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The Influence Factors on Decision Making to Choose the Right Industrial Lubricating Oil: a Research in Bilecik Industry

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Abstract

The objective of this research is centred on obtaining the factors which effect of the quality and quantities of the used lubricating oils and additives of companies at the first organized industrial zone (OZI, industrial park) in the centre of Bilecik. In accordance with the attainments taken from the literature scan, an application has been performed using the survey technique in companies which are active in manufacturing, distribution and processing sector at the first OZI, Bilecik. The data obtained from these questionnaires are recorded through a computer program and after the statistical analyses, the influence factors on decision making to choose the industrial lubricating oil have been determined in Bilecik industry.

The questionnaire results presented that participants from the first OZI companies in Bilecik were preferred both of mineral and synthetic base oil stocks, as lubricating oils, 60%in the totalratio. After applied questionnaires, the results also demonstrated that the lubricating fluids were fortified with carefully selected additives to provide optimum performance and service life while maximizing protection of the equipment and machinery and also for reducing environmental pollution, minimizing waste of lubrication oil.Different additives andtheir dosage were selected up to their synergic or antagonistic affectat the operating conditions and manufacturing processes in plant, by the participant of this research.

Keywords: *additives, friction –wear, functions of lubricants, industrial lubricants, ,minimizing waste*

1. INTRODUCTION

Lubrication with a lubricating oil focuses on the key principle: building an oil film between two mating surfaces that move relative to each other, to separate the surfaces and prevent them from touching. Achieving this goal reduces friction and can help prevent wear caused by direct surface-to-surface contacts. Selecting the right lubricants is critical to preventing surface-to-surface contact [1]-[5].

Lubricants are categorized according to their application area. Regarding this, there are many types of lubricants. Automotive lubricants and industrial lubricants are the most general categories. The industrial lubricants can be classified as industrial gear oils, hydraulic lubricants, turbine and compressor oils, heat transfer oils, metalworking fluids, etc. All these lubricants are characterized by their viscosity, viscosity index, colour, acidity, lubricant, detergent and dispersant properties, thermal and oxidative stability, hydrolytic stability, foaming characteristics, anti-corrosion properties, anti-wear and extreme pressure properties, and carbon residue leaving tendencies regarding the processes in which they are involved([4]-[7]). A lubricant is formed up of mainly two parts, base oil and additives. Base oil constitutes 80-99 % of a lubricant. And additives constitute the remaining 1-20% of the lubricant formulation [8].

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Base fluids such as mineral oils and also synthetic products generally cannot satisfy the requirements of high performance lubricants without using the benefit of modern additive technology. Additives are synthetic chemical substances that can improve lots of different parameters of lubricant. They can boost existing properties, suppress undesirable properties and introduce new properties in the base fluids ([4], [6]-[8]).

Since lubricating oils are obtained from petroleum – a finite product, and with dwindling production from world oil reserves, the need arises more than ever, to recycle used lubricating oils. With increased time of usage, the lubricating oil loses its lubricating properties as a result of over-reduction of desired properties, and thus must be evacuated and a fresh one replaced. With the large amount of engine oils used, the disposal of lubricating oils has now become a major problem. A current trend in developing countries is the reliance upon governmental regulation, legislation, and mandate as mechanisms for minimizing the amount of waste destined for final disposal. This has led industries for find satisfactory solutions that will reduce the contribution of used lubrication oil to pollution and also recover these valuable hydrocarbon resources ([9]-[12]).

2. MATERIALS AND METHODS

In this study, survey technique was applied for collecting data's. 26 factories in the first OZI, Bilecik have surviving corporation. Unfortunately, researching data's were collected from only 10 factories(38.5%) in the first OZI, Bilecik, because only 10 factories were accepted to give acknowledgement.

Firstly, the data required for survey research were collected from 10 people who were representative of participant factories. In the present study demographic variables include information about respondents, info about respondents' behaviours, respondents' opinions; age, sexuality, work experience, sector experience, educational status, title in plant, working department.

Second part of questionnaire was prepared according to relevant literature to obtain measure respondents' knowledge and familiarity with a subject. At this part especially closed questions were provided as a list of acceptable responses; checklists, multiple choice questions, true/false questions, and attitude scales fit this category. Respondents found it easier to answer the question when response alternatives were provided, and it was easier and less time-consuming to interpret and analyse the responses to closed questions ([13],[14]).

A descriptive analysis of all independent and dependent variables were conducted. Summary statistics, such as means and standard deviations, were reported for each variable. After the statistical analyses, the influence factors on decision making to choose the industrial lubricating oil have been determined in Bilecik industry.

3. RESULTS AND DISCUSSION

Gathering demographic data related with participant factories were provided the tips about reasons of specific aspects among to choose lubricating oils and additives. Demographic variables include information about respondents are given at Fig. 1.

