

EVALUATION OF RON FUELS PERFORMANCE IN MALAYSIAN MARKET

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**EVALUATION OF RON FUELS PERFORMANCE IN MALAYSIAN
MARKET**

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**This report is submitted
in fulfillment of the requirement for the degree of
Bachelor of Mechanical Engineering (Automotive)**

Faculty of Mechanical Engineering

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DECLARATION

I declare that this project report entitled “Evaluation of RON Fuels Performance in Malaysian Market” is the result of my own work except as cited in the references

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APPROVAL

I hereby declare that I have read this project report and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Automotive).

Signature :

Name of Supervisor : Associate Professor Dr. Noreffendy Bin Tamaldin

Date :

DEDICATION

I dedicate this thesis to my beloved family, a respected supervisor, lecturers, assistant engineers and my friends. Thanks for everything.

ABSTRACT

Nowadays people still does not fully understand about to choose the fuel to fill in their car where the questions arise what are the best fuel grade or type of fuel brands because nowadays, many of fuel brands and grades appeared in our market. The goal of this research to analyse the fuel properties, performance of engine and emission level. In this research, fuels that have been used were PETRONAS as a baseline and were compared to SHELL and PETRON fuels. For fuel properties, the test are divided by two experiment such as bomb calorimeter test and hydrometer test. Engine performance test was performed by using engine dynamometer while emission level test was conducted by using portable gas exhaust analyzer. Next, the result of the experiments will indicate the graph of comparison of fuel properties, engine performance and emission level. For fuel properties test were determine the density of fuel and energy content as a heat of combustion of fuel. Besides, the engine performance test were collected data of power, torque and brake specific fuel consumption to be analysed. This emission test were running at the same time with engine performance test. So, the composition that tested and analysed for this research are carbon monoxide, carbon dioxide and hydrocarbon. After all the experiment were completely done, the result were collected and ready to be analysed. The result indicate the better performance produced between RON 95 and RON 97 fuels is RON 97. While, the comparison of RON 95 between fuels brands show PETRONAS 95 produced highest performance in term of highest value of power and torque. For RON 97, PETRONAS 97 produced the best performance between SHELL 97 and PETRON 97 also in term of power and torque produced. Further study can be carry out in detail to achieve the better result of engine performance and emission level.

ABSTRAK

Pada masa kini orang ramai masih tidak memahami sepenuhnya untuk memilih bahan api untuk mengisi ke dalam kereta mereka, di mana timbul persoalan apakah gred bahan api terbaik atau jenis jenama bahan api yang terbaik kerana pada masa kini, banyak jenama bahan api dan gred muncul dalam pasaran kita. Matlamat kajian ini untuk menganalisis sifat-sifat bahan api, prestasi enjin dan tahap pelepasan gas ekzos. Dalam kajian ini, bahan api yang telah digunakan adalah PETRONAS sebagai garis panduan dan dibandingkan dengan bahan api SHELL dan PETRON. Bagi sifat-sifat bahan api, ujian dibahagikan kepada dua bentuk seperti ujian kalorimeter bom dan ujian hidrometer. Bagi ujian prestasi enjin pula dijalankan menggunakan enjin dinamometer manakala ujian tahap pelepasan gas ekzos telah dijalankan dengan menggunakan alat mudah alih penganalisa gas ekzos. Seterusnya, hasil daripada eksperimen akan menunjukkan graf perbandingan antara sifat-sifat bahan api, prestasi enjin dan tahap pelepasan gas ekzos. Untuk ujian sifat-sifat bahan api adalah menentukan ketumpatan bahan api dan kandungan tenaga sebagai haba pembakaran bahan api. Di samping itu, ujian prestasi enjin mengumpulkan data kuasa, tork dan brek penggunaan bahan api tertentu untuk dianalisis. Ujian tahap pelepasan gas ekzos telah berjalan pada masa yang sama dengan ujian prestasi enjin. Jadi, komposisi yang diuji dan dianalisis dalam kajian ini adalah karbon monoksida, karbon dioksida dan hidrokarbon. Selepas semua kajian ini telah sempurna dilakukan, hasilnya telah dikumpulkan dan bersedia untuk dianalisis. Berdasarkan kajian, prestasi terbaik yang dihasilkan oleh bahan api RON 95 dan RON 97 menunjukkan RON 97 adalah bahan api yang terbaik dari segi prestasi enjin. Manakala, bagi perbandingan antara bahan api RON 95 jenama PETRONAS 95 menghasilkan prestasi yang terbaik dari segi nilai kuasa dan tork. Bagi bahan api RON 97 pula, PETRONAS 97 mempamerkan prestasi yang terbaik berbanding SHELL 97 dan PETRON 97 dari segi kuasa dan tork yang dihasilkan. Kajian lanjut boleh dijalankan secara terperinci untuk mencapai hasil yang lebih baik dari segi prestasi enjin dan tahap pelepasan gas ekzos.

