a location for cottage hospitals. They should be located on streets with high pedestrian traffic rather than motorized vehicle traffic.

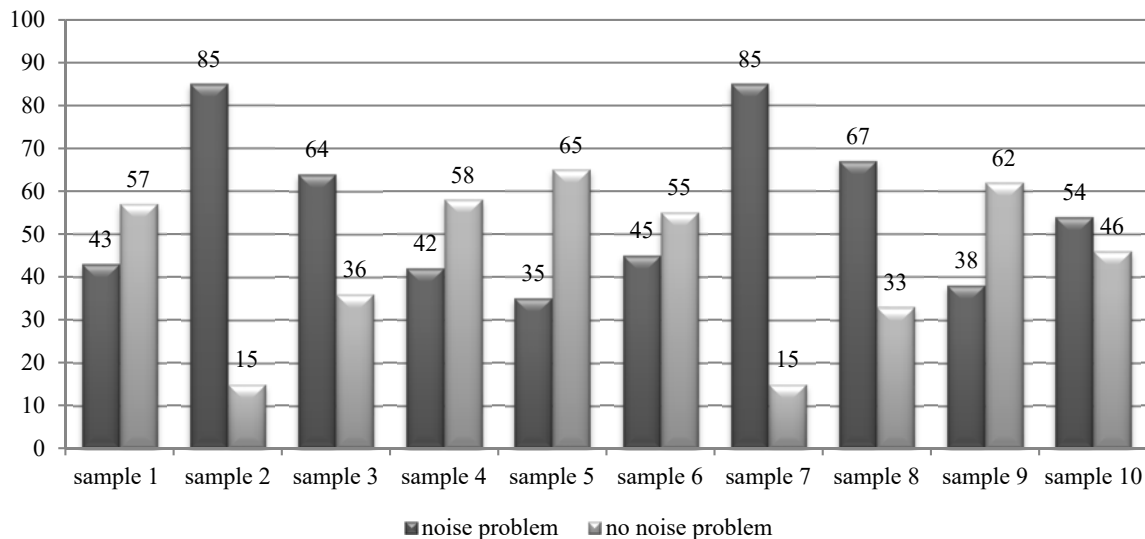


Figure 17. Satisfaction levels of the users’ on audial comfort

In the general evaluation in addition to the survey results observations were also used and the following conclusions were made:

- Because thermal comfort could not be achieved completely, air conditioners were installed in physicians' rooms to reduce heat in summers.
- There are noise sources close to cottage hospitals such as markets.
- The washbasins in physicians' rooms are not separated and therefore create hygiene problems.
- Waiting halls do not have natural ventilation and lighting possibilities.
- Because physician rooms are entered and exited directly from the waiting halls, these locations cannot carry out their functions properly and the current size of waiting halls does not serve their purpose.
- Rooms that are used as kitchens open to waiting halls causing hygiene risks.
- There are no separate service entrances to buildings. Therefore health personnel, patients and services use the same routes.
- Buildings are generally single story. However there are no elevators that increase accessibility of people with disabilities and patients in cottage hospitals which give services in more than one floor.
- Patients that require emergency services or normal examinations receive such services at the same locations.
- There is no help desk that welcome and direct patients.
- Using the same observation room for injections disturbs privacy of patients.
- Breast feeding room is also used as the kitchen of personnel.
- The number of toilets is not adequate. They are not separated for personnel, patients, men and women.
- There are no separate toilets for children and people with disabilities.
- Corridor wideness is not suitable for usage by people with disabilities.

Conclusions

Creating climatic, audial and visual comfort conditions in buildings is a factor increasing satisfaction of their users. Health structures have a more special position when compared to other building types. Because creating optimum comfort conditions in buildings, where health services are given, can make a positive contribution for the treatment of patients. It may also have a positive impact on health personnel, which work under very intense conditions in our country. The information received from surveys and observations made in 10 cottage hospitals were evaluated together in this study, which is the first step of health institutions. The evaluations, which are given below, were made with the aim of providing guidance for improvement of current cottage hospitals and for the design of new one: Accordingly;

- The arrangement and size of locations used as cottage hospitals do not fully satisfy their users. Special attention should be made to their design.
- Users evaluated indoor air quality as inadequate because of the crowdedness of waiting halls and lack of sufficient and natural ventilation. In design processes these locations should be planned with sufficient daylight and natural ventilation.
- There are no elevators for people with disabilities. The sizes of usage areas not adequate for usage by people with disabilities and there are no toilets for people with disabilities in any of the buildings examined.
- Materials that can be easily maintained, cleaned, that are stainless and dirt resistant should be used generally to increase hygiene.
- In order to achieve thermal comfort both in summers and winters due care should be exercised to ensure the building is situated to receive adequate sunlight and that protective design features are employed, the building is insulated and has an adequate heating system.
- Inadequate size of rooms for the number of users, absence of natural ventilation, and distribution of kitchen and food odor to the building creates discomfort. Windows should be situated to ensure effective air movement and window sizes should be reconsidered in places where the number of users increases.
- All spaces in the buildings should be designed to create natural lighting.
- Audial comfort cannot be achieved due to internal and external noise sources. Materials to be used in the building should not be noise dampening and also buildings should be planned in areas which do not have noise sources in their surroundings.

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INVESTIGATION OF VIBRATION DAMPING IN THE PASSENGER SEAT

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Abstract: In this study, it was aimed to decrease the vibration reaching to passenger from the legs of vehicle seats. For this purpose, seat legs were manufactured from aluminum foam material by utilizing vacuum casting method. The aim of this study is to provide a comfortable and healthy to travel by decreasing the vibration coming from the chassis of the intercity buses. In experimental study, 2 seats having different legs were placed into the same type of vehicles. It was performed in two different experimental studies. In the first, modal analysis was used and Frequency Response Function (FRF) graphs were obtained. The second acceleration measurement was made and acceleration graphs were obtained. Both graphs obtained by this method were compared to two legs. It was observed that legs made of foam material shows better damping properties in vibration than 2 mm thick sheet metal original legs. Besides, it was observed that the foam material improved the comfort and delayed the tiredness threshold.

Keywords: modal analysis, acceleration, vibration, aluminum foam, damping, car seat

Introduction

In current century, one of the most important efforts of scientists is on finding the solutions of health problems triggered by negativities depending on developing technology use. One of the most important negativities is the vibrations with which we always face at any point during our daily lives. Under the lights of scientific studies, it is known that the vibration has significant effects on living creatures and non-living things. Human body faces with many different vibrations daily.

In that study, the vibration has been classified as whole-body vibration and hand-arm vibration (Griffin, 1997). Scientists have worked on modeling the human body-seat system within a vibration medium, and it has been determined that it is required in order for model of a human sitting on a seat to be established to evaluate the factors such as seat cushion, suspension system and seat surface geometry and the general human dynamics together (Rosen and Arcan, 2003). Estimating the response of integrated human body-seat structure to vibration signal is very hard nowadays. That's because of the complex dynamic behavior of the human body seating on seat in response to the vibration (Leo, Fard, Subic and Jazar, 2013). In theoretical analysis of vehicle vibrations and a computer modeling study, the vibrations occurring in a vehicle were examined theoretically, and particularly the responses of the vehicle to signals coming from the road were taken as base (Er, Orak and Par, 2006). The medical and biological effect of the vibration depends mostly on the amplitude and the duration of exposure. The frequency of the vibration having significant effect on human body is between 1 Hz and 100 Hz (Candır, 2012). In general, the dynamic response of the seats is examined in tests, where the acceleration is measured at the ground and seat-bottom while there is a passenger on the seat (Corbridge and Griffin, 1986). It has been emphasized that the roughness and the velocity on road is a factor increasing the vibration value (Eaton, 2003). The standards of seat test require the use of human objects for measuring vibration isolation of the seats (Lewis, Griffin, 2002). In porous material, the damping coefficient depends on the pores. As the number of pores increases, then the damping also increases (Dahil, Baspinar and Karabulut, 2011). In vehicles, the effect of vibration firstly emerges as tiredness. Tiredness gradually increases the muscle tension of driver, and leads to increase in hormonal secretion by affecting nervous, blood circulation and digestive systems (Babalik and Orak, 1992). The reason of spinal failures has been, in many studies, found to be the vibrations transmitted from the vehicle to driver. In a clinic study carried on a person spending more than half of his working hours on driving a motor vehicle, it has been determined that he was more compliant about the back ache than other people do (Bovenzi and Zadini 1992, Dupuis and Zerlett 1987, Troup, 1988).

The aim of this study is to ensure the comfortable and healthy journeys of passengers. In order to do it, the seat legs made of porous material have been manufactured via vacuum method. These legs have improved the damping, and decreased the vibration reaching to the feet of passengers.

Materials and Methods

First of all, the mold to be used in production of porous material via vacuum method was designed. In order to cast the open-porous aluminum foam material that will be used in seat legs, the mold made of SAE1040 material with dimensions of 50 x 30 x 500 mm to be used in leg manufacture was prepared. After the mold production, the casting process of the foam material to be used in seat construction was started. 4 seat legs at dimensions of 25 x 40 x 250 mm were produced from porous aluminum material by using vacuum casting method. The foam Legs as seen in Figure 1.



Figure 1 The foam legs

The most important measurement value required for modal analysis is the Frequency Response Function (FRF). By comparing the obtained FRF, the information about the dynamic behaviors between the leg types was obtained. Since the stimulation effects to come to the seat will occur at the point of connection of the seat with floor, these points were selected to be the points where the stimulation will be implemented during measurement. The points where the vibrations coming from the floor will be transmitted directly to the passenger (connection points between the legs and seat structure) were determined to be the response points. The free-free conditions were ensured as well as possible before the tests. The data was gathered from the seat via 2 accelerometers having 3 axes. The stimulation is provided from the bolt holes where the legs are mounted on the floor.

In order to determine the levels of vibrations reaching at passengers, a test pad placed under the passenger seat was used, and HVM100 device was used for digitizing the information obtained. By transferring the vibration data to system by using HVM100 device, the acceleration graphics were prepared with Blaze software.



Figure 2 Acceleration measurement test work

The vehicle had pass over the speed bump at speeds of 25 km/h, 50 km/h and 75 km/h. The accelerations occurring as a result of vibrations reaching to passenger from original leg and foam leg were compared through these graphics.

In order to determine the levels of vibrations reaching at passenger seat, as seen in Figure 2, the passenger was sit on 3 directional acceleration receiver – test pad placed on the seat. In order to prevent any weight change throughout the study, the person sitting on the seat during the study was the same person in all the measurements. The acceleration in 3 directions was recorded HVM 100 device during 2 minutes of vehicle travel

Results and Discussion

The changes in stimulation and response points lead to changes in frequencies and amplitude values in FRF graphics. From the change in amplitude values, it is seen that the actual mode frequency overstrains the part. In order to obtain a FRF graphic, 5 hammer impacts have been applied on each of stimulation points, and the mean of these 5 FRF graphics were taken.

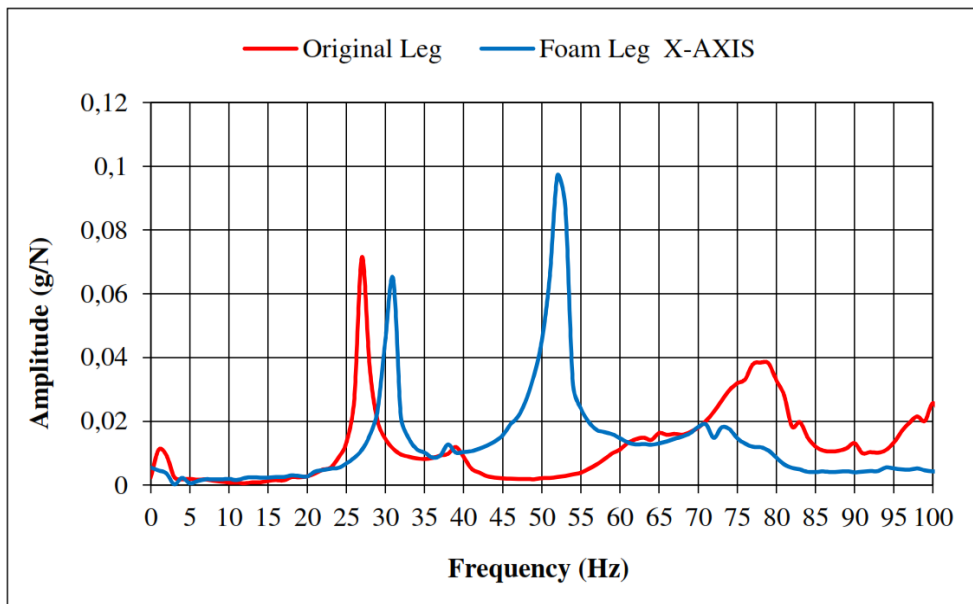


Figure 3 FRF graphic in direction of x-axis in 0-100 range

It is seen in Figure 3 that it has postponed the 1st mode of original leg to higher frequencies, that it has increased the damping rates for 1st mode, and that it has led to improvement from this aspect. It has also been observed that it hasn't led to any improvement useful for 2nd mode of original leg, that it has made damping worse, and that it has postponed the mode to slightly lower frequencies. It has been seen in original leg that the decreases occurred in modes in high frequencies and there occurred improvements from this aspect.

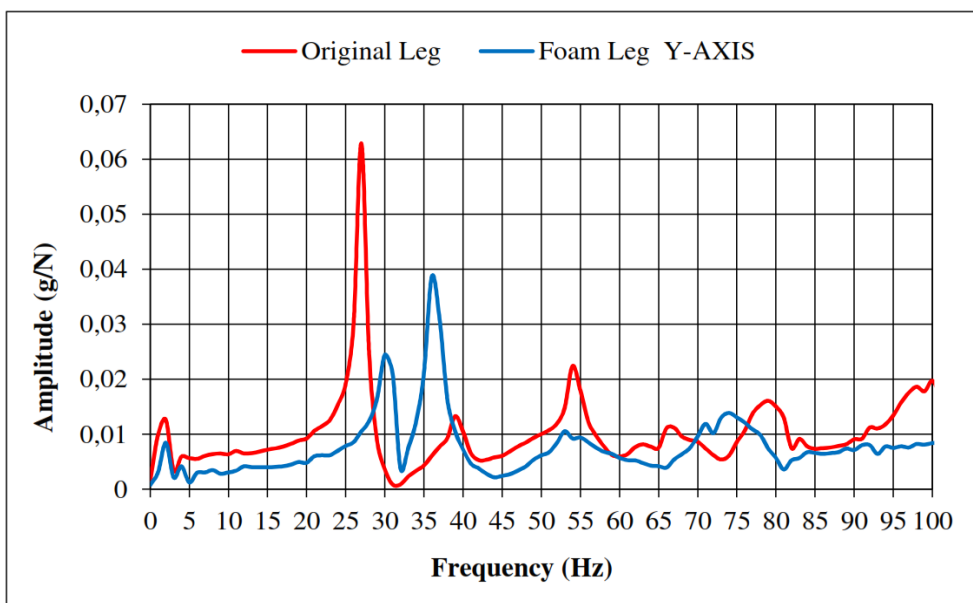


Figure 4 FRF graphic in direction of y-axis in 0-100 range

As seen in Figure 4, it has been observed that it postponed the 1st mode in original band to higher frequencies, and that it led to a little increase in damping rates for 1st mode. In proportion to original leg, the improvements were observed in damping rates, and there occurred the improvements from this aspect.

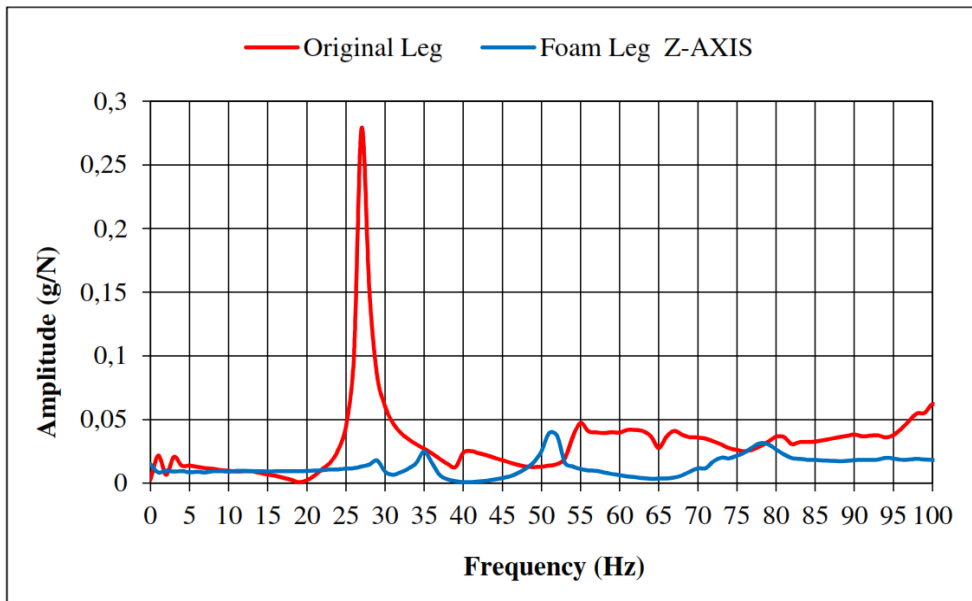


Figure 5 FRF graphic in direction of z-axis in 0-100 range

As seen in Figure 5, it has led to an improvement by postponing the 1st mode in the original leg at 20-45 Hz higher frequencies, but it hasn't created any improvement for 2nd mode but made the damping worse.

