



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**THE EFFECT OF ENGINE OIL ON VEHICLE FUEL
CONSUMPTION**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Technology Automotive) (Hons.)

by

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• APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology Automotive (Hons.). The member of the supervisory is as follow:

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(Project Supervisor)

• ABSTRACT

The effect of fuel consumption on the vehicle testing is designed to identify the effect of engines oil in order to make to reduce fuel consumption on the vehicle. In this study is focused on the fuel consumption level when using a different engine oil . The properties of engine oil and their effect on vehicle fuel consumption control systems are of great interest as fuel consumption are reduced. To test the fuel consumption level is using different type of engine oil. Three engine oils that will used in my experiment, there are mineral oil, semi synthetic and fully synthetic. By running this experiments by using the manual testing method which take out the fuel pump from the fuel tank of the vehicle and sink it into the measurement oil pan and wait for in the certain minutes until the engines ran out of fuel after that collect the data by read the reading at the indicator at the oil measuring pan. After the testing is done the effect of engines oil can be answered by the result that revealed from this method. The project is also to analyse the effect of different type of engine oil on vehicle and to produce a guideline on which type of engine oil is suitable for user vehicle engine. And the result of this analysis have been discussed and compared which type of engines oil are suitable for the vehicle fuel consumption. The comparison means generate the graph and from there can compared all of the type of engine oils and which one is better for the engine that used in this project.

• ABSTRAK

Kesan penggunaan bahan api pada ujian kenderaan yang direka untuk mengenal pasti kesan minyak hitam terhadap enjin serta dibuat untuk mengurangkan penggunaan bahan api pada kenderaan. Dalam kajian ini tumpuan kepada tahap penggunaan bahan api apabila menggunakan minyak enjin yang berbeza. Sifat-sifat minyak enjin dan kesan mereka ke atas sistem kawalan penggunaan bahan api kenderaan mendapat perhatian yang tinggi kerana penggunaan bahan api dikurangkan. Untuk menguji tahap penggunaan bahan api dengan menggunakan berlainan jenis minyak enjin. Tiga minyak enjin yang akan digunakan dalam eksperimen saya, terdapat minyak mineral, semi sintetik dan sintetik penuh. Dengan menjalankan eksperimen ini dengan menggunakan kaedah ujian manual yang mengambil pam bahan api dari tangki minyak kenderaan dan tenggelamkan ke dalam bekas pengukuran minyak dan menunggu dalam beberapa minit tertentu sehingga enjin kehabisan minyak selepas itu, data diambil dengan membaca bacaan pada penunjuk di pan pengukur minyak. Selepas ujian itu dilakukan kesan minyak enjin telah terjawab dengan keputusan yang didapati dari kaedah ini. Projek ini juga dijalankan untuk menganalisis kesan yang berlainan jenis minyak enjin pada kenderaan dan mengeluarkan garis panduan mengenai jenis minyak enjin yang sesuai untuk enjin pengguna kenderaan. Dan hasil daripada analisis ini telah dibincangkan dan dibandingkan jenis minyak enjin yang sesuai untuk penggunaan bahan api kenderaan. Perbandingan yang telah dibuat dengan membina graf dan dari sana boleh dibuat perbandingan di antara semua jenis minyak enjin yang digunakan dan mana satu yang terbaik untuk enjin yang digunakan dalam projek ini.

• DEDICATIONS

Dedicated to my supportive mother Rekihah binti Ibrahim. To my supervisor Mr. Mohd Sulhan bin Mokhtar, to all the lecturers and technicians that involved in my final year project and fellow friends for all of their help and friendship.