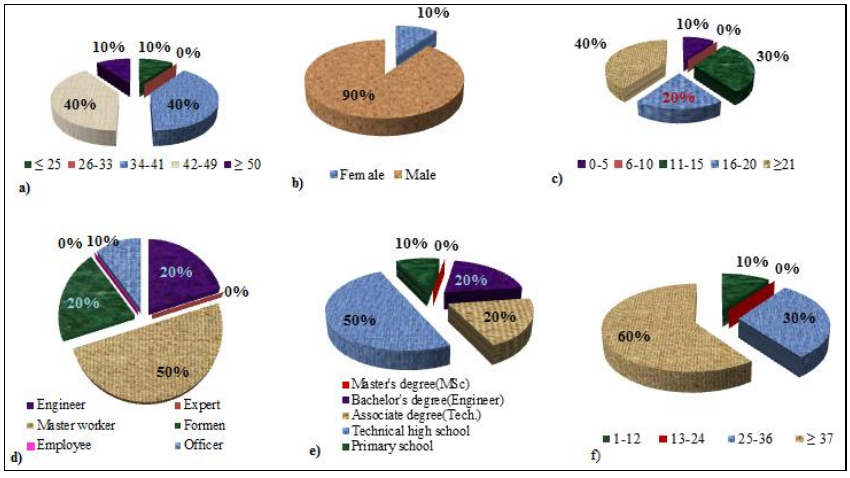

Figure 1. Demographic information; (a) Age, (b) Sexuality ,(c) Work Experience, ,(d) Title in plant, (e) Educational status, (f) Sector experience,

Lubricating oil preferences of the firms in Bilecik 1st OZI are shown in Fig. 2. 90% of the firms preferred gear oils and turbine oils usage was 20%. The types of the machinery equipment were effective on the choice.

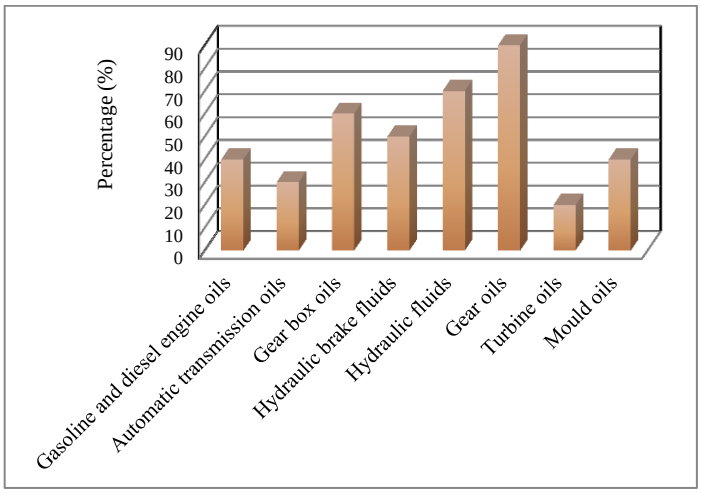

Figure 2. The Lubricating oil preference of the firms in Bilecik 1st OZI

Fig. 3 shows all of the firms' aims were avoiding wear and reducing friction when using lubricating oils. Increasing energy yield was on the last place by 20%.

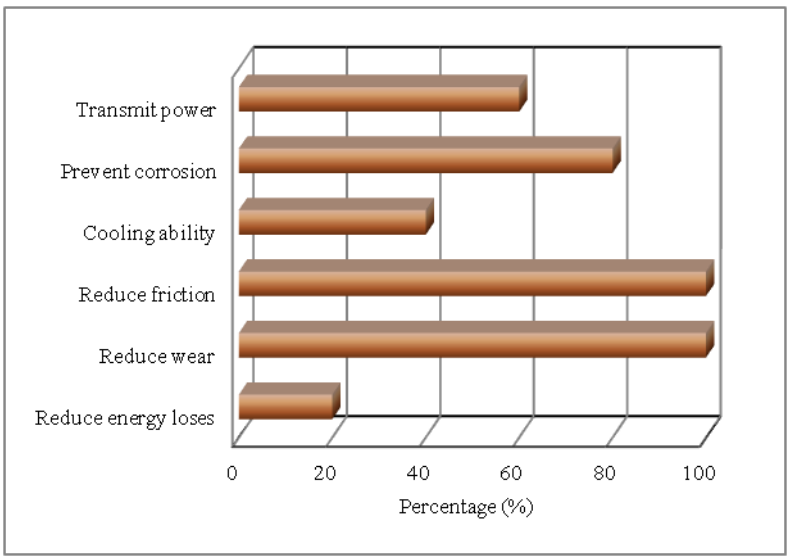

Figure 3. The aim of lubricating oil using as basic functions

All of the lubricating oil used firms benefited from the lubricating oils in the protection of bearings and prevention of wear. Furthermore, all the firms took advantage of lubricating oils in delaying the wear.

60% of the surveyed firms used both mineral based and synthetic base oil. The firms preferred to use synthetic oil on account of reduced friction, low temperature and reduced wear.