As the level of acceleration increases, the duration of tiredness decreases. In other words, as the acceleration gets higher, the patient reaches at the tiredness threshold sooner. The accelerations of both of seat legs were measured at 3 speed levels. While the vehicle passes over the speed bump, the acceleration in vehicle is higher than it is on a normal road.

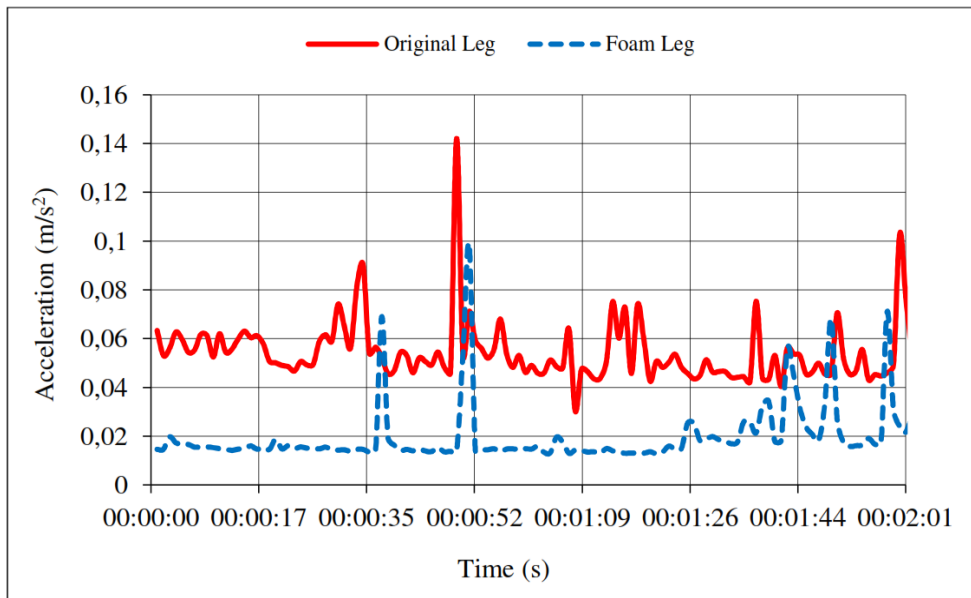


Figure 6 Acceleration-time graphic of original and foam legs at 25 km/h

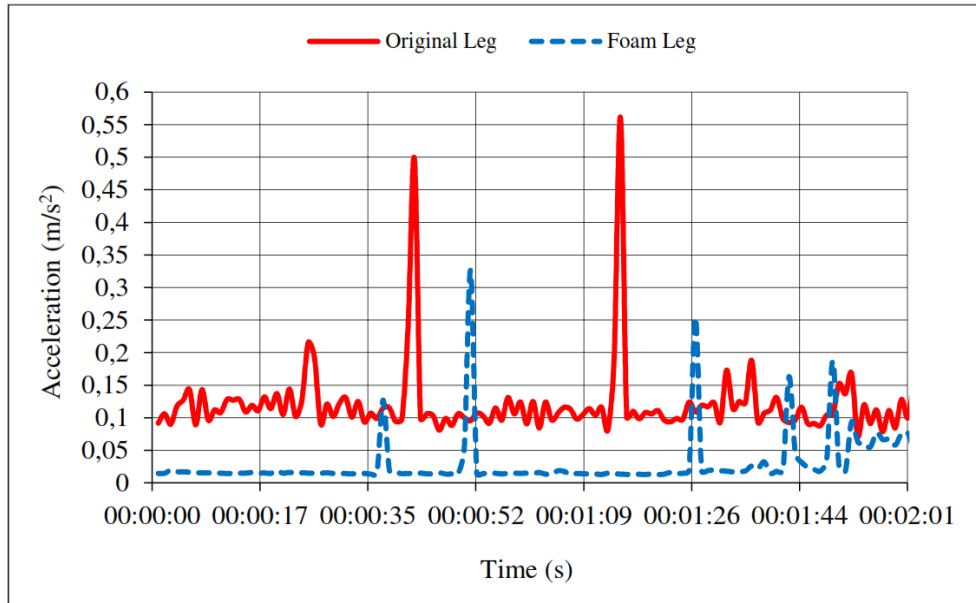


Figure 7 Acceleration-time graphic of original and foam legs at 50 km/h

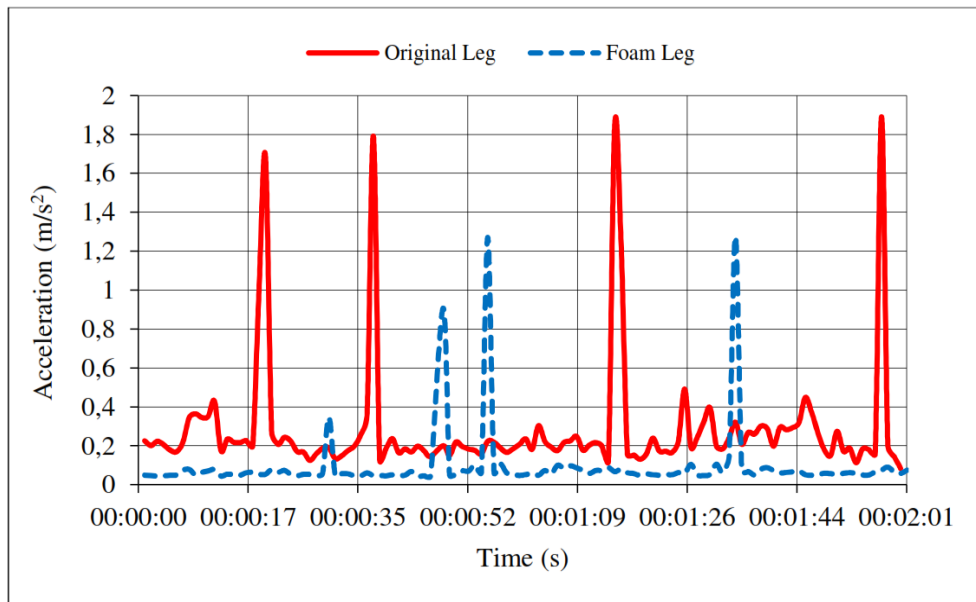


Figure 8 Acceleration-time graphic of original and foam legs at 75 km/h

As seen in graphics, whole of the vehicle passing over the speed bump showed vertical rigidity. On the other hand, both of speed and acceleration of the vehicle reached maximum. The graphics prepared are the graphics of vertical acceleration. It was observed that acceleration values increased as the speed increased.

Conclusions

As seen in FRF graphics; while the amplitude levels are low in certain frequencies, they reach very high amplitudes (peak points) at certain frequencies. The force implemented at these special frequency points, where the amplitudes peak, transforms more into vibration within the structure.

Considering the lower frequencies, it is seen in the graphics that the foam leg would work better, while it is seen that the original leg would work better while considering the higher frequencies.

As seen in acceleration graphics that acceleration has increased in both of legs as the speed increased. Acceleration measured at seat with aluminum foam leg was found to be lower than the acceleration measured at the seat with original leg.

Acceleration levels of the seat with original leg increased before the seat with foam leg did. It was observed that the foam material improved the comfort and delayed the tiredness threshold. Accordingly, the seat with foam leg damped the stimuli forces better than original legs did. Faster movement of vehicles decreases the tiredness threshold. Thus, passengers get tired sooner.

As a result of both experimental studies, foam leg foot was observed that better than the original leg vibration damping.

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ONTOLOGY BASED RECOMMENDER SYSTEM WITH USING DISSIMILAR USERS

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Abstract: Rapid development of the e-commerce, increase in the product range and customers in the past years makes it difficult to find the products that customers are looking for, in terms of customer made confusion and led to time losses. These developments have necessitated the development of new customer-oriented marketing strategy. Recommender system directs interests of customers to the product which they can like and buy. So the companies that use these systems increase profits by providing strategic advantages while helping customers. Collaborative Filtering (CF) is a successful technique used in recommendation system. They try to find out customer's interest in a new product, based on similarities of customers' previous ratings. In the literature, these calculations are performed with the principle which is: similar users have similar tastes. In this paper these calculations are performed with thoughts that dissimilar users have dissimilar tastes, too. Currently algorithm of collaborative filtering suffers from some problems such as cold start and sparse data. At the same time this paper aims to propose ontology based solution for cold start problem.

Keywords: Ontology, Recommender System, Dissimilar User

Introduction

Rapid development of the e-commerce, increase in the product range and customers in the past years makes it difficult to find the products that customers are looking for, in terms of customer made confusion and led to time losses. These developments have necessitated the development of new customer-oriented marketing strategy. At this point recommender systems have become modern marketing tools for new generation e-stores by providing personalized service to users while using past user preferences, product database and some other parameters. The main aim of the recommender systems find products that the user is interested in and, offer meaningful advice among millions of products (Melville, 2010, p.829). Today recommender system has been increasingly used in companies in particular e-commerce applications and these companies provide strategic advantage. Recommender systems are important part of some e-commerce sites such as Amazon.com and Netflix.com. They are real world examples of these systems.

In the past a wide variety of recommender systems are proposed such as Content Base Filtering (Chen, 2011, p.1371; Barranco, 2010, p.409; Pazzani, 2007, p.325), Collaborative Filtering (CF) (Herlocker, 1999, p.230; Herlocker, 2002, p.287; Gong, 2010, p.745; Al Mamunur Rashid, 2006), Knowledge Based Systems (Burke, 2000, p.180), Hybrid Systems (Burke, 2002, p.331; Salter, 2006, p.35), etc. Although there are wide variety of recommender system discussed any of them satisfy some problem like cold start and sparse data without any additional mechanism. In this paper we propose a naive ontology based collaborative method to deal with cold start problem.

The rest of the paper organized as follows: Section 2 provides background on ontologies and CF algorithms and defines some problems which CF suffers from them. In section 3 we define our ontology CF algorithms using dissimilar users. Section 4 provides explanation of dataset and evaluation metric. Section 5 represents the result and the last section concludes the paper.

Background and Motivation

Recommender systems are classified according to their prediction approach (Adomavicius, 2005, p.734). The recommender systems can be divided into four main categories; Content based filtering, collaborative filtering, knowledge based systems and hybrid systems. Collaborative filtering has achieved most success in real world application area and our study is focused on collaborative filtering.

Collaborative Filtering (CF)

The word collaborative filtering was mentioned the first commercial recommenders system called Tapestry (Goldberg, 1992, p.61). CF works by collecting user opinions about items as ratings, they use this ratings to calculate similarities between users. Then CF finds users interest about items that they have never seen and taste before, using this ratings. If calculated interest is positive then CF recommend items to users.

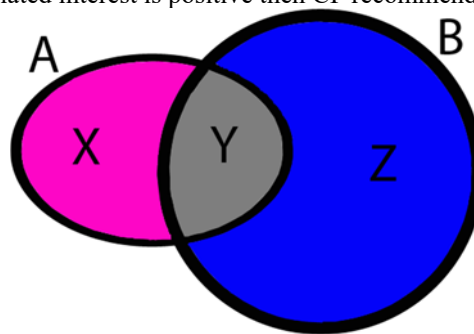


Figure 1: The representation of principles of collaborative filtering.

Where A is the set of items rated by Alice and B is the set of items rated by Bob. Region Y is the set of items rated by both users. Region X is the set of items rated by Alice but Bob has never seen or tried before. Region Z is the set of items rated by Bob but Alice has never seen or tried before. The CF says that the similarity calculation made through the region Y. At the result of calculation there is positive correlation between Alice and Bob we define they are similar users, so most probably they have similar tastes. According to this inference Alice most probably likes the items which are in region Z.

Generally we examine CF algorithms in three following steps: first step similarity calculation, second step neighborhood selection and the last step prediction computation.

1. Similarity calculation

In the first step of CF algorithms similarities between active user and the other users were calculated. In CF algorithms there are several similarity methods have been used such as cosine vector similarity, adjusted cosine vector similarity and Pearson correlation coefficient, etc (Gong, 2010, p.745). According to our experiments Pearson correlation coefficient gives better results; because Pearson correlation coefficient takes into account the user average.

$$sim(a,u) = \frac{\sum_{i \in I} (R_{a,i} - \bar{R}_a) \cdot (R_{u,i} - \bar{R}_u)}{\sqrt{\sum_{i \in I} (R_{a,i} - \bar{R}_a)^2} \cdot \sqrt{\sum_{i \in I} (R_{u,i} - \bar{R}_u)^2}} \tag{1}$$

where $R_{a,i}$ denotes the ratings of user a on item i , \bar{R}_a is the average rating of user a . I is the set of items rated by both user a and u .

2. Neighborhood selection

Second step of CF algorithms is the step to find nearest user to active user. In this step the results which obtained from the similarity step have been used to find active user's nearest neighbor. User based CF algorithms works this principle that similar users have similar tastes. According to this definition each user is not included in the calculation process. So CF selects similar users and discards dissimilar users. This process is called neighborhood selection in literature. There are two different methods for neighborhood selection. One of them is threshold method and the latter is k -nearest neighbor method.

3. Prediction calculation

The users selected in step two acts to the extent of their similarities to the prediction. In this stage the user similarities between the active user utilize as weight vector. There are variety of prediction method while the most accurate results are obtained Adjusted Weighted Average (AWA); because AWA takes into account how users perceive the rating scales. In this study we also observed that this method gave the best results.

$$R_{a,i} = \bar{R}_a + \frac{\sum_{u \in U} (R_{u,i} - \bar{R}_u) \cdot \text{sim}(a,u)}{\sum_{u \in U} \text{sim}(a,u)} \quad (2)$$

where \bar{R}_a is the average rating of user a , \bar{R}_u is the average rating of user u . U is the set of active user's nearest neighbors that rated the item i .

Semantic Web and Ontologies

According to Tim Berners-Lee who inventor of the world wide web, semantic web is defined extension of current web (Berners-Lee, 2001, p.28). The semantic web provides a common language that allows data to be shared between and reuse some applications. Most information on the web environment is designed for human understandable but semantic web assures information that can be understood by humans and computers. The main structure of semantic web is ontologies. Ontologies most common use definition is an explicit specification of a conceptualization (Gruber, 1995, p.907). Ontologies have key duty in technology by integrating interoperability and data, information and process (Grobelnik, 2009, p.59). Recent years ontologies have been used with recommender systems in academia.

Semantic Recommendation

In semantic web recommendation approach the recommendation process is generally based on concept diagram or an ontology describing acknowledge based and uses semantic web Technologies (Peis, 2008). Semantic recommendation systems used cold start and data sparsity problems of collaborative filtering system (Wang, 2007, p.4069). In this study semantic recommendation approach is used work out cold start problem in recommendation systems. Cold start problem in recommendation system can be divided into three categories; new system, new user, new item.

New system

When establishing new recommender system there is no data about user preferences, so it is difficult to give the good advice. The users rates items over time and the input data of the system increases. Thus allows recommendation system to give better advice. We think that semantic web cope with this problem until the system collects enough data.

New user

When a new user registration there is no history of this user, so the system couldn't predict what the new user interested in. To deal with this problem some recommender systems want to the user to rate a set of item when registering. We think that semantic web cope with this problem until the new user rate some items.

New item

Like new user problem when an item is added the system, there is no past information of this item, so the system can't recommend this item to the user. This problem refers to new item problem in literature. We think that semantic web approach work out new item problem until the item is rated by some users.

We can solve these cold start problems by using knowledge based structure of semantic web technologies. Because ontologies are knowledge based technologies, so they don't take into account of users and items past information.

Proposed System

Pure CF algorithms works this principle that similar users have similar tastes. From this principle the CF find user similarities by using past rates of user. Then CF use this similarities to predict interest level of user to the item that the user has never seen before. So pure CF uses similarity between users, but we use dissimilarity between users and we obtain good results like (Bulut, 2014). We thought that if the similar users have similar tastes and interests, the dissimilar users have dissimilar tastes and interests. If the prediction can calculated by using positive similarity correlation, its reverse is also possible. So the prediction can calculated by using negative similarity correlation.

In our approach we calculated similarities between active user and the other steps just like the traditional CF algorithm. In the neighborhood selection step, we choose dissimilar users (not nearest neighbors) unlike traditional CF. We use AWA method to find prediction in the last step.