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- LIST OF SYMBOLS AND ABBREVIATIONS**

PCM	=	Powertrain Control Module
mm	=	Millimetre
PAO	=	Polyalphaolefins
PIO	=	Polyinternal Olefins
SAE	=	Society of Automotive Engineers
Cm ³	=	Centimetre cube
cc	=	The Displacement of The Vehicle
BLM	=	Base Line Model
FWD	=	Front Wheel Drive
<	=	Lower Than
>	=	Higher Than
%	=	Percentage
FPOC	=	The Flash Point
HTF	=	Heat Transfer Fluid
° C	=	Degrees Celsius
km / h	=	Kilometre per Hour
mph	=	Miles per Hour
mPa.s	=	Megapascal per Second



INTRODUCTION

- **Introduction**

The chemical compounds between non-petroleum synthesized and petroleum based being derived to becomes the engine oils. Nowadays, motor oils are usually mixed or blended by using base oil composed of hydrocarbon, polyalphaolefins (PAO), and polyinternal olefins (PIO), and the compound consist between two material which is carbon and hydrogen are organic. Some high performance of engine oils contain up to 20% by the weight of esters to produce the base oil. Motor oil or in other words is motor oils, or lubricant is the variant that well-developed of lubricants are used for the lubrication of internal combustion engines . To reduce wear on moving parts, inhibit corrosion, improve sealing, and cool the engine by carrying heat away from moving parts is the main function of this lubricants. From this statement, it is related to my project which is to know the effect of engine oil on vehicle fuel consumption. This study focused on the consumption level when using a different engine oil .The properties of engine oils can affect fuel consumption in a number of ways. A numerical code system for grading motor oils has established by The Society of Automotive Engineers (SAE) according to their viscosity characteristics. The Society of Automotive Engineers viscosity grades include the following numbering, from low viscosity to high viscosity: 0, 10, 15, 20, 25, 30, 35, or 40. The letter W are suffixed with the numbers 0, 5, 10, 15 and 25, labelled as

whether they are winter or cold start viscosity, at lowest temperature. The number such as 20 comes with or without the letter of W according on it is being used to marking whether it is a cold or hot viscosity grade. Mineral oil blenders had always struggle to keep up with the increased loading and temperature demands of higher performance engines, introducing higher viscosity lubricants for greater film strength. However, for performance and fuel economy the engine manufactures always called out for lighter weight oils. Racing improving the multiply, developments from high performance race engines continually is a true case to multiply the next generation road car engines. The development of lubrication in the race engine field similarly finds it's way the high street shelves. The first major change in internal combustion engine lubrication was brewing In the late of sixties.(Gavin Scott, July 2005)

- **Problem Statement**

One of the dreaded things car owner face is oil consumption. For some people the only time when they have to do anything motor oil related is the time when they find out that its level is too low so it needs to be topped up. That's assuming that the regular oil change is done by the repair shop and not the owner. It's easy to think that the oil consumption is the oil's fault especially if you didn't notice it until the last oil change. Oil consumption has many reason such as engine design, driving style, seal and gasket condition, higher than normal engine temperature, too low viscosity, low quality motor oil, and etc. Engines oil is any of various well-developed lubricants (comprising oil enhanced with additives, for example, in many cases, extreme pressure additives) that are used for lubrication of internal combustion engines. Motor oils today are mainly blended by using base oils composed of hydrocarbons, polyalphaolefins (PAO), and polyinternal olefins (PIO), thus organic compounds consisting entirely of carbon and hydrogen. The base oils of some high-performance motor oils however contain up to 20% by weight of esters. The advantage that we can solve the problem that give the benefits to the user is the engine oils can be use for a long mileage and it have the high performance of engines

also get a better fuel consumption. So we have the option to do with use the semi-synthetic oil than mineral and fully synthetic because it's are too expensive and quite not available in market for mineral. From that we must get a better result of fuel consumption to avoid from damage of the engine performance like it happened before and to reduce the problem that the user being through before. The related issues that happen is the quantity viscosity of the engine oil.

- **Objective**

Oil is very important. Without oil your engine and other moving parts would wear out very quickly. The main function of oil is to lubricate. Oil molecules are special because the way they line up they coat things providing a thin layer of protection. Just like how you don't get your hands dirty when you wear latex gloves. Different oils are made up of different additives and made for different uses so be sure to follow the manufacturer's specifications when changing any lubricants. Motor Oil has 3 functions, there are lubricating moving parts, for Cooling and Cleaning by carrying dirt or contaminates to the Filter.