80% lubricating oil used firms in Bilecik 1st OZI signified that resistant to oxidation and thermal degradation, and low viscosity are reasons for lubricating oil preference (Fig. 4).

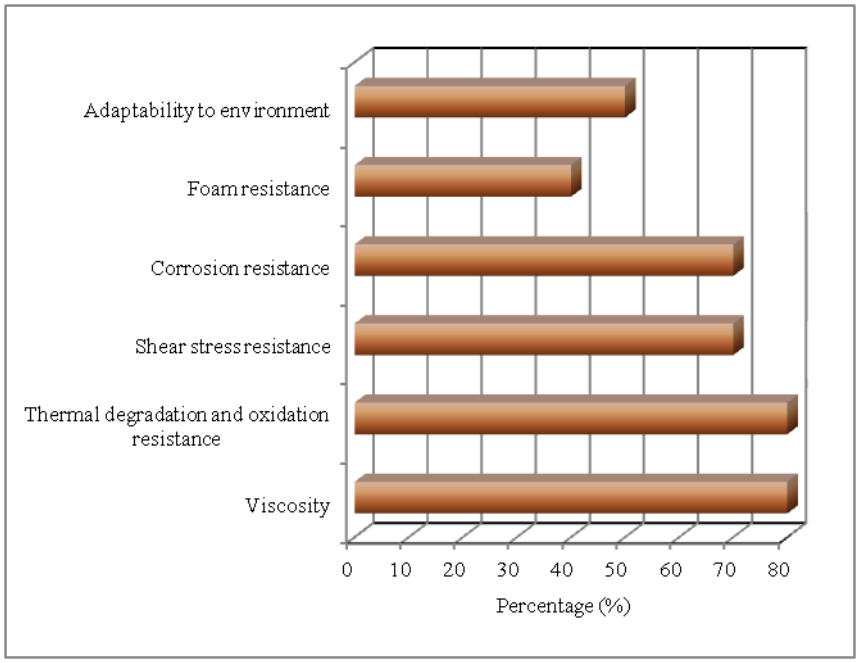

Figure 4. The properties that affect the choice of lubricant

Fig. 4 shows a major part of the surveyed firms, 80%, used antifriction and corrosion inhibitor additives. Detergents and dispersants, and viscosity index improver were rarely used additives. Antifriction and corrosion inhibitors were the additives that provided most satisfaction. Viscosity index improvers and antifoams provided satisfaction 50%.

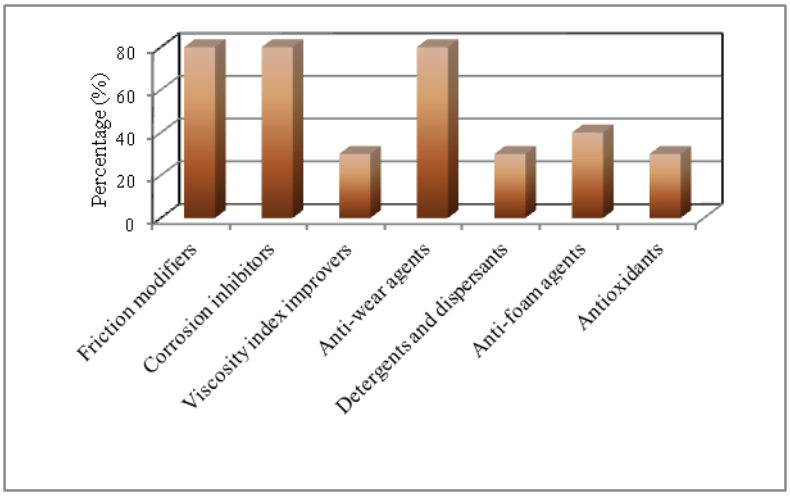

Figure 4. The usage of additive groups

4. CONCLUSIONS

Lubricant product quality is important to keep machines and equipment operating properly and to produce quality parts and materials. For decades, lubricant suppliers have been developing and manufacturing specialty lubricants tailored to the requirements of industrial applications. All lubricants must meet general technical requirements such as reducing friction and wear, protecting against corrosion, dissipating heat, providing a sealing affect etc. so many variables influence to choose the right lubricant. The other desired advantages by lubricants were reduced operating costs resulting from less downtime, improved labor utilization, measurable energy savings and increased output, like social, political, economic, and environmental issues. A current trend in developing countries is the reliance upon governmental regulation, legislation, and mandate as mechanisms for minimizing the amount of waste destined for final disposal. This has led industries for find satisfactory solutions that will reduce the contribution of used lubrication oil to pollution and also recover these valuable hydrocarbon resources. Synthetic oils, fluids and greases, and

blends of synthetic and petroleum-based oils, are used where extended lubricant life is desired, the increased time between oil changes offsets the difference in cost.

As a result, choosing the proper lubricantand additivesfor an application is critical. Before making a selection lubricant to perform above stated functions in different systems is a complex task, involving a careful balance of properties both in the lube base stocks and the performance enhancing additives.

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