In the ontology side of the system (figure 2), it was identified two main classes which is called person and movie. Person class was divided into subclasses (director, screenwriter, actor, etc.). The film class was categorized by

genre (anime, documentary, action, sci-fi, etc.). In the next step, it was identified the necessary relationships between classes. Data properties of these classes were identified such as production year, actor and budget. Last step in this creating ontology, we generate individuals (instance).

Dataset and Evaluation Metric

This section provides dataset introduction and evaluation metric.

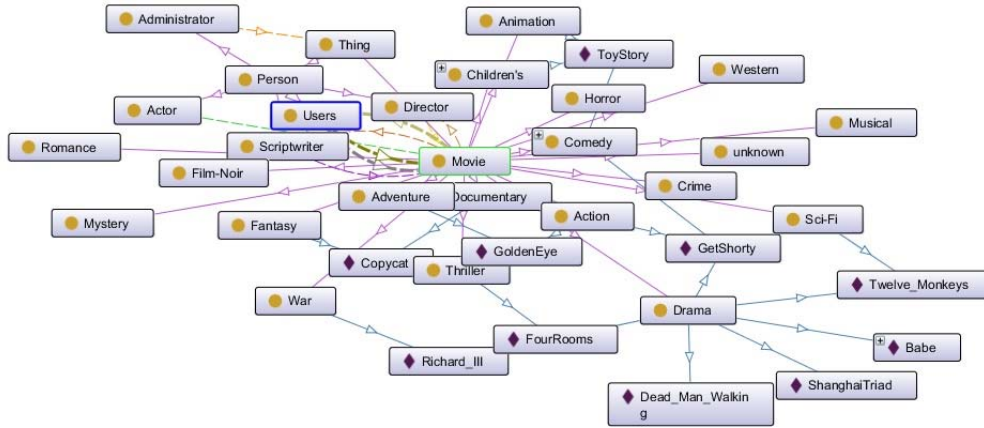


Figure 2: Visualization of the system generated by OntoGraf which is plug-in of the Protégé 4.3.

Dataset

In order to compare the results of pure CF algorithm we use the movielens dataset that is collected by Grouplens research Project from Minnesota University. The dataset was collected through movielens web site from September 1997 to April 1998. This data set consists of 100,000 ratings (1-5) from 943 users on 1682 movies and Each user has rated at least 20 movies.

We divided the database into a train-dataset and a test-dataset. %20 percent of the all ratings were randomly selected and used test-dataset and the others were used train-dataset.

Evaluation Metric

Statistics accuracy metrics measure the prediction accuracy that found by recommender systems. They show us how to prediction success is. It is the numerical distance of the actual value.

$$MAE = \frac{1}{N} \cdot \sum_{i=1}^N |Ru,i - \hat{Ru,i}| \tag{3}$$

where N is the number of test data, Ru,i is the actual value of rating, and $\hat{Ru,i}$ is the prediction of CF algorithm.

Experimental Results and Discussions

This section is provide our experiment result. In steps of CF algorithm we keep the parameter constant and we execute the traditional and proposed CF algorithm. We used movielens dataset which was mentioned in previous section.

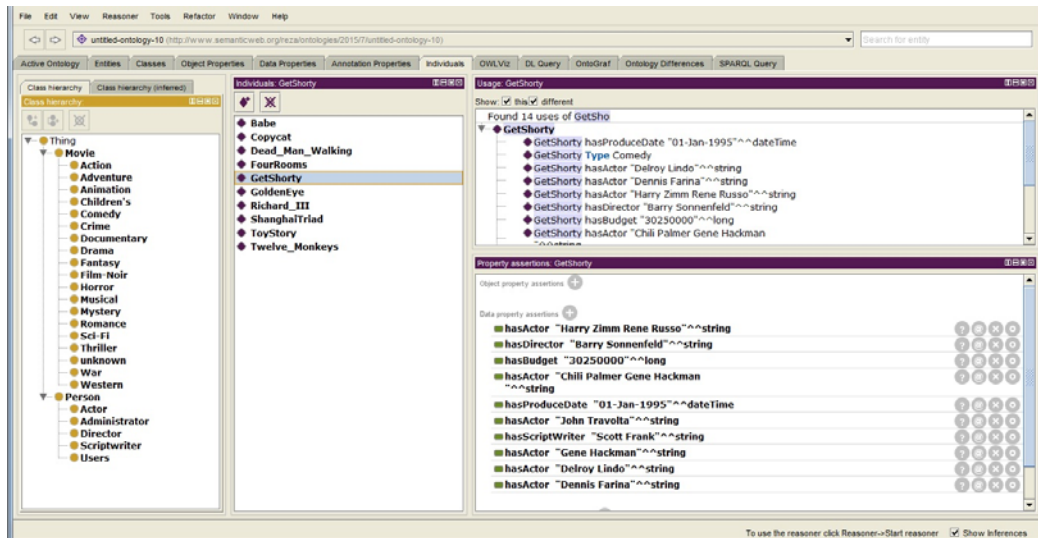


Figure 3: creating individuals by using protégé ontology tool.

Table1: Comparison of proposed CF and traditional CF.

Algorithm	MAE
Traditional CF	0,817
Dissimilar Approach	0,885

These parameters used for this experiment.

- Similarity method : Pearson Correlation Coefficient
- Neighborhood selection method : Threshold (0)
- Prediction method : AWA
- Evaluation metric : MAE

Table 1 shows the performance of the traditional and the proposed CF. As we can see, the proposed system compete with the traditional one. If we can study a bit more on proposed system maybe it will be able to give better results.

We create individuals of classes (figure 3). The class properties and data properties are used for user that newly registered and used for item that newly added. We used this ontology for recommend item to new users until the new users rated enough item.

Conclusion and Future Work

This paper represents a new CF algorithm which uses dissimilarity and our experiments show that the proposed algorithm can compete with traditional algorithm. Maybe in our future work if we are setting parameters again in accordance with the proposed algorithm or we perform minor changes in step one or step three, the proposed CF will be able to give better results. Or we can combine the proposed system and the traditional one it will be able to give the better results.

In our study we propose ontology based recommender system to solve cold start problem in this area. We have achieved good tips and future work we can improved our algorithm and will be able to come out this problem.

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STRUCTURAL ANALYSIS OF LINEAR SWITCHED RELUCTANCE MOTOR DESIGNED EI CORE

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Abstract: In this study, structural analysis of the linear switched reluctance motor (LSRM) the horizontal move axis, made of EI cores were investigated. Designed this linear motor is working as switched reluctance motors. The force is carried out around 1600 N in previous electromagnetic analyzes. In parallel with it, 1600 N force is selected for the structural analysis. Force is applied to the motor's axis of movement (Z axis). Under this force, the deformation of the motor stator and translator, stretch ratio and strength of material has been computed with the structural finite element method (FEM). Especially structural analysis, stretching ratio of the translator poles in z axis and with it structural effects on the bearing diameter of the stator have been examined.

Keywords: Linear Switched Reluctance Motor, EI Core

Introduction

Conventional linear systems are driven by a rotational motor, which is mechanized with a pulley or chain drive system. These types of mechanisms can cause faults, require periodical maintenance and inefficient. Mechanical transmissions that are converted from rotational movement to linear movement cause power losses. Mechanical transmissions are not necessary because linear movement forces are transferred magnetically. The actuator has a simple geometrical structure and it does not require a permanent magnet; therefore, its design and manufacturing costs are low (Amoros & Andrada, 2010).

LSRM is designed with EI core structured, one sided and transverse magnetic flux that is fault-tolerant and energy-efficient. LSRM has 12 stator poles, 3 phases, and 250 W power. This study includes structural analyses with Finite Element Analysis (FEA) of a LSRM. The actuator design has been computed for deformation, flexural rate and reliability of the material by structural analyses with finite element method. In this process, causing permanent damage to the material is aimed to predict during the operating state by the obtained values of the forces as a result of static magnetic analyses.

EI Core Linear Actuator

The iron sheets are stamped out in E and I shapes and are stacked as an EI core with a 3-legged structure. Coils can be wound around any leg, but usually the center leg is used. It is obtained from transformer manufacturers easily and cheaply. The simulator and real prototype models of the actuator are shown in Figure 1. The LSRM is divided into two pairs of their magnetic flux directions, these being transverse or longitudinal flux structurally. Either can be designed as single- or double-sided (Krishnan, 2004). The actuator consists of a stator and translator parts. The stator is the fixed part and is called a passive stator because it has no coils on it (Fenercioglu & Avsar, 2015). The translator is the moving part and is called an active translator because it has coils. The three-phase linear actuator has a 6/4 pole ratio and each phase has two excited coils. Sizes of the proposed linear actuator are presented in Figure 2 and Table 1.

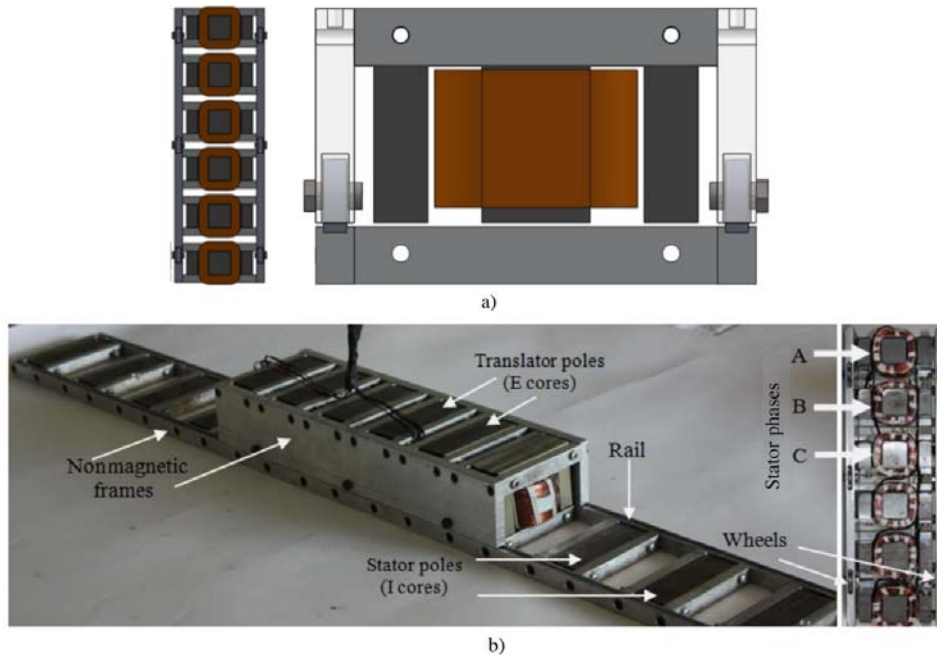


Figure 1. Simulator and real prototype models of the linear actuator: (a) front-rear view, (b) real prototype model.

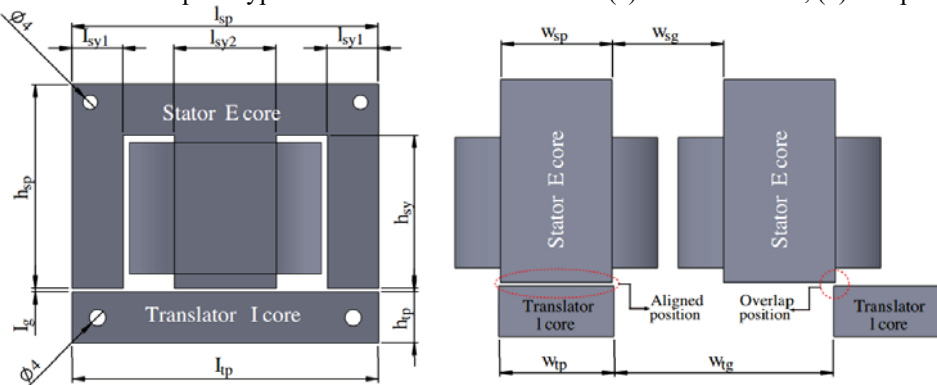


Figure 2. Sizes of proposed linear actuator.

Table 1. Geometrical sizes of the actuator.

Symbol	Dimensions	Size (m)	Symbol	Dimensions	Size (m)
l_{sp}	Length of stator pole	0.084	w_{sp}	Width of stator pole	0.030
l_{sy1}	Length of stator yoke 1	0.014	w_{sg}	Gap of stator poles	0.030
l_{sy2}	Length of stator yoke 2	0.028	w_{tp}	Width of translator pole	0.031
l_{tp}	Length of translator pole	0.084	w_{tg}	Gap of translator poles	0.059
h_{sp}	Height of stator pole	0.056	l_s	Length of overall stator	0.33
h_{sy}	Height of stator yoke	0.042	n_{sp}	Number of stator poles	6
h_{tp}	Height of translator pole	0.014	n_{tp}	Number of translator poles	12
l_g	Length of air gap	0.001	m	Number of phase	3

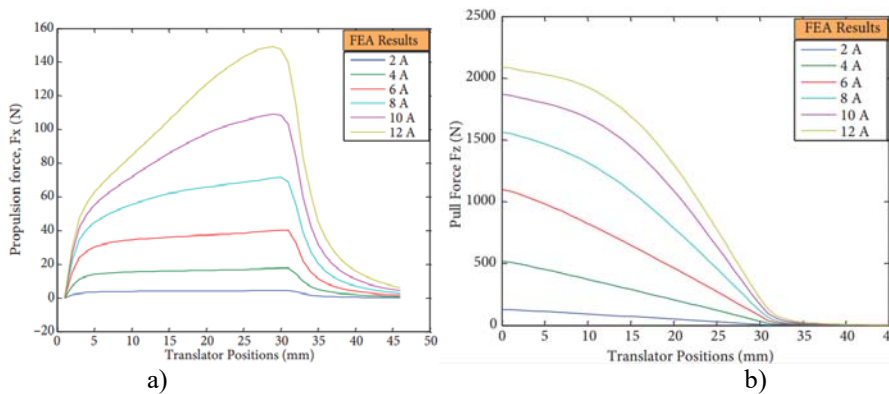


Figure 3. a) The propulsion force (F_x), b) the pull force (F_z)

As a result of the magnetically FEM analysis, EI cores 2000 At magnetomotive force and 1.5 tesla flux values are observed. These values are start of the saturation point on the BH curve. When EI core reaches 2000 amper-coil, Fx force reaches 70 N propulsion force. Fz force has reached 1600 N pull force (Fenercioglu & Avsar, 2015). The thus obtained Fz force has referenced to structural analyses with finite element method. Consist of Fz force on the actuator design has ben computed for deformation, flexural rate and reliability of the material by structural analyses with finite element method. In this process, causing permanent damage to the material is aimed to predict during the operating state by the obtained values of the forces because of static magnetic analyses.

Structural Analyses of Translator and Actuator

Which will be applied to the translator pole is selected by 6/4 structured switched reluctance motor. Because in the state of stator with 6 poles 3 phases, due to everytime 2 poles are triggered also corresponding 2 poles of translator has been triggered. As the highest point will be the center close to the point of stretching translator pole to pole force has been given to 2 translator poles. This force is distributed by dividing the threshold value which is 1600 Newton equally to 2 translator. Figure 4. shows ANSYS finite element fixing point of the pole with translator programs and force values are given.

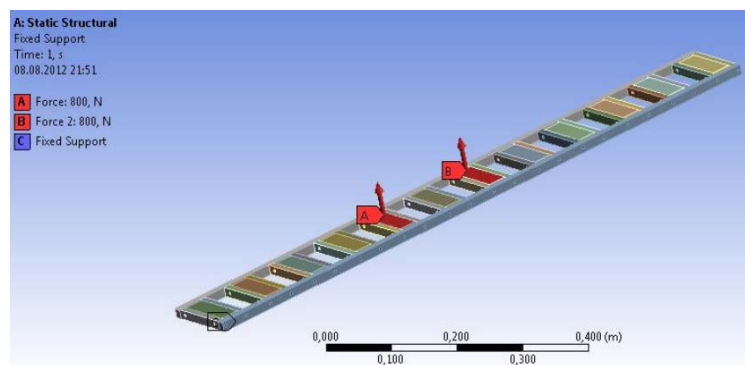


Figure 4. Fixing points and force values of the translator pole in ANSYS

Although the translator flexing forces in the structural analysis of a translator 1600 Newton aimed on determining deformations and stretching may occur aluminum. As a result of FEA by a method in general amount of spring force applied despite flexing in Figure 6 and a maximum stretching amount of the material are given in millimeters.

After computing total stretch ratio is computed durability of the material in response to these forces. The aluminum alloy is used as a fixing element for damage computing at 1600 Newton on the material. Aluminum alloy yield strength (Yield Strength) is approximately 280 MPascal. So finite element method with equivalent stresses exceed the yield strength in the analysis took place (Equivelent (von-Mises) stress) values are not irreversible formation of a tear or damage to the material. Translator_ equivalent stress (Equivelent (von-Mises) stress) values and highest tensile values are given in Figure 7.