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LIST OF ABBREVIATION

RON	Research Octane Number
RPM	Revolution Per Minutes
C.R	Compression Ratio
AKI	Anti Knock Index
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
HC	Hydrocarbon
FTIR	Fourier Transform Infrared Spectrophotometer
FKM	Fakulti Kejuruteraan Mekanikal

CHAPTER 1

INTRODUCTION

1.1 Background of the study

The Research Octane Number (RON) is a number that is being assigned to various grades of fuel to present its capacity to oppose auto-ignition or known as knocking. RON is dictated by running the fuel in a test engine with a variable compression ratio under controlled condition, and the outcome is contrast with mixture of iso-octane and n-heptane. As such, it is a rating used to quantify an fuel knocking resistance in spark-ignition engines. The lower of RON the less easier it turn for fuels to ignite in engine. (Tamaldin N., 2012).

Below are the several kind of petrol fuel:

a) Unleaded Petrol (ULP)

Unleaded Petrol or ULP has a Research Octane Number (RON) of between 91 and 93. Vehicles that use ULP operates with a catalytic converter because of the emitted gasses from exhaust are too high.

b) Premium Unleaded Petrol (PULP)

This premium petrol is a special blend of petrol with a higher octane rating which can produce higher engine power. So it gives more performance to the vehicle as well as knock-free performance and assisting the vehicle to run at its optimum. PULP has a Research Octane Number (RON) of 95 or 96.

c) Ultra Premium Unleaded Petrol (UPLUP)

Ultra means ultimate or it is a fuel have high octane unleaded fuel that maximizes engine performance. The fuel burns cleanly as well as producing less pollution. UPULP which has a RON of 98 commonly recommended for imported high performance vehicles.

Nowadays, in our market, there are two types of fuel RON which are usually used by the Malaysian namely RON 95 and RON 97. A couple of years ago, government had introduced RON 95 fuel in our country because of the global fuel price increase sharply within short period of time. RON 97 fuel still remains in our market with a higher price than RON 95. The government will follow the development in the market prices of product cost for each time and currency exchange rate to determine the retail prices of petrol for the consecutive months.

People prefer the RON 95 fuels to be filled in their vehicles due to lowest price but questions arise about the performance of engine and fuel consumptions. There are so many rumours and speculative argument all over Malaysia about the exact short term, medium term and long term impact of using this lower RON grade fuel to the vehicle. Air pollution is one of the most dangerous environmental problems all over the globe. Continuously increasing use of fuel by the vehicles will give the poisoned emission to the surrounding. So, nowadays peoples are searching to use low emission product of fuel but have high performance. Manufacturers compete to produce new technology of fuel that gives the low emission.

This project was initiated to provide some insight of the engine performance in term of Power, Torque, Fuel consumption and emission produced by using different RON grade fuel using engine dynamometer and other equipment. The engine performance of vehicles will be analysed the graph of performance after fuel test using an engine dynamometer. Emission test will conduct using portable combustion analyzer, and the data will be analysed to decide which type of fuel RON and brands gives higher performance and less emission level.