The objective of this project is:

- To study relationship between engine oil (effect engine oil on fuel consumptions) by using different type of engine oils for examples mineral, semi and fully synthetic

- To analyze the fuel consumption data
- To identify which type of engine oils will give good/better fuel consumptions.

- **Work Scope**

The scope of this project starting from the selection of mineral oil lubricants, synthetics oil semi- and fully synthetics oil. Each oil has one sample selection. and so is the selection of cars to be tested for fuel consumption test run. Cars in select Proton Saga BLM 1.3cc. and the last one is how to test the effect of engines oil on vehicle fuel consumption is to run a manual test on testing engine within different type of lubricating.

- **Type Of Engines Oil**

Table 1.1 : Sample of Engine Oils

No sample	Type	Grade	Quantity
Sample 1	Mineral oil	15W-40	4 litres
Sample 2	Fully synthetic oil	5W-40	4 litres
Sample 3	Semi synthetic oil	10W-40	4 litres

- **Type of Engine Use In This Project**

- a) Proton Saga BLM
- b) FWD (front-wheel drive), manual 5-speed gearbox
- c) Petrol (gasoline) engine with displacement: 846 cm³

- **Testing Activities**

- Test the fuel consumption within take out the fuel pump from the vehicle.
- Refill the oil around 1litre into a pan that put the fuel pump into it
- Wait until the engines dead within time range 10-30 minutes.
- Take the data on test and analyse.

- **Significant Of Study**

To know about the effect of engine oil on vehicle fuel consumption and also to add knowledge about the fuel pump and manual test on the engine testing and how it will give the result when the process is started which is the result of fuel consumption. The research could reduce the fuel consumption rate and produce less friction from each engines oil usage of automobile vehicles. It will help to increase the importance usage of fuel consumption results to analysis a certain experiment that contribute to high cost and long duration from this research.

LITERATURE REVIEW

- **Introduction**

This section will discuss about the fundamentals, theories and concepts of this project in detail. Besides that, it also explains about the perspective, components and method that will be used in this project. The effect of the engines oil on vehicle fuel consumption that will be discussed is more about comparison and analysis.

- **Lubricant**

A Lubricants are substances introduced to reduce the friction between the surfaces in contact with, which ultimately reduces the heat generated when the moving surface. It also has the function of power transmission, transport foreign particles, or heating or cooling surface. Reduces friction material known as lubrication. The used of lubricant additives began early 20th century with the use of fatty oil and sulfur in mineral oil to improve lubrication under high loads. Applications of the additive obviously improve the surface mechanics properties of steel–steel friction pairs, and the modulus of the friction surface are increased by 67 and 90%, respectively (Yang Yu, 2007).

From ancient of Egypt, liquid lubricant have been practiced by humans for thousands of

years ago. The ancient of Egyptians shows that the anaglyph inside recorded that people at the time used lubricant (water) to help carry the statue. Present production of biodegradable lubricant only 1% of the total production. Worldwide consumption of lubricant in 2005 was around 40 million metric tonnes and approximately 30% of the lubricant consumed ended up in ecosystem. A lubricant consist of a base oil (>90%) and additive package (<10%). The base oil used for the formulation of most lubricants environmentally hostile mineral oil. (Bartz, 2006). Demand for environmentally friendly lubricants are increasing because of the high concern for environmental protection (M.A.Azhari, 2015). Several lubricant attributes which includes the level of toxicity, biodegradability and the products of biodegradation. Pose a constant threat to ecology and vast ground water reserves. In this context, environmentally adapted lubricants have become more and more important (S.M. Alves, 2012). The research have reviewed the application of vegetable oil based as a lubricant to be replaced with the mineral oil based lubricant. For lubricant oils analysis, their chemical composition and size of particles in wear remains could determine the method of choice. (Rodolfo Francisco Lara,2015).