In the FEM structural analysis of the material actuator 1600 Newtons is required to be calculated deformation on the bearing shaft and also material. As a result of finite element analysis by a method with the highest stresses in the material it is given in Figure 8.

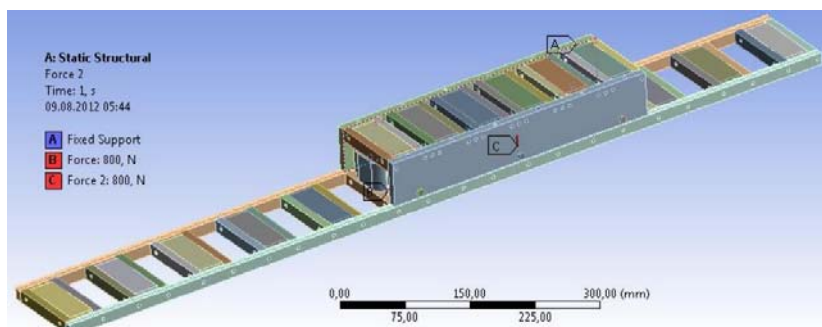


Figure 5. Fixing points and force values of the actuator in ANSYS

Results

The total deformation rate of return changing the total space is computed in ANSYS. As the highest value of the deformation, force applied by this calculation is 0.0141 mm. This result is a small value enough to be ignored.

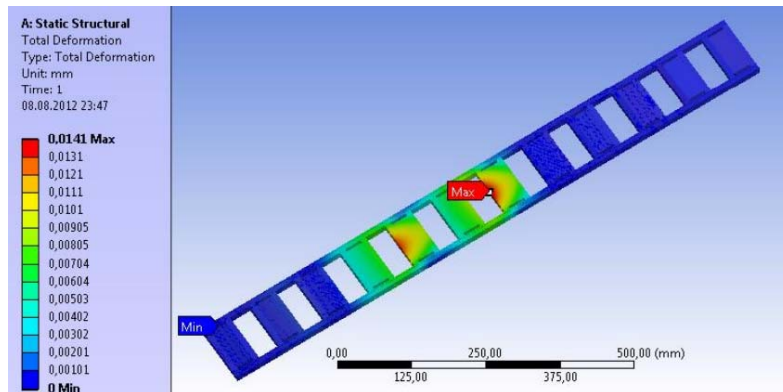


Figure 6. Total deformation rate in ANSYS

The Equivalent (von-Mises) stress of the material as shown in figure 7-a is about 5 MPascals in the FEM analysis. However, as Figure 7-b, where the highest stress experienced was identified as 30.1 MPascal. This situation does not occur even deformation of the material.

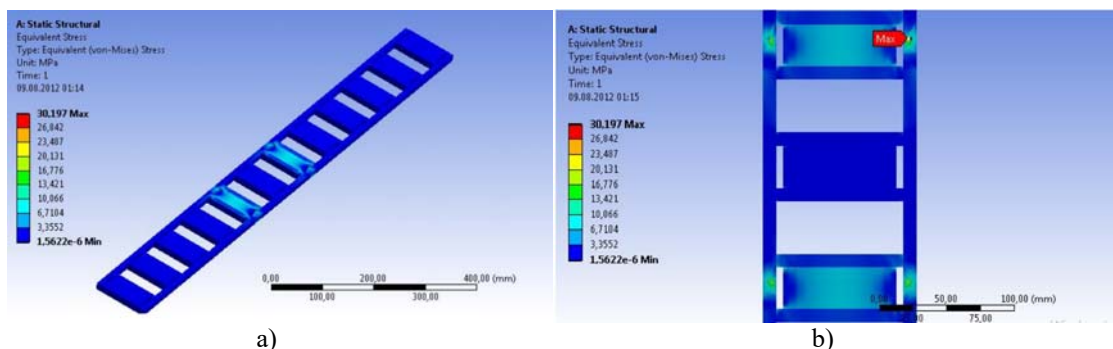


Figure 7. a) Equivelent (Von-Mises) Stress in ANYSYS
b) Translator regions where the maximum stress occurs

Value is defined as the maximum stress occurs 8722 MPascal in which actuator bearing point. In this case the material has no deformation.

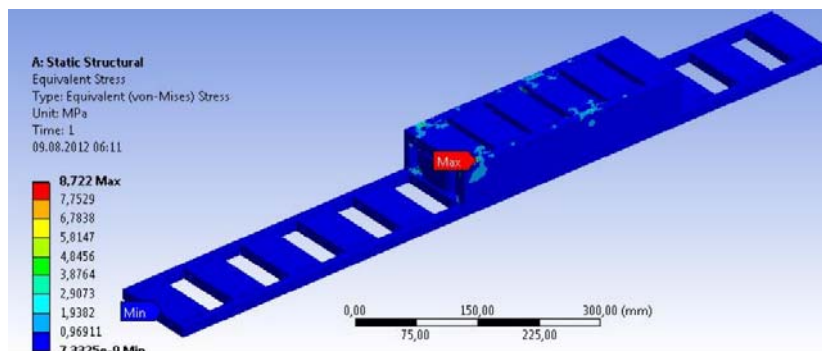


Figure 8. The highest voltage point in ANSYS

Conclusions

Single sided, EI core LSRM was structural analyzed by FEA software in order to determine deformation limits. When the highest force was applied, total deformation is calculated as 0.0141 mm. Under the maximum stress and Equivalent stress material has no deformation. Proposed design is acceptable as safety.

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SUGGESTION MECHANISMS OF SYNTHESIS A NOVEL CHIRAL COMPOUND: (*R*) AND (*S*)-1-(2-BENZYLOXY-3-METHOXYPHENYL)-2,2,2-TRICHLOROETHYL BENZENESULFONATE

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Abstract: A novel chiral compound was synthesized from the reaction between the new benzimidazole, 2-(2-benzyloxy-3-methoxyphenyl)-1*H*-benzimidazole **8** and benzenesulfonyl chloride **9** in dry dichloromethane DCM at 45°C for 10 hr in the presence of 4-*N,N*-dimethyl aminopyridine DMAP **12** as a catalyst was expected to obtain 2-(2-benzyloxy-3-methoxyphenyl)-1-(phenylsulfonyl)-1*H*-benzimidazole, **10**. Unfortunately, a novel chiral compound (*R*) and (*S*) 1-(2-benzyloxy-3-methoxyphenyl)-2,2,2-trichloroethyl benzenesulfonate **11** was obtained as a single crystal (59% yield) with melting point of 58.4°C. We suggest preliminary mechanisms of the formation of **11** by two ways: a) It is formed benzimidazolide ion **13** that is attacked from benzene sulfonic acid **15**, which is hydrolyzed from **9** to form *N*-(2-aminophenyl)-2-(benzyloxy)-3-methoxybenzimidine benzenesulfonate **17**, or b) that benzimidazole **8** is hydrolyzed to its basic compound benzyl *o*-vanillin **18**, which it attacks the 4-(dimethylamino)-1-(phenylsulfonyloxy) pyridinium chloride **21** to form (2-(benzyloxy)-3-methoxyphenyl) (phenylsulfonyloxy) methylum ion **22**. However, the mechanism of this reaction still is under investigation.

Keywords: Benzimidazole; Benzimidazolide ion; benzenesulfonyl chloride; Benzenesulfonic acid; 4-*N,N*-Dimethyl aminopyridine; (*R*) and (*S*)-1-(2-Benzyloxy-3-methoxyphenyl)-2,2,2-trichloroethyl Benzenesulfonate.

Introduction

Between 1977 and 1980, Gill's teams were synthesized three novel compounds **1–3**, which they distinguished by a new bulky functional group as a *p*-toluene sulphonate ester. Two of those derivatives showed as (*R*) and (*S*) enantiomers **2** and **3**, while **1** showed as (*S*) configuration (Begley *et al.*, 1978; Gill *et al.*, 1979; Figure 1).

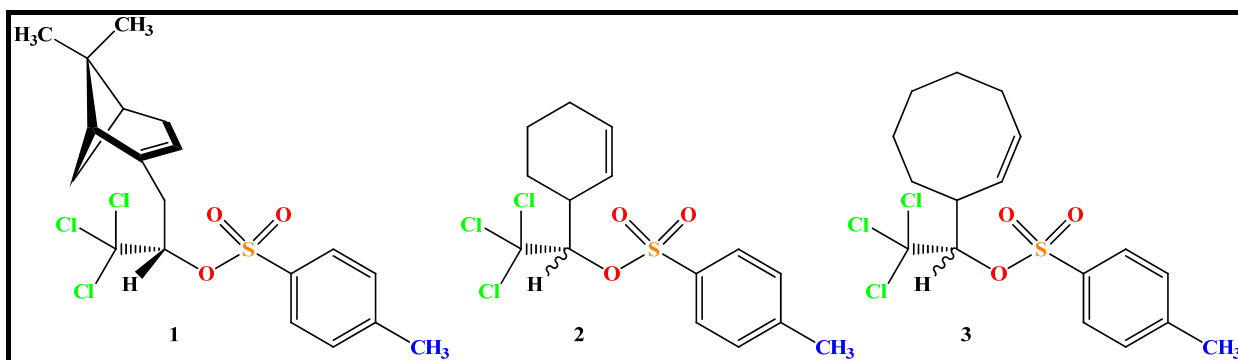
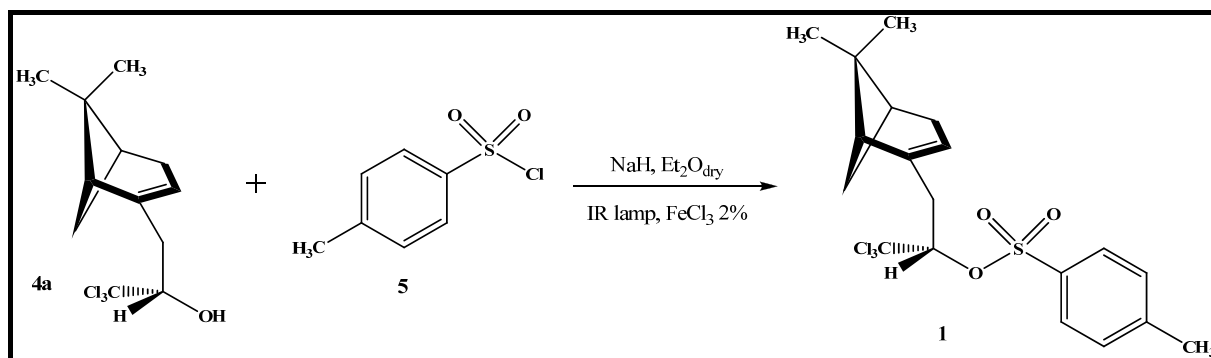
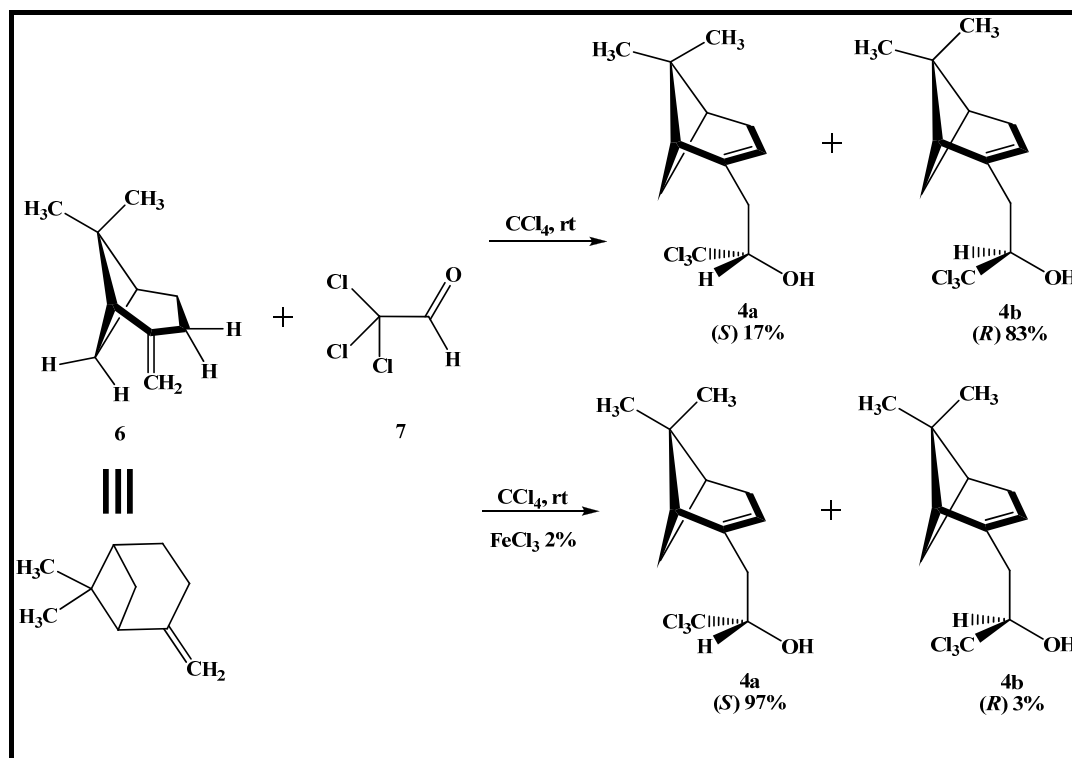


Figure 1: *p*-Toluene sulphonate esters **1–3** (Begley *et al.*, 1978; Gill *et al.*, 1979).

Those derivatives were formed by the reaction of **4a** with toluene-*p*-sulphonyl chloride or tosyl chloride **5** (Scheme 1). Compound **4** was formed as enantiomers (*S*) **4a** and (*R*) **4b** with ratio 17:83 by the addition of (–)-(1*S*, 5*S*)-pin-2(10)-ene **6** to chloral **7**, while the ratio was enhanced in the presence of FeCl₃ 2% as a bulky Lewis acid catalyst to 97:3, respectively, which were confirmed by ¹H and ¹³C NMR experiments and X-ray analysis, (Begley *et al.*, 1978; Gill *et al.*, 1979; Scheme 2). Derivatives **2** and **3** were synthesized as enantiomers (*R*) and (*S*) from the reaction of cyclohex-1-ene and cycloocta-1-ene with **5**, respectively (Figure 1).

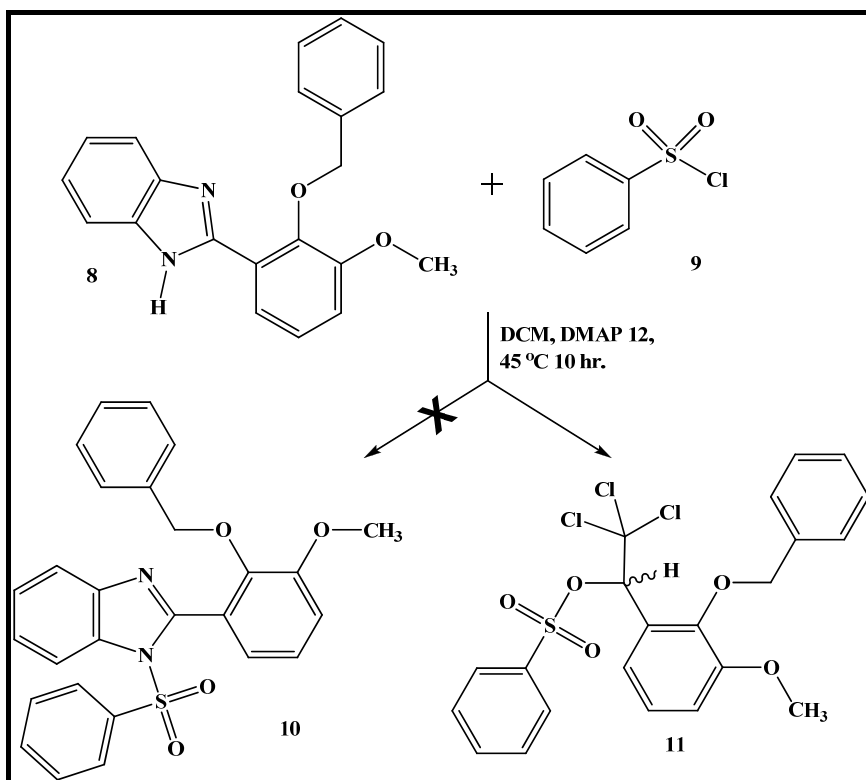


Scheme 1: Derivative 1 was prepared by (Begley *et al.*, 1978)



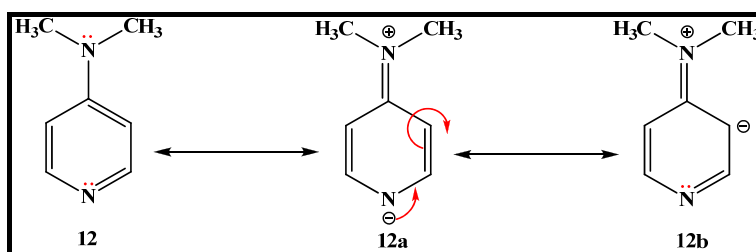
Scheme 2: Gill *et al.* method to prepare derivative of 4 (Gill *et al.*, 1979)

In 2007, a novel chiral compound (*R*) and (*S*) 1-(2-benzyloxy-3-methoxyphenyl)-2,2,2-trichloroethyl benzenesulfonate **11** was obtained from the reaction between the new benzimidazole, 2-(2-benzyloxy-3-methoxyphenyl)-1*H*-benzimidazole **8** and benzenesulfonyl chloride **9** in dry dichloromethane DCM at 45°C for 10 hr in the presence of 4-*N,N*-dimethyl aminopyridine DMAP **12** as a catalyst. This reaction was expected to obtain 2-(2-benzyloxy-3-methoxyphenyl)-1-(phenylsulfonyl)-1*H*-benzimidazole, **10** but it is formed **11** (Al-Douh *et al.*, 2007; Al-Douh, 2012; Scheme 3).