1.2 Problem Statement

The general public nowadays still does not fully understand about to choice of fuel in their car between RON 95 and RON 97, which one will better deliver engine performance and also fuel consumption. There have been claims that RON 97 fuels performs than RON 95 fuels, and also helps clean engine components better. Some also said that the emission gasses output from a vehicle also affected by using different types of RON fuel grades. Therefore, the problem statements for this project are:

- I. The actual content and detail composition of the RON 95 and RON 97 fuels between one manufacturer and another which is trade secret.
- II. The effect of different of RON fuel grades and different brands to the vehicle remain unknown to the public.
- III. The vehicle performance (power, torque, brake specific fuel consumption) resulting from this RON grades and fuel brands also not fully understood.
- IV. Emission level produced from different RON grade and fuel brands also varies.

1.3 Objectives

Below are the objectives for this project:

- I. To study the various of RON fuel properties in Malaysian market.
- II. To compare the performance of engine with different types of RON fuel grades and brands (power, torque, brake specific fuel consumption).
- III. To compare the emission level from vehicle by using different types of RON fuel grades and brands.

1.4 Project Scope and Limitations

The scopes of this project are:

- I. The properties of petrol fuel that have been chosen to study are density and energy content.
- II. The analysis of the performance of engine from the graph of performance (power, torque and brake specific fuel consumption) by using engine dynamometer.
- III. The analysis of the amount of emission gasses produced by different type of RON fuel grades and brands using portable gas exhaust analyzer.
- IV. Using two types of RON which RON 95 & RON 97 from three types of fuel producer which are Petronas, Shell, and Petron.

CHAPTER 2

LITERATURE RIVIEW

2.1 Introduction

Summary of the sources related to the research include about the fuel for instance research octane number and other things about the gasoline. In this section, will show how the theory that related to this project such as research octane number, internal combustion engine and about emission. This section also will show the success result and methods of other research which related to this project.

2.2 Research Octane Number (RON)

The octane number of a fuel describes how well it will or will not self ignite. The numerical scale is set by testing fuels. The fuel at question is compared to other fuels that have set standards. One fuel that is used for the test is isooctane (2,2,4 trimethylpentane), which is given the octane number (ON) of 100. The higher the octane number of the fuel the less likely it will self-ignite. In SI engines self-ignition will occur when the fuel ignites before the use of the spark due to high temperatures. When self-ignition occurs in SI engines pressure pulses are generated. This high pressure causes damage to the engine. This activity of self-ignition is called knock. Engines with low compression ratios can use low octane fuels since the temperatures and pressures are lower. High compression engines must use high octane fuel to avoid self-ignition and knock. (Faizal, 2009)

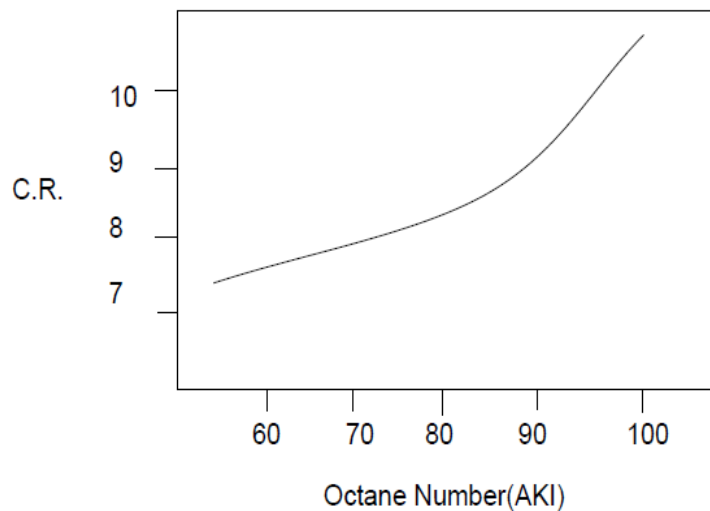


Figure 2.1: Graph of Compression ratio vs Octane number (Salaza , 1998)

Fuels that were used earlier had low octane numbers so therefore engines with low compression ratios were used. As technology advanced the engine design advanced. Engines were designed with higher compression ratios so higher pressures and temperatures were attained. Fuel had to be manufactured to have higher octane numbers. The structure of the fuel depicts the value of the octane number. For example hydrocarbon components that has