- **The Grades Of Engines Oil**

Their viscosity characteristics are established due to numerical code system for grading of engine oils by The Society of Automotive Engineers (SAE). The grading viscosity includes from low to high viscosity which is 0, 5, 10, 15, 20, 25, 30, 40, 50, or 60. The letter W is suffixed to the numbers 0, 5, 10, 15 and justified whether they are cold start viscosity at lowest temperature. With or without a W the number 20 comes being use to marking a winter or high or hot viscosity grade. The viscometrics related to these grade is defined by the document of SAE J300. To flow through a standard orifice, at standard temperature by measured the time takes for a standard amount of oil is called kinematic viscosity. The higher the viscosity or higher SAE code which means the longer it takes to produce the grading.

To denied confusion with cool grades of the oil the SAE using SAE16 as a standard to follow SAE20 rather than of SAE15 involving of new lowest motor oils viscosity grades. A polymeric viscosity index improver additive can't use to a single grade of motor oils as by SAE J300 which means six are mention as winter-grades and given letter of W as a marking. 0W, 5W, 10W, 15W, 20W, 25W, or 20, 25, 30, 40, and 50 are the eleven grades of viscosity. The weight of engine oils and a single engine oils or are usually called straight weight oils are referred by these numbers. (James A. Spearot, ed., 1989)

The oil graded as SAE viscosity grade such as 0W, 10W, 15W, 25W, 30W, 35W or 40 and 50 based on the coldest temperature the oil pass it which means is the lower of the viscosity grade lowest temperature of the oil can through it. That oil must be labeled by SAE 5W if an oil success for the specification at 5W or 10W but if not success for 0W the oil cannot be mentioned as 0W or 10W. The kinematic viscosity is read at a temperature of 100 degree Celsius for single non winter grade or equal to older non-SI units, centistokes. The oil falls in at that temperature according on the range of viscosity, the oil is graded as viscosity grade by SAE such as 20, 30, 40, 50, or 60. A minimum viscosity measured at 150 degrees Celsius and at a high shear rate is also required for SAE grades 20, 30 and 1000. When the higher viscosity which means the higher of the SAE viscosity grade is. (James A. Spearot, ed., 1989)

- **Temperature and Grades**

Before the vehicle is started up it must range from cool temperature in the cold weather, when the car is fully warmed up in a hot summer weather which means is to hot operating temperatures. When cold or lower viscosity, the engines operate the temperature, a specific oil will have highest viscosity. For main single grade oil temperature are difference between the extremes of temperature is too large. A special polymer additives called viscosity index improvers are added into the oil to get the difference in viscosity closer together. To make lubricant a multi grade engine oils within

using these additives because it maybe to have multi grade lubricant without of viscosity index improvers. When cold or hot viscosity of the second grade, the idea is to make the multi grade oil to have viscosity due to viscosity of the base grade. It also allows one type of oil used for the entire year. Thus even when various grades initially expanded, and they are often described as all-season oil. In addition, the viscosity of various grades still differentiate logarithmic temperature, while the slope representing the change is reduced. It also represents the slope changes with temperature according on the type and quantity of additives to the base oil. (James A. Spearot, ed., 1989)

SAE established for various grades of oil, including the two viscosity grades, for example, 15W-30 is indicated with the same multi-grade oil. 10W is the first number stands for viscosity at lower temperatures while the second number is the viscosity at 100 degrees Celsius. SAE J300 defines both the number used individually for single grade lubricant. Therefore, the lubricant that is mentioned with a grade 10W-30 should it success with the requirements of SAE J300 viscosity grade for both grades, and all must be placed on the viscosity grades. If the oil containing no viscosity index improvers, and can be recognized graduate with a grade of oil that can also be labelled with one of the two SAE viscosity grade. In other words, oil is also very easy in multi grade lubricant that can be provide with basic without any viscosity index improvers is 10W-15. All of this also can be mark as 10W-20, 30W, or 40. If there are viscosity index improvers are used, the oil can not be marked as a single-grade oils. (James A. Spearot, ed., 1989)