Scheme 3: Synthetic route towards the compound **11** (Al-Douh, 2012)

Additionally, DMAP **12** was greatly facilitated acylation of hindered alcohols with carboxylic acid anhydrides (Steglich and Hofle, 1969; Steglich, and Hofle, 1970; Hofle and Steglich, 1972; Hofle, *et al.*, 1978), which it is considered the most effective acylation catalyst comparing to other familiar derivatives (Hassner, *et al.*, 1978), including, **12** is faster 20,000 times than pyridine in acylation (Hofle, *et al.*, 1978). The resonance of **12** showed the localization of the pair of electron in nitrogen atom when it is sharing with the double bonds of the pyridine ring, which it has to share with other nitrogen atom, to localized the negative charge in *ortho* and *para* positions of tertiary amine (Scheme 4).



Scheme 4: The resonance of **12** (Hassner, *et al.*, 1978).

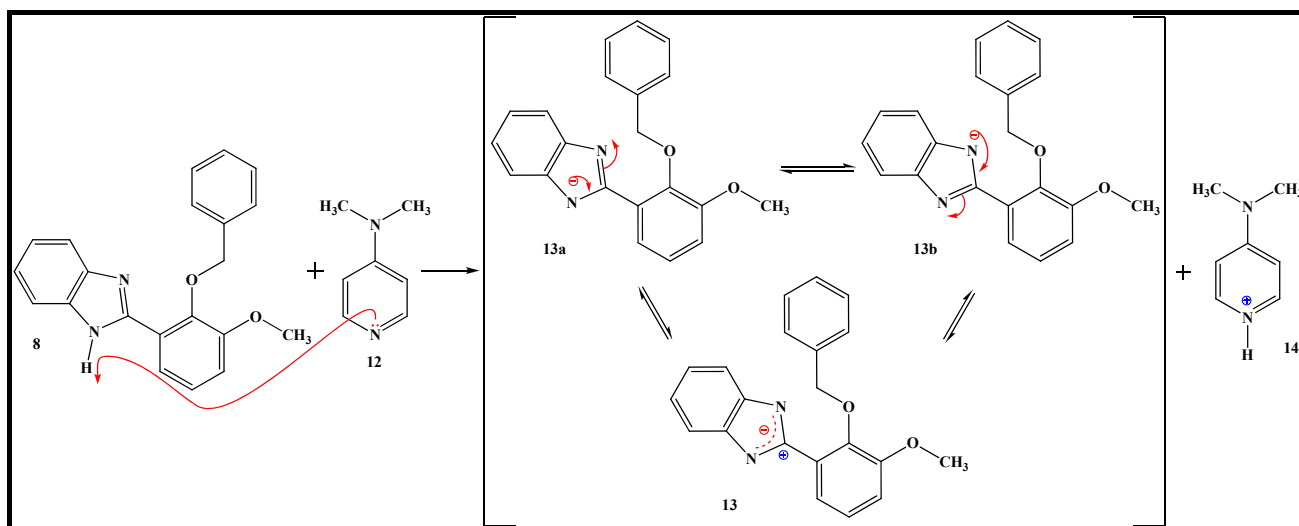
In our previous work, we have been reported the synthesis of **11** and confirmed by FTIR, HRMS, X-Ray crystallography (Al-Douh *et al.*, 2007), 1D and 2D NMR spectroscopy (Al-Douh, 2012). The mechanism of this reaction was unknown. Therefore, we suggest of preliminary mechanisms of the formation of **11** by two ways:

Catalytic Protonation Mechanism (CPM):

This mechanism has four steps.

The first step in CPM:

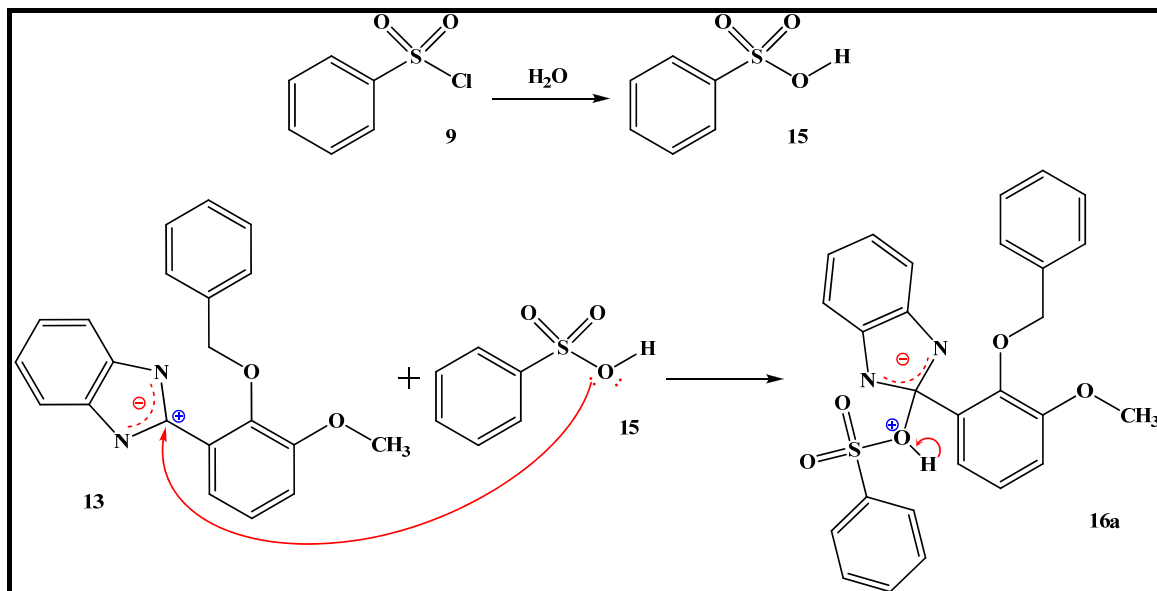
This step is started by the formation of benzimidazolide ion **13** as an intermediate, which it is formed from the reaction between the benzimidazole **8** and the catalyst DMAP **12**. The pair of electron of nitrogen atom in the pyridine ring of **12** attacked that proton in the tertiary amine of **8** to form two an ionic intermediate structures **13a** and **13b** and unstable protonated ion 4-*N,N*-dimethyl aminopyridinium ion **14** (Scheme 5). It is called benzimidazolide ion step.



Scheme 5: The formation of the benzimidazole ion **13**.

The second step in CPM:

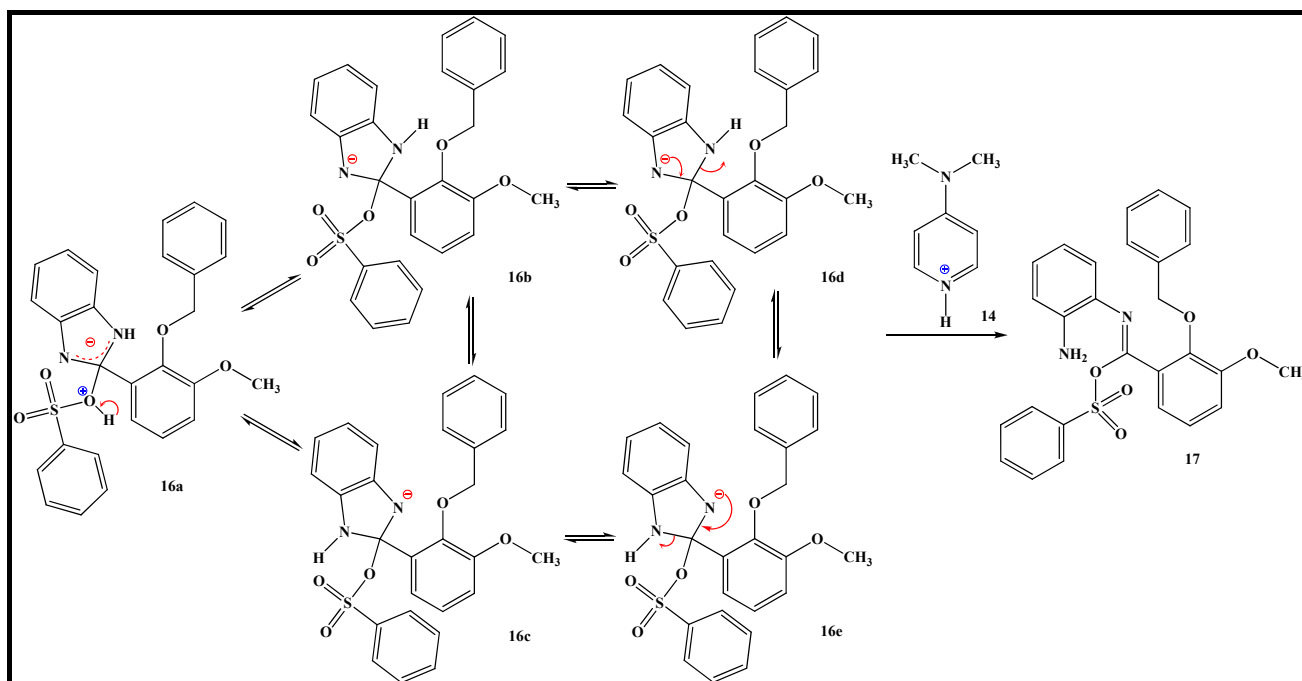
On the other hand, benzene sulfonic acid **15** is formed from **9** by hydrolysis, then, the benzimidazole ion **13** is nucleophilic attacked from **15** to form *N*-(2-aminophenyl)-2-(benzyloxy)-3-methoxybenzimidine benzenesulfonate **17**, through an intermediate **16** (Scheme 6). This step called hydrolyzed step.



Scheme 6: The hydrolysis of **9** and formation of **16**.

The third step in CPM:

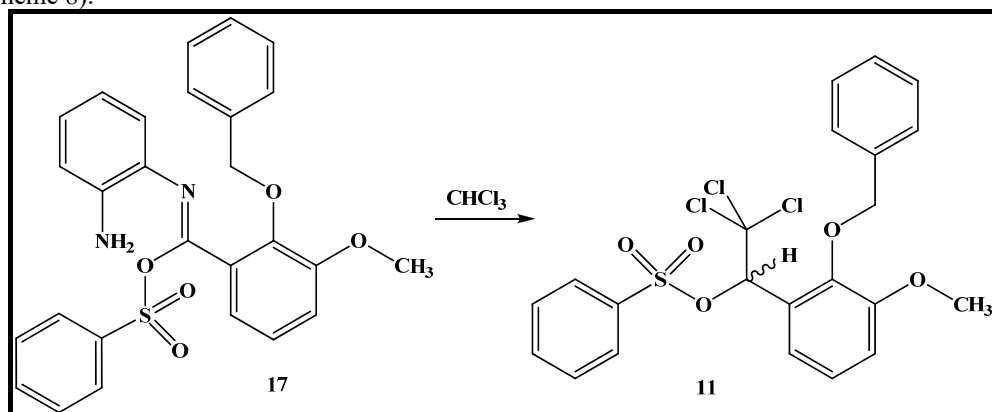
This step is tautomerism step, which an intermediate **16a** was tautomerised when it loses proton to form both ions **16b** and **16c** that converted to both tautomer ions **16d** and **16e**, respectively, followed to form **17** in the presence of **14** (Scheme 7).



Scheme 7: The tautomerization of ion 16 to form 17.

The fourth step in CPM:

This step unclear to convert 17 to 11. It is deemed a free radical step carried 17 in the presence of CHCl_3 as a solvent to form 11 (Scheme 8).



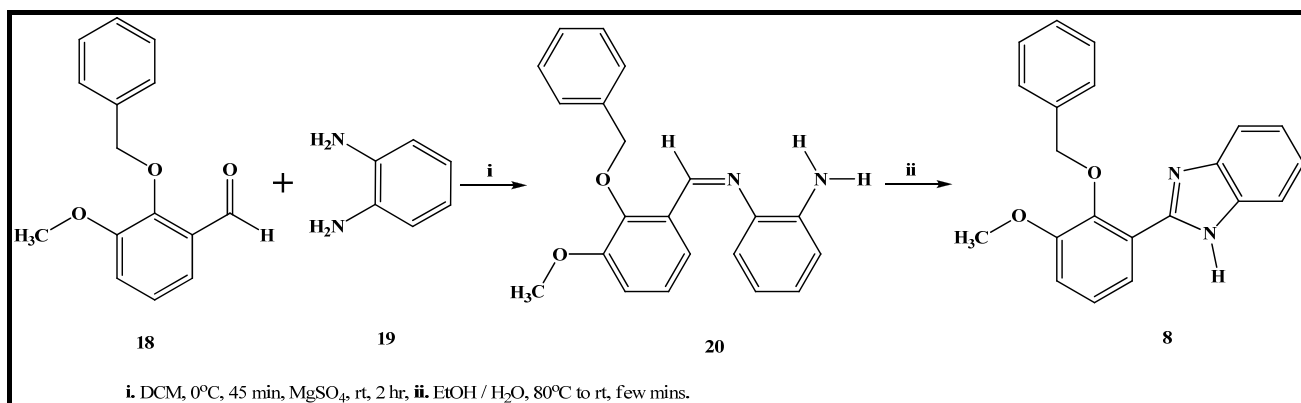
Scheme 8: The formation of 11.

Hydrolysis Mechanism (HM):

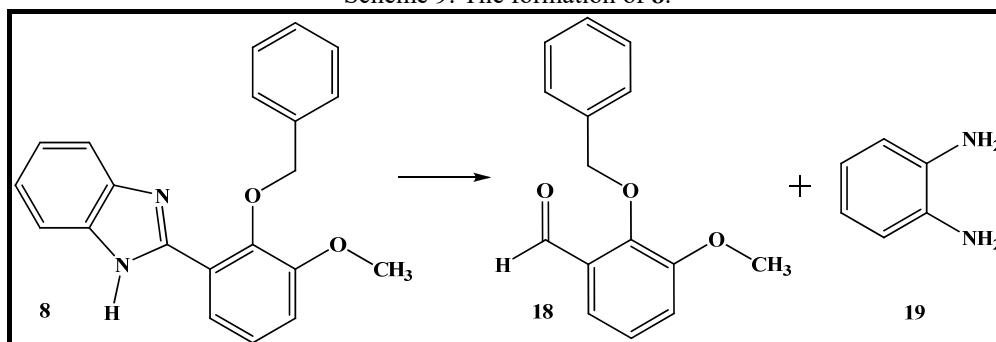
This mechanism has three steps.

The first step in HM:

This is called the hydrolysis of benzimidazole step, which it is started by the hydrolysis of 8 to its raw materials benzyl-*o*-vanillin 18 and phenylenediamine 19 (Scheme 10), while the benzimidazole 8 was synthesized by the reaction between 18 and 19 in DCM at low temperature with other derivatives (Al-Douh, *et al.*, 2006a,b; Al-Douh, *et al.*, 2009; Al-Douh, *et al.*, 2011; Scheme 9).



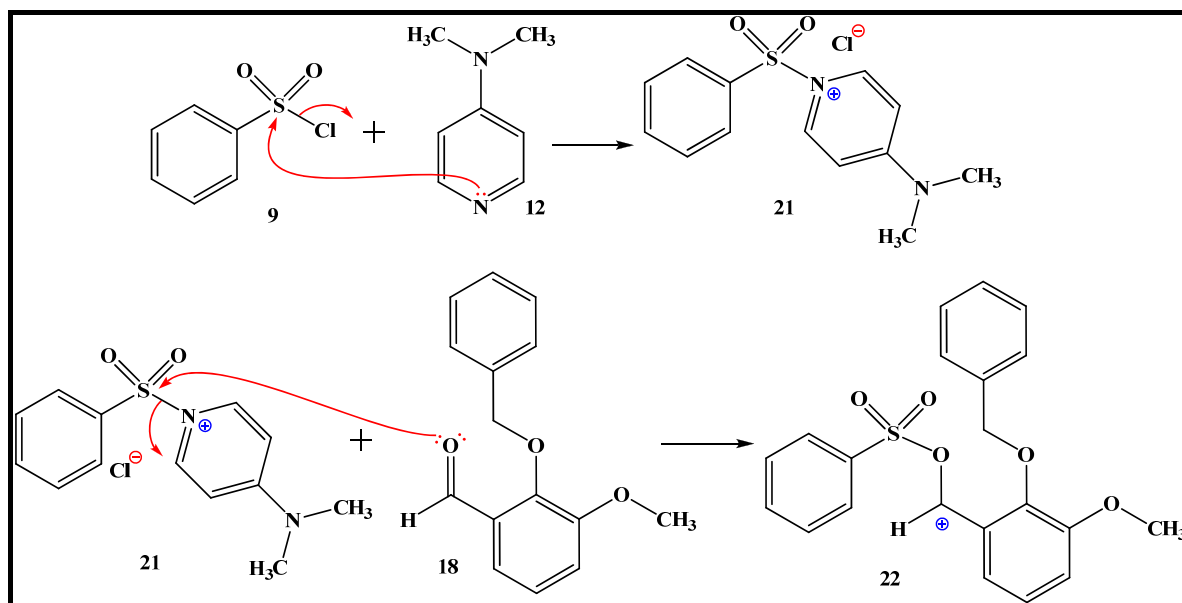
Scheme 9: The formation of **8**.



Scheme 10: The hydrolysis of **8**.

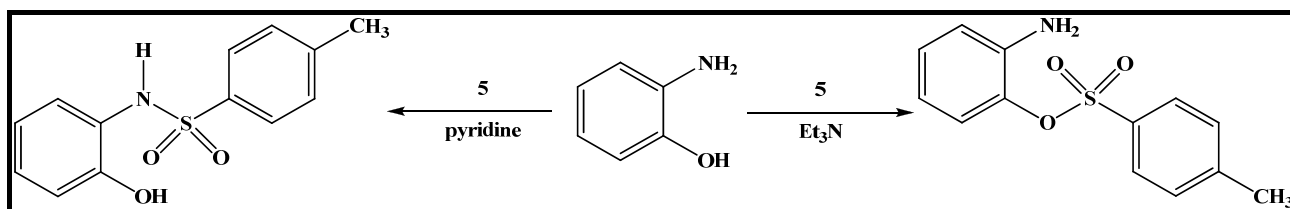
The second step in HM:

The benzosulfonyl chloride **9** is attacked by nucleophilic catalysis **12** to form the 4-(dimethylamino)-1-(phenylsulfonyloxy) pyridinium chloride **21**, then, the pair of electrons on the *O* atom in **18** attacked to form (2-(benzyloxy)-3-methoxyphenyl) (phenylsulfonyloxy) methyl cation **22** (Scheme 11). This step is called nucleophilic catalysis mechanism or two tetrahedral mechanisms (Smith, 2013).



Scheme 11: The formation of **22** from **18**.

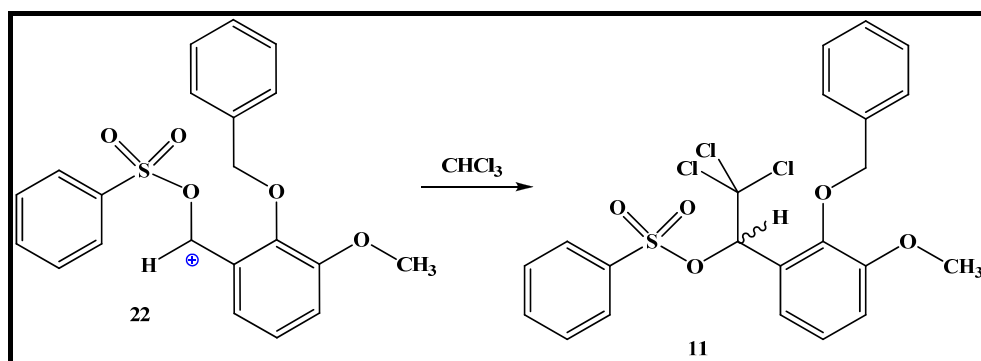
Kurita reported the selectivity tosylation by **5** of *o*-aminophenol in both pyridine and triethyl amine as solvents. The tosyl group was substituted in amino functional group in pyridine, while it was substituted in hydroxyl functional group in triethyl amine (Kurita, 1974; Scheme 12).



Scheme 12: The tosylation of *o*-aminophenol (Kurita, 1974).

The third step in HM:

This step also unclear to convert **22** to **11**. It is deemed a free radical step carried **22** in the presence of CHCl_3 as a solvent to form **11** (Scheme 13).



Scheme 13: The formation of **11** from cation **22**.

CPM vs. HM:

We expect CPM more than HM, in first step; ion **13** was strongly formed in benzimidazolide ion step than hydrolyzed step of **8** to **18** and **19**, whereas the hydrolyzed products from **8** to its raw compounds do not exist. On the other hand, compound **17** in steps two and three of CPM mechanism formed from ion **13** crossed tautomerised of **16**, while the methylum cation **22** will be formed from **18** as raw material if it was really hydrolyzed from **8** in HM mechanism. Both last steps in CPM and HM mechanisms to form **11** from **17** and **22** in the respective are unclear. It is believed that compound **11** is formed in the presence of CHCl_3 . However, these steps need more studies to prove which one forms **11**.

Conclusion

In this work, both suggested mechanisms catalytic protonation mechanism **CPM** and hydrolysis mechanism **HM** to form a novel chiral compound (*R*) and (*S*) 1-(2-benzyloxy-3-methoxyphenyl)-2,2,2-trichloroethyl benzenesulfonate **11** were presented.

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THE DETERMINATED COMBUSTION PROPERTIES OF FIR WOOD IMPREGNATED WITH FIRE-RETARDANTS

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Abstract: In this study, the effects of impregnation material and impregnation methods on combustion properties of Fir (*Abies bornmulleriana*, Mattf.) have been investigated. The four different method was used for impregnation process. Combustion test was performed according to the procedure of ASTM-E 69 standards. According to the test results fire retardant materials and impregnations methods was found to be the most successful fire retardant chemical and long-term dipping method in Fir.

Key words: Fir, Dipping method, Fire Retardant

Introduction

Wood has many good properties from the point of view of processing, physical and mechanical properties, aesthetic, environmental and health aspects. In many countries the wood is widely used as building material, in some areas as main construction and decoration material. The combustion of wood relates to the fuel burn rate (or the reaction rate), the combustion product (or the emissions), the required excess air for complete combustion, and the fire temperatures. The processes are extremely complicated, principally, because the wood has a complex physical and chemical composition (Bednarek and Kaliszuk, 2007). Wood is a naturally durable material that has been recognized for centuries throughout the world for its versatile and attractive engineering and structural properties. It is well known that there are possibilities to improve significantly the fire performance of wood by chemical treatment and to widen its application options. In general the amount of flame retardant uptake to the wood is directly proportional to the improvement of reaction to fire characteristics [Balog, 1986]. Important reactions to fire parameters in the full scale fire are heat release rate and time of flashover (Babrauskas and Grayson, 1992). Flame retardant treated materials may have much better fire performance concerning these parameters than untreated wood products. Combustion of wood involves a complex series of physical transformations and chemical reactions that are further complicated by the heterogeneity of the substrate. Wood, and cellulosic materials in general, do not burn directly; under the influence of sufficiently strong heat sources they decompose to a mixture of volatiles, tarry compositions, and highly reactive carbonaceous char. Gas-phase oxidation of the combustible volatiles and tarry products produces flaming combustion. Solid-phase oxidation of the remaining char produces glowing or smoldering combustion, depending on the rate of oxidation (Baysal, 1994). Wood coatings more often are designed to retard ignition and rate of burn rather than to provide the fire-resistive barrier which is more typical of steel coatings. Typically, coatings protective (or retardant) against cellulosic-type fires are applied in thin film coat sup to 1.5 mm (60mils) thick. These coatings are usually not very weatherable; so, for outdoor applications, a protective topcoat is needed (Shafizadeh, 1984). Uysal et al. (2008) investigated the effects of finishing materials polyurethane, cellulosic, synthetic, polyester, and acid hardening varnish on combustion properties of Scotch pine. Cellulosic varnish was found to be the most successful varnish according to the CO amounts and mass reduction. According to their results, all of the varnishes used to in their study showed a low resistance against fire and high temperatures. Uysal and Kurt (2005) studied the impregnation of the oriental spruce (*piceaorientalis L.*) with boron compounds, and the test samples were applied to the combustion test. A borax-boric acid % 10 solution was found to be the most successful fire retardant chemical. Kurt and Uysal (2009) investigated the effects of fire retardant materials zincchloride and di-ammonium phosphate were found to be the most success full fire- retardant chemicals in LVL. Since it diminishes combustion, the impregnation of LVL produced from walnut by using PF and PVAc adhesives can be advised to be impregnated by using the pressure-vacuum method. The aim of this paper is to investigate the combustion properties and emission testing of Uludag fir, widely used in building construction. The samples were impregnated with firetex produced by kale natural using 3 different dipping method.

Material and Method

Wood Material

Uludag fir (*Abies bornmülleriana* Mattf.) was used. The test samples were chosen randomly from timber merchants of Ankara, Turkey. Special emphasis is given for the selection of the wood material. Accordingly, non-deficient, proper, knotless, normally grown (without zone line, without reaction wood and without decay, insect mushroom damages) wood materials are selected.

Impregnated Materials

Firetex is an effective, natural, non-toxic, ecologic and economic water based fire-retardant and fire-extinguisher. The properties of some physical are given in Table 1.

Table 1. Physical Properties of firetex

Boiling point	98 °C
Freezing point	-3 °C
pH	3,7
TDS	739 ppm
Evaporation (60 °C / 24 h)	% 50

Preparation of Test Samples

The oversized test samples were acclimatized until they were stable at 20 ± 2 °C and 65 ± 3 % relative humidity in climate room. Later on they were cut with the dimensions of $9 \times 19 \times 1016$ mm³ according to the procedure of ASTM E – 69.

Impregnation processes stated at ASTM D 1413-76, TS 344 and TS 345 were applied to the prepared test samples. For this aim, the samples were dipped into the impregnation solution (having packing viscosity) for 2 min, 24 h and 7 days, respectively, for short-term dipping, provided the samples passed over 1 cm of its upper surface and finished with fire retardant finishing. The peculiarities of impregnation were determined before and after impregnation processes. All processes were carried out at 20 ± 2 °C. The samples, oven dried before and after impregnation, can be calculated by the formula

$$R = \frac{GC}{V} \times 10^3 \text{ kg} / \text{m}^3,$$

where R is the retention of impregnation material, $G = T_2 - T_1$, T_1 is the sample weight before impregnation (g), T_2 is the sample weight after impregnation (g), C is the concentration (%) and V is the volume of the samples (cm³). Impregnated test samples were kept at 20 ± 2 °C and at 65 ± 3 % relative humidity until their weights became stable.

Execution Test

The combustion test was carried out according to the principles of the ASTM E –69. But some changes were made in the stand. For this purpose, a digital balance having 0.01 g sensitiveness has been used for determination of mass reduction of materials when they are burnt. Butane gas was used to make an ignition flame. The gas flow is standard as the high of flame is 25 cm, the temperature must be 1000 °C. The distance between the bottoms of the test samples, which were hanged inside of the fire tube and the top of the gas pipe must be adjusted as 2.54 cm. During the test, mass reduction, temperature and released gas (CO, NO, O₂) were determined in every 30 seconds. The test was made under a chimney where the flow of air blown was drawn with natural draft. At the beginning of combustion test flame source was used for 4 minutes then flame source was taken away and it was continued 6 minutes. Totally 10 minutes, the test was lasted.

Statistical Procedure

Descriptive statistics analysis was applied to determine both the amount of retention in the prepared natural and the effects of impregnation material on combustion with or without flame source.

Results and Discussion

The air dry density (0.430 gr/cm³) was obtained fir wood. The proportion of impregnation material is given in Table 2.

Table 2. Proportion of Retention

Test no	Impregnation Method	Retention (%)	
		\bar{X}	HG *
1	Finished with by a brush	6,6	A
2	Short-term dipping (2 min)	11,5	B
3	Middle-term dipping (24 h)	36,1	C
4	Long-term dipping (7 days)	52,8	D

\bar{X} : Average *HG: Groups of Homogeneity

The highest retention proportion was observed in dipping method of long time and the lowest in finished with a brush. The averages of mass reduction are given in Table 3.

Table 3. Average of Mass Reduction(%)

Measured of time	Control	Dipping method			with a brush
		2 min	24 hours	7 days	
1	3.06	5.29	1.75	2.45	7.62
2	6.59	7.41	4.57	3.86	12.51
3	10.88	11.60	5.74	6.28	15.42
4	16.91	14.32	7.95	7.76	17.27
5	25.42	17.15	10.64	9.48	18.16
6	35.47	20.66	12.48	10.26	19.26
7	44.92	22.12	13.61	11.42	19.75
8	51.34	24.63	14.92	13.61	20.14
9	59.16	26.24	16.86	15.57	20.86
10	65.74	27.96	17.95	16.12	21.47
11	76.32	33.65	21.64	18.00	22.74
12	84.12	36.42	22.30	19.54	24.51
13	88.46	39.25	24.61	20.16	25.84
14	91.15	41.42	25.49	21.33	27.18
15	94.05	42.16	27.56	23.76	29.38
16	95.10	43.41	29.18	24.37	32.14
17	96.22	44.67	31.46	25.01	33.44
18	97.34	45.23	31.98	25.38	34.16
19	97.75	45.69	33.25	25.76	35.28
20	98.65	46.12	33.70	26.24	35.69

The highest mass reduction was (%98.65) observed in control samples, the lowest value (%26.24) in the impregnated with firetex by long-term dipping method. The averages of O₂ amounts are given in Table 4.

Table 4. Average of O₂ amounts (%)

Measured of time	Control	Dipping method			With a brush
		2 min	24 hours	7 days	
1	20.02	20.12	20.05	20.37	20.24
2	19.41	19.82	19.75	20.01	19.88
3	19.1	19.67	19.66	19.84	19.55
4	18.83	19.53	19.58	19.68	19.25
5	18.58	19.29	19.36	19.57	19.16
6	18.65	19.21	19.46	19.49	19.05
7	18.57	19.59	19.49	19.67	19.35
8	18.36	19.74	19.70	19.79	19.48
9	17.91	20.11	19.85	19.90	19.76
10	18.13	20.41	19.92	20.63	19.99
11	18.2	20.50	19.99	20.92	20.38
12	18.47	20.88	20.36	20.97	20.82
13	18.94	20.91	20.78	20.97	20.97

14	19.54	20.94	20.88	20.98	20.98
15	19.71	20.95	20.97	20.98	20.98
16	20	20.97	20.98	20.99	20.99
17	20.33	20.97	20.98	20.99	20.99
18	20.57	20.98	20.99	20.99	20.99
19	20.69	20.99	20.99	20.99	20.99
20	20.72	20.99	20.99	20.99	20.99

The highest reduction of O₂ concentration (% 20.99) was measured in the impregnated with firetex by all of the dipping method. The lowest change of O₂-concentration (%17.91) in combustion of non-impregnated fir control samples. From the control samples it can be seen that the impregnation chemicals has the effect of fire retardant. Control samples gave the highest CO₂ concentrations. The averages of temperature are given in Table 5.

Table 5. Average of Temperature Values(°C)

Measured of time	Control	Dipping method			with a brush
		2 min	24 hours	7 days	
1	87.9	85.9	99.4	89.6	83.1
2	116.1	102.6	117.6	104.0	101.6
3	150.1	119.4	129.4	114.3	118.4
4	176.2	134.1	137.3	122.7	138.6
5	204.6	150.1	145.4	130.6	154.1
6	228.3	163.4	157.0	138.1	159.7
7	248	165.6	165.1	147.3	166.4
8	269.8	163.4	166.4	151.8	166.8
9	310.9	156.0	165.0	149.6	164.5
10	384.9	140.1	163.2	138.3	154.2
11	425.7	132.7	160.6	128.1	140.1
12	424.6	125.6	149.5	120.1	129.0
13	405.6	116.0	138.5	113.7	120.6
14	359.4	109.9	129.4	106.0	112.7
15	309.5	102.3	121.0	101.8	106.4
16	271.3	97.6	114.1	97.3	101.2
17	238.3	92.5	109.6	93.0	96.3
18	218.4	88.4	104.1	90.4	92.3
19	201.1	85.7	100.2	87.5	89.4
20	185.5	82.0	96.4	84.2	85.2
Mean	260.8	120.6	133.4	115.4	124.0

The highest averages temperature (260.8 °C) variation was observed in the fir control samples, the lowest (115.4 °C) in impregnated with firetex by long-term dipping method. The averages of variations of CO are given in Table 6.

Table 6. Variation of CO (ppm)

Measured of time	Control	Dipping method			with a brush
		2 min	24 hours	7 days	
1	36.7	79.3	86.3	50.2	90.5
2	70	131.3	156.4	118.4	128.4
3	92.1	152.4	178.7	142.6	157.7
4	107.5	163.1	184.9	154.8	173.1
5	148	174.0	186.0	162.4	179.2
6	264.3	189.0	194.1	175.1	185.3
7	414.8	195.2	160.5	190.0	216.0
8	484.9	209.6	156.0	167.4	212.7
9	487.3	229.9	145.7	153.7	154.4
10	437.5	179.4	112.5	111.8	120.6
11	309.5	148.5	101.2	91.7	84.1
12	317.9	132.6	93.3	53.9	52.9
13	282.7	110.4	51.4	28.4	26.2
14	204.7	108.9	23.6	11.2	13.0
15	254.1	102.7	10.4	4.3	10.1

16	233.1	79.0	7.3	3.7	7.3
17	183.3	49.2	5.9	3.1	5.4
18	116.4	18.6	4.7	2.5	4.1
19	70.2	5.1	3.4	2.2	2.5
20	58.3	2.5	3.0	1.9	1.1
Mean	228.7	123.0	93.3	81.5	91.2

The highest increase in CO concentration was (487.3ppm) observed in the control fir samples and the lowest in (1,1 ppm) impregnated with firetex by with a brush samples. The averages of variation of NO are given in Table 7.

Table 7. Variation of NO (ppm)

Measured of time	Control	Dipping method			with a brush
		2 min	24 hours	7 days	
1	0.4	8.1	14.7	17.4	8.7
2	1.3	7.5	12.5	14.5	7.9
3	1.9	6.4	9.7	12.7	7.5
4	3.2	5.5	8.8	9.1	7.2
5	3.9	5.1	8.4	8.0	6.6
6	3.3	4.8	7.7	7.4	6.2
7	3.5	4.2	6.7	7.1	5.4
8	4.3	3.7	6.2	6.5	4.6
9	4.9	3.4	5.0	6.0	4.2
10	6	2.7	4.4	5.7	3.5
11	6.5	2.5	4.1	5.2	2.6
12	6.5	2.3	3.8	3.9	2.2
13	5.7	2.0	3.7	3.7	1.9
14	4	1.7	3.5	3.2	1.6
15	3.3	1.5	2.7	2.5	1.4
16	2.7	1.1	2.6	2.1	1.3
17	1.5	0.9	2.4	1.8	1.1
18	0.5	0.7	2.1	1.4	0.8
19	0.3	0.4	1.8	1.2	0.5
20	0	0.2	1.4	1.0	0.3
Mean	3.2	3.2	5.6	6	3.8

In this study, the highest increase in NO concentration was observed in the experiment of (17.4 ppm) impregnated with firetex by long-term dipping method samples and the lowest in those of (0 ppm) non-impregnated control fir samples.

Conclusion

According to Table 3, after taking the flame source from the fire tube, the highest mass reduction (98.6 %) was observed in the non-impregnated control samples, the lowest in the impregnated with firetex by long-term dipping method fir samples (26.2 %) at the second stage of combustion. It has been observed that impregnated with firetex by long-term dipping method fir samples decreases mass reduction values 72.4 % in average.

According to Table 4, the highest O₂ consumption was observed in the non-impregnated control samples (17,91 %). It been has observed that impregnated by short-term, middle-term, long-term dipping method fir samples impregnated with firetex samples decreases O₂ consumption values 3,09 % in average.

According to Table 5, the highest temperature was observed in the non-impregnated fir control samples (260,8 °C). It been has observed that impregnated by long-term dipping method fir samples impregnated with firetex samples decreases °C consumption values 56 % in average.

According to Table 6, the highest ratio of CO was observed in the non-impregnated control samples (487.3 ppm). According to the averages values, it been has observed that impregnated by long-term dipping method fir samples impregnated with firetex samples decreases CO ratio values 64 % in average.

According to Table 7, the highest ratio of NO was observed in the impregnated with firetex by long-term dipping method samples (17,4 ppm). According to the averages values, it been has observed that impregnated by long-term dipping method fir samples impregnated with firetex samples increases NO ratio values 87 % in average. Consequently, fire retardant impregnated material was found to be the most successful according to the CO amounts and mass reduction. It can be proposed that protecting by dipping method or with a brush firetex of historical wooden structure due to fire risk.

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TURKISH STOCK MARKET DEPENDENCY TO INTERNATIONAL MARKETS AND EXCHANGE RATE

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Abstract: In a financially integrated global market, the returns of countries' stock markets are partially determined by world risk especially arising from developed countries. Global crisis and even some local crisis have contagious effect on almost every market. In this study, Turkish stock market dependency to world market and regional markets, effect of exchange rates to Turkish stock market return are examined with international CAPM and APT. Stock markets indices, some proxies of world market portfolios and exchange rates are main data for the study. Due to time series properties of data, conditional models are more proper to use. Conditional models consider time dependent properties of variables especially when there is heteroscedasticity problem. Those models reveal relation better between Turkish Stock market and international stock markets. Expected result of study is that Turkish stock market is exposed to risk arising from international factors and market correlations.

Keywords: Turkish Stock Market, Exchange Rate

Introduction

International financial integration is getting more attention in recent years. Economies face with more frequent crisis and their impacts became more subversive and more global. So understanding interaction and interdependence of financial markets is crucial for investors, policy makers and industry stakeholders.

Some studies focused on explaining interdependence by common factor affecting those markets. These common factors may depend on or result of economic integration, liberalisation or more macro variables that have more influence on markets especially in crisis periods. Some studies of them are Walti (2011), Baele (2005) and Cheung and Lai (1999) which focused on monetary integration, Beine and Candelon (2010) which focused on liberalization at emerging markets. On the other hand Kallberg and Pasquariello (2008) suggested that there are correlations between markets more than those fundamental factors can explain.

As the markets correlation increases, international diversification is no more benefit to reduce investment risk. This consequence remarked in some studies (e.g. Byers and Peel, 1993).

Engle et al. (1990) examined the spill over behavior of volatility between markets. GARCH models can be used for examining time dependent volatility. Engle et.al used it also for the volatility transfer from one country to another. Where the idea supports that the volatility is not country specific or not only depends on the factors of country also affected by other markets.

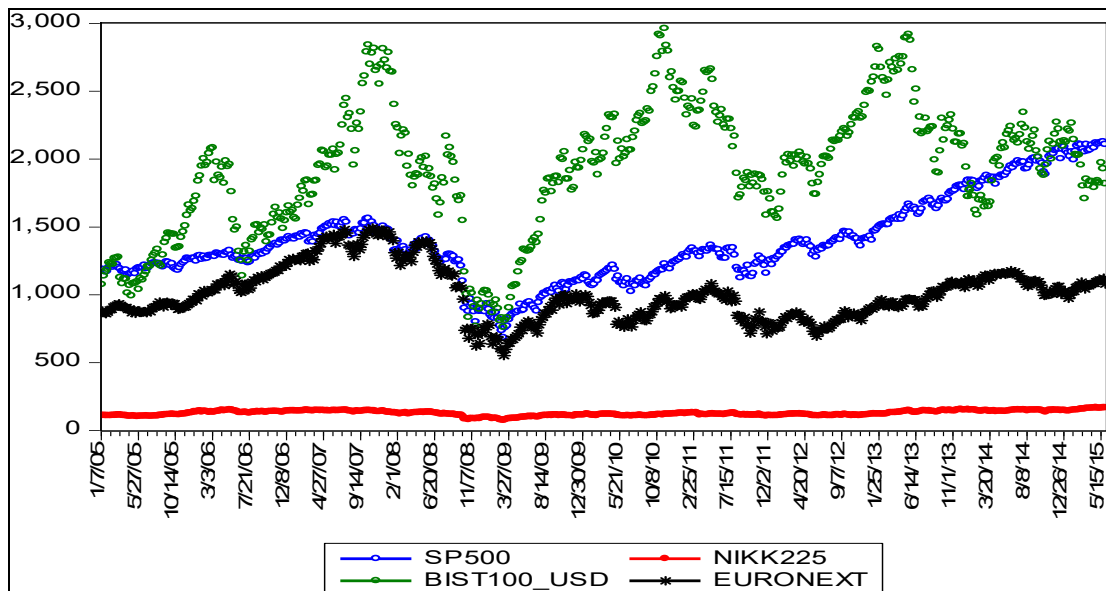
Some studies focused on the contagious behavior of crisis. Forbes and Rigobon (2002) claimed that because of market interdependence the volatility increases in a country causes an increase in the other countries and that causes higher correlation. The crisis in one country affects the other but no more than the normal period. That is the interdependency level does not change in crisis period. This study accepts that there are correlations between markets but it proposes that correlation does not change in crisis period. Bekaert et al. (2005) examined World and regional market integration and also proportion of variance driven by global, regional and local factors. The more researches about financial market correlation one can look at Bekaert et al. (2009), Dungey and Martin (2007) and Taylor and Tonks (1989).

The aim of this study is to examine dependencies of Turkey's Stock Market (Borsa Istanbul –BIST) to some selected markets. This dependency is examined by three regression based models and by correlation analysis.

DATA

The main data for the study includes stock market indices of Turkey, Europe (in general), United States (SP500) and Japan (NIKKEI225), and also USD/YEN, USD/EURO and USD/TL exchange rates. Indices value Turkey (BIST100 in TL and USD) gathered from Borsa Istanbul web page, the other indices (US, Japan and Europe)

gathered from yahoo finance web pages. Exchange rates of USD/YEN, USD/EURO and USD/TL gathered from IMF web page, ECB and Turkish Central Bank respectively. EURONEXT and NIKKEI225 indices converted to USD by using these exchange rates. BIST100 index gathered in TL and USD from web page. The data covers the January 2005-May2015 interval. In the graphic below BIST100, NIKKEI225, EURONEXT and SP500 indices values in USD can be seen. SP500 and EURONEXT have common trends. Turkish stock market has more volatility than the others.



Graphic 1: Selected Stock Market Indices in USD Prices

The stock market indices are all have a unit root according to Augmented Dickey Fuller (ADF) test. It is common to have unit root in financial time series data. So for the further analysis and models the data have to be stationary. The general step for making series stationary is to convert original series by using natural logarithm or calculate first difference. For the price series of any asset (indices can be accepted as an asset as well) first difference of natural logarithms of series will be return data. When r is return of asset and P_t is price than

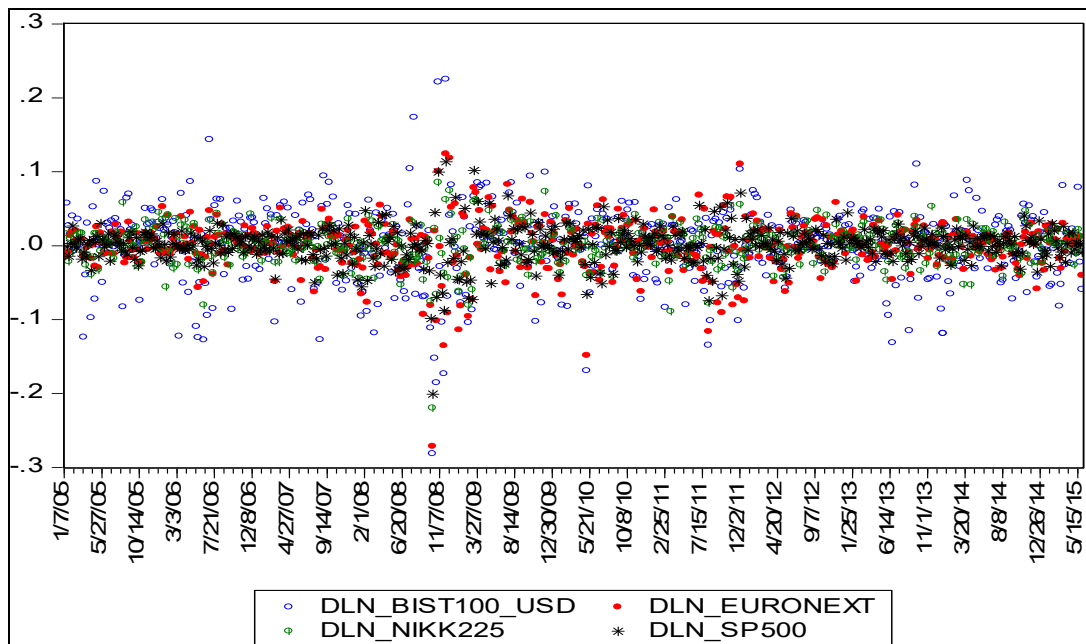
$$r_t = \ln(P_t/P_{t-1}) = \ln(P_t) - \ln(P_{t-1})$$

All the return data about indices are stationary with respect to Augmented Dickey Fuller (ADF) test. For the USD/TL exchange rate the first difference is stationary so the changes in exchange rate ($S_t - S_{t-1}$) are used for the analysis. In all analysis weekly returns are used. There are 542 weeks in the period. The return is calculated with respect to last working day closing prices of a week. So ends of the day exchange rates are used for the conversions of some indices to USD.

The table below shows that the descriptive statistics of the variables used in the models and analysis. BIST100 USD returns have the highest volatility with highest standard deviation. The graphics of returns can be seen in graphic 2. It can be clearly observed volatility increase in years 2008-2009.

Table 1: Descriptive Statistics for Log return of selected market indices

	Mean	Median	Max	Min	Std. Dev.	Obs.
RET_BIST100 TL	0.00219	0.00552	0.15758	-0.19273	0.03822	542
RET_BIST100 USD	0.00097	0.00545	0.22482	-0.28150	0.05258	542
RET_EURONEXT	0.00037	0.00366	0.12427	-0.27166	0.03416	542
RET_NIKKEI225	0.00077	0.00195	0.08560	-0.21962	0.02595	542
RET_SP500	0.00106	0.00217	0.11356	-0.20084	0.02518	542
USD/TL EXC First Difference	0.00231	0.00015	0.22180	-0.19930	0.03133	542



Graphic 2: Return (Log first difference) of Selected Stock Market Indices in USD

International Capital Asset Pricing Model (CAPM)

The CAPM was introduced by Jack Treynor (1961, 1962), William F. Sharpe (1964), John Lintner (1965) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory. Capital Asset Pricing Model (CAPM) proposes that the expected return of any asset is derived from the market overall return with an sensitivity level (coefficient Beta). If any specific asset having the coefficient one, than it is expected to yield market return, if it is less than one than this asset will yield less return (or less loss) than the market realized. In other words Beta (β) indicates the systematic risk (the risk that all investment opportunities exposed to) level of assets with respect to market risk. In details the CAPM model is:

$$E(R_i) = R_f + \beta_i (R_m - R_f)$$

R_i : return of asset i (“E” means expected value); R_f : risk free asset or investment return R_m : market return

The Capital asset pricing theory is applicable internationally by estimating individual country return from a world market return proxy. In this study world market return is estimated by returns geometric average of Euronext, SP500 and NIKKEI225 indices in USD and the model is as below:

$$R(\text{BIST100_USD}) = C + \beta * R(\text{WORLD_INDEX})$$

“R” stands for return and in international level with exchange rate risk, it is assumed that there is not any riskless asset and risk free rate of return.

Table 2: Test Result of The Regression Model (International CAPM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable: DLN_BIST100_USD				
Method: Least Squares				
Sample (adjusted): 1/14/2005 5/29/2015				
Included observations: 542 after adjustments				
C	0.000117	0.001737	0.067362	0.9463
RET_WORLD	1.311890	0.067774	19.35675	0.0000
R-squared	0.409632	Mean dependent var		0.000971
Adjusted R-squared	0.408539	S.D. dependent var		0.052576
S.E. of regression	0.040434	Akaike info criterion		-3.574585
Sum squared resid	0.882871	Schwarz criterion		-3.558736
Log likelihood	970.7126	Hannan-Quinn criter.		-3.568388
F-statistic	374.6836	Durbin-Watson stat		2.058901
Prob(F-statistic)	0.000000			

From the table 2, the coefficient beta (β) has the positive and statistically significant value. Which means Turkey stock market's overall return is dependent to world market return and it has bigger than one. Turkey's stock market is more volatile than the world average. Test result gives the constant value insignificant. In CAPM constant value is proxy for the riskless asset return and internationally it is expected to be zero.

These results also propose that the international diversification may not ensure expected risk reduction within the more systematic risk property of countries.

MORE MODELS ON INTERNATIONAL EFFECT TO TURKEY'S STOCK MARKET

Multifactor models suggest that expected return of any asset can be derived from various macro economic factors in addition to market return. Changes in those factors changes expectations from any asset return and it can be modeled. In this study those factors are selected from international factors.

$$R(\text{BIST100_USD}) = C + \beta_1 * R(\text{SP500}) + \beta_2 * R(\text{EURONEXT}) + \beta_3 * R(\text{NIKKEI225})$$

From the result in Table 3, all indices significant positive effect on Turkish Stock Market returns. The highest coefficient value belongs to EURONEXT (0.644). Again the constant is insignificant that means it has the value zero. This model have multicollinearity problem because of high correlation between independent variables but they still have positive significant coefficient.

Table 3: Test Result of The Regression Model with Selected Stock Price Indices

Dependent Variable: DLN_BIST100_USD

Method: Least Squares

Sample (adjusted): 1/14/2005 5/29/2015

Included observations: 542 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000182	0.001732	0.105343	0.9161
DLN_SP500	0.362336	0.121710	2.977050	0.0030
DLN_EURONEXT	0.644708	0.095911	6.721958	0.0000
DLN_NIKK225	0.210907	0.092124	2.289376	0.0224
R-squared	0.417714	Mean dependent var		0.000971
Adjusted R-squared	0.414467	S.D. dependent var		0.052576
S.E. of regression	0.040231	Akaike info criterion		-3.580989
Sum squared resid	0.870785	Schwarz criterion		-3.549290
Log likelihood	974.4480	Hannan-Quinn criter.		-3.568593
F-statistic	128.6480	Durbin-Watson stat		2.055664
Prob(F-statistic)	0.000000			

The third model for Turkey's stock market return is below. In the third model because of one of the independent variable is exchange rate, Turkish Lira return of stock market is used as dependent variable. Similar to previous models, both two factors have significant coefficients. Effect of exchange rate (USD/TL) is negative that means increase in exchange rate have negative effect on stock market return. For the Turkish investors means increase in exchange rate drops stock market prices. This is another dimension of international dependency.

$$R(\text{BIST100_TL}) = C + \beta_1 * R(\text{WORLD}) + \beta_2 * D(\text{EXC_USD_TL})$$

EXC_USD_TL is the exchange rate of USD/TL and first difference (D) is used for the model because the original series is not stationary.

Table 4: Test Result of The Regression Model with World Return and Exchange Rate

Dependent Variable: DLN_BIST100_TL				
Method: Least Squares				
Sample (adjusted): 1/14/2005 5/29/2015				
Included observations: 542 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002714	0.001249	2.172345	0.0303
RET_WORLD	0.632144	0.055787	11.33140	0.0000
D_EXCH_USD_TL	-0.404580	0.045668	-8.859151	0.0000
R-squared	0.429147	Mean dependent var		0.002191
Adjusted R-squared	0.427029	S.D. dependent var		0.038219
S.E. of regression	0.028930	Akaike info criterion		-4.242343
Sum squared resid	0.451119	Schwarz criterion		-4.218569
Log likelihood	1152.675	Hannan-Quinn criter.		-4.233047
F-statistic	202.6006	Durbin-Watson stat		2.296096
Prob(F-statistic)	0.000000			

Static and Dynamic Correlations Between Turkey’s Stock Market and Other Markets

Another method for measuring Turkish stock market dependency to other markets is correlation analysis. Correlation matrixes of selected variables are in table 5. High correlation between BIST100 TL and USD is a mathematical result and it is meaningless. Similar to previous models EURONEXT have the highest correlation with Turkish stock market. A change in exchange rate is negative effect on Borsa Istanbul returns.

Table 5: Correlation Matrix for The Factors Used in Previous Models

	RET_BIST100 TL	RET_BIST100 USD	RET EURONEXT	RET NIKKEI225	RET SP500	USD/TL EXC First Difference
RET_BIST100 TL	1.000	0.960	0.577	0.462	0.536	-0.541
RET_BIST100 USD	0.960	1.000	0.632	0.498	0.582	-0.690
RET EURONEXT	0.577	0.632	1.000	0.681	0.821	-0.477
RET NIKKEI225	0.462	0.498	0.681	1.000	0.623	-0.420
RET SP500	0.536	0.582	0.821	0.623	1.000	-0.429
USD/TL EXC First Differ	-0.541	-0.690	-0.477	-0.420	-0.429	1.000

Financial time series mostly have changing variance (heteroscedasticity) problem. For a series GARCH models and its extensions are used for the modeling variance. Dynamic conditional correlation (DCC) is an extension of GARCH method that reveals the correlation with time dimension (Engle 2002; Cappiello et al.2006). It determines conditional correlation which means it changes for the time. With this method correlation behavior changes can be observed.

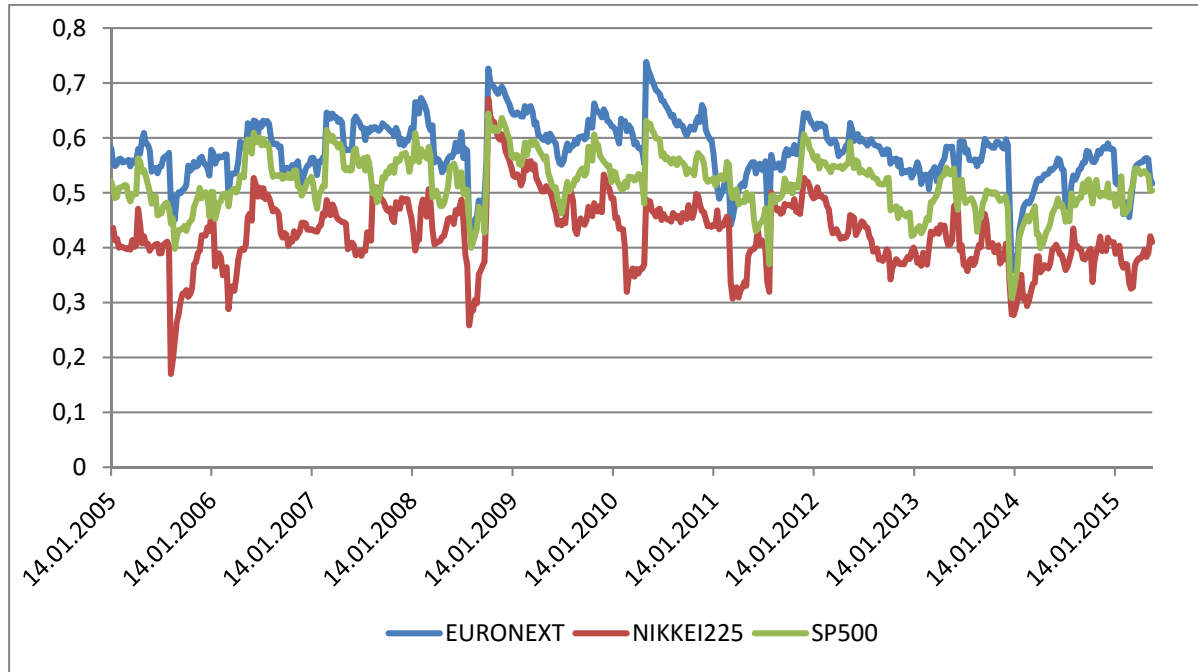
There is various methods for conditional (means changes over time) correlation methods. DCC is one of them and it can be done by using eviews package. When DCC applied it gives a correlation series for original observation time frame. So Table 6 gives the descriptive statistics of correlations between Borsa Istanbul index USD return and the other indices returns. The correlations are deviates within narrow band and almost every group have the same property.

Table 6: Descriptive Statistics of Dynamic Conditional Correlation of Borsa Istanbul USD return (BIST100_ USD) with Other Markets Returns

	Mean	Median	Max	Min	Std. Dev.	Obs.
EURONEXT	0.576	0.577	0.738	0.358	0.055	542
NIKKEI225	0.425	0.424	0.671	0.170	0.064	542
SP500	0.517	0.517	0.644	0.308	0.051	542

Graphical representation of correlations are in graphic 3. Every correlation series have similar trends but correlation between Borsa Istanbul and Euronext follow higher level than the others. The correlation in mid 2008 to end of 2010 follows higher than the other periods.

This graphic also shows that there are positive correlations between markets.



Graphic 3: Dynamic Conditional Correlation of Borsa Istanbul USD return (BIST100_USD) with Other Markets Returns

Conclusion

In this study preliminary work for determining interaction between Turkish Stock Market and rest of the world is realized. The examination completed with limited number of indices and economic factor (exchange rate). Some models needs to be revised with more international market proxies and economic factors. More detailed geographic diversification of market would be better.

Even though these limitations the study gives promising results about the international dependency of markets. As the World become more global and investment opportunities go beyond the borders, financial markets becomes one global markets. In such a condition systematic risk cannot be inevitable, in other words it cannot be eliminated by diversification.

The correlations between markets change over time, generally it increases in crisis period, but more detailed analysis can be done and focus on regional or seasonal effect. Conditional correlation and conditional variance concepts gives more information about world risk and its effect to financial market.

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USE OF ACTIVE LEARNING METHODS FOR MECHANIC PROGRAMS IN VOCATIONAL SCHOOL

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Abstract: Teaching program of universities aim to help the students to memorize information. Also, students can use information when they are necessary. It is one of the main condition of learning and teaching process. There are two types of learning. We can classify them as active and passive learning. Today, active methods are gaining importance increasingly. In practice, active learning course compared with conventional treatment courses as understanding of the processing method, and the concept of keeping the memory efficiency. In this study, the effect of the active learning method has been the subject of machine programs. For this purpose, the effects of the active learning method in the machine technician course examined. The results show that practices have strong bonds with active learning methods. In this study will respond the relationship between employer expectations and high academic results. Taking part of industrial machine technician who graduated from the program is related to this topic. Also, learning sufficient information for a successful recovery and practice for professional work is related to this topic. If we implement effective educational methods and grow up technician who has knowledgeable about his area, we can have staff member who can adapt changes easily and we can achieve this success. This study deals with susceptibility to these issues and willingness of the teaching staff, emphasizing the need for improvements in application behavior. Implementation of active learning techniques in machine technician education depends on efforts of the teaching staff and students. Because the information can be obtained from new sources very quickly. It affect our world in the 21st century. It is clear that the education area requires developments beyond the traditional education system and new learning methods. Therefore, active learning methods are becoming increasingly important.

Keywords: Active learning methods, Machine program, Vocational school

Introduction

In general, the training of university aims to memorize information to students. Also, students can remember the informations when they need them. Memorize and recall the information after a certain time in undergraduate and graduate teaching, is the most important point of education. Memorization of information depends on learning largely. This demonstrates the importance of learning way.

In the last two decades, higher education has known great changes, the main thrust in teaching is more on professional programs rather than knowledge based programs, and therefore a lot of concerns toward teaching effectiveness have been raised within many educational institutions around the world (Biggs & Tang, 2011).

In this regards, many approaches have been developed to improve the quality of higher education, to convert learning from teacher centered to student centered and to adopt interactive methods (Justice, Rice, Roy Hudspith & Jenkins, 2009).

Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing (Bonwell & Eison, 1991). While this definition could include traditional activities such as homework, in practice active learning refers to activities that are introduced into the classroom.

The core elements of active learning are student activity and engagement in the learning process. Active learning is often contrasted to the traditional lecture where students passively receive information from the instructor (Prince, 2004).

Employers expect more from local graduates, especially when it comes to the application of knowledge (Griesel & Parker, 2009).

According to (Erasmus, Loedolff, Mda, and Nel, 2006), young people are unemployed or lack entrepreneurship due to a lack of specialized skills. Some of those skills are identified by (Bethlehem, 1997) as 'communication skills', 'decision-making skills', 'analytical skills', teamwork skills, 'well-practised leadership skills' and 'good interpersonal skills'.

In the traditional education system, we can get information which are obtained by hearing or seeing. The survey states that we can remember 30% of this information. Active learning covers talking about lecture, making discussion. Also, active learning covers animation (simulated) and making presentation. When active learning methods are used, it said that students can remember 70% of their talking. When students talk and do, they can remember 90% of talking. Consequently, we can remember and learn easily by using active learning techniques (Breivik, 1994). Overall, the improvement of vocational school and taking a part of graduates of these schools depends on the using of informations effectively. The information is important at this point to remind the application.

ACTIVE LEARNING AND CLASSIFICATION TECHNIQUES AND MECHANICAL TECHNICIAN TRAINING ARE ORDERED ACCORDING TO THEIR IMPORTANCE

Active learning techniques has been identified as 21 agents in a research which is conducted by (Morgan in, 1997). There are various Active teaching and learning techniques for civil engineering education (Mertol & Yilmaz, 2011).

1. Types of Alternative Course: Lecture is split into three parts. In the first part, the lecture is told by an instructor, the course is applied together in the second part and in the last section, short course examination is applied to reinforce the information.

2. Applied Learning: Telling by modeling for better understanding. Previously conducted basic systems is used in a different way by participating new things.

3. Learning by doing experiments: This course is conducted in laboratory by applying certain principles, materials and using the information. It is the way to achieve results by applying the procedure. It is way of analyzing informations by using various experimental units.

4. Problem Solving: There are problems experienced there before. The Students find general solution for problem rather than specific solution.

5. Learning by preparing a project: The specified project is carried out by students. It is an important application for an effective operation.

6. Drawing up with a guide: Students solve problems with a shown path. It is the making operation with production bar and making production with machine tools.

7. Education Using Computer: The computer is used as a tool by students and teachers; for example, the assignment (article or drawing) is prepared and delivered by e-mail on the computer.

8. Learning by reading: After the presentation, the article is read before coming to class to learn necessary parts for the lessons. The course is also processed in parallel to this article.

9. Learning by Doing Presentation: There is determined issue. Students search and learn this issue. Then, students present the subject in the class.

10. Group work: The lecture is conducted by giving importance to improve the student's ability to learn and socialize (Bonwell & Eison, 1991). They can do a difficult task with less time.

11. Learning by doing homework in class: Students find solutions in main issue. The issue is told with a article.

12. Multimedia: Computer is used as a goal, not as a tool. Solutions will be created with computer-aided drawings and informations that gained from internet for applications and assignments.

13. Discussion (students among themselves): Course is processed like open discussion. It aims to improve communication.

14. Discussion (classroom): Course subject is processed like open session. Groups or classes can be identified for discussions.

15. Based Visual Lesson: This technique is described in the required subjects to teach students with visual tools. These tools are computers, projectors, television etc.

16. Learning by playing: It is learning by playing. Students can understand the decision-making and relationships in complex situations. It is an important teaching technique. Today, almost all of the traditional game and modern games can be used in the lecture. It is important to select suitable technique.

17. Questions for teachers by asked students: After the lecture, questions are asked by students.

18. Learning Test and Quiz: Questions which are identified with the purpose of the course are asked for the students. In order to measure students knowledge, it is important to design questions carefully.

19. Working on a experienced event: There is an event which happened before students find resolutions by discussion, presentation, group work. This kind of study requires intensive work for students.

20. Guest Speaker: Students can find answers to many questions in his mind. Students can learn the person's perspective.

21. Reviving learning like theatre: The desired topics processed into a short skit or revitalizing a game. It requires strict and intensive preparation by the teacher.

If Active learning method which are described in 21 items above is used in university engineering degree program (in the program of vocational colleges machine), they will improve quality as a result of effective implementation. Having certain amount of knowledge level is important. On the other hand, teachers and students should have knowledge to apply these things effectively.

CHANGES IN ENGINEERING AND SHORT CYCLE (ASSOCIATE'S DEGREE) PROGRAMS (IN VOCATIONAL SCHOOLS)

Many universities which have engineering department and short cycle (associate's degree) program has begun to make the transition to an educational model to get Engineering Education Evaluation and Accreditation Association Accreditation (MÜDEK). The scope of this accreditation and Bologna process, Mechanical Technician qualifications who graduated from the program is defined and the lecture is shaped according to these qualifications. These qualities are as follows. According to the conventional machine, these qualities covers many different topics.

- Designing productions, planning and the ability to analyze and interpret the results taking an active role skills.
- Ability to communicate effectively with other technician areas.
- The profession of technicians, the ability to understand the impact of social dimensions.
- The profession of technicians, according to the social dimension, to be aware of their responsibility to know the impact in terms of job security and application.
- To be aware of necessity of lifelong learning, to be aware of the rapid developments in science and technology and continuous self-improvement in this regard.
- At the national and international levels, to be knowledgeable and sensitive about the environmental problems existing age.
- To be aware of computers which shows very quick change and to be knowledgeable about the use of computers and computerized manufacturing and designing in the subject field of their professional ability to use and effective.
- Reviving with computer software via the revitalization of the workpiece production (simulation). This way covers many areas. So, the technician should know sufficient information.

Conclusions and Recommendations

When the changes in machine technician profession and technology of training is taken into account, active learning techniques will be useful to improve the quality of teaching and students. Also, students who are educated by these active learning techniques, can memorize more easily and they can apply in their carrier.

Efficient university education and loved profession will help the people who will be trained in business.

These techniques will help us to grow up confident students. Students can be willing to solve the problems with these techniques. Students can know how to use ability.

Students will be trained in the future in a more positive approach. In order to achieve these objectives, the vocational school students admitted to the undergraduate portion of the university are required to have a certain level of basic information.

Industrial enterprises must be directly closely with universities to choose components based on their branches students during the internship of students.

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