



**TECHNICAL UNIVERSITY OF MALAYSIA MALACCA**

**Effectiveness of Oil Consumption  
at Motoring Test  
Case Study: Automotive Company**

Thesis submitted in accordance with the requirements of the National Technical University of Malaysia Malacca for the Degree of Bachelor of Bachelor of Engineering (Honours) Manufacturing (Robotics and Automation)

By

**Aisyah Almajidah Tan Bt. Sofian Tan**

Faculty of Manufacturing Engineering

May 2007



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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CASE STUDY: AUTOMOTIVE COMPANY**

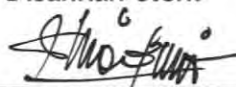
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**EFFECTIVENESS OF OIL CONSUMPTION AT  
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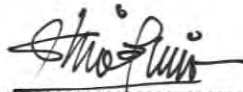
This thesis submitted to the senate of UTeM and has been accepted as fulfillment of the requirement for the degree of Bachelor of Manufacturing Engineering (Honours) (Robotics and Automation). The members of the supervisory committee are as follows:

B/P



.....  
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.....  
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Faculty of Manufacturing Engineering

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Universiti Teknikal Malaysia Melaka  
Karung Berkunci 1200, Ayer Keroh  
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## **Abstract**

This thesis aims to complete oil utilization during motoring test for manual transmission. This thesis is introduced by one of our automotive industry company, which is PERODUA Engine Manufacturing Sdn. Bhd. This project is based on productivity improvement on oil utilization during motoring test for manual transmission in automotive company. The purpose of this thesis is to reduce 50% oil in usage and to reduce the oil consumption for 50%, which is from 49 drums of oil to 25 drums to reduce the oil cost for motoring test. Other than that, the effects of the frequent of the same oil usage need to be studied as this will bring problems in motoring test. For this thesis, scope of the project is in reducing the oil usage for manual transmission motoring test for PERODUA car models such as Kelisa 850 and 1.0, MyVi 1.0 and 1.3 and Kenari 1.0. The problem occurs when the sum of oil utilization for motoring test process is abundant. This happened when motoring test is implemented, some of the oil amount is trapped in the transmission, which is about 1.8L for each transmission. And because of this, company needs to spend more money in getting oil. In this improvement, the viscosity of the oil needs to be considered in order to know the frequent of oil can be used. As the solutions, trapped oil in the transmission needs to be removed by using pneumatic system and this can be done by using recycled parts from this company. From the findings or test, the result is gathered from the tests on three types of car models are succeeded and more than the targets. By checking the oil viscosity for used oil, it is proved that the used oil can be reuse as the result is according to the PERODUA viscosity measurement standard. By implementing this improvement idea, it is believed that PERODUA can save cost in production and by recommending viscometer to replace the current viscosity measurement method; PERODUA can improve their quality in management



# **DEDICATION**

*For my beloved mom and siblings*

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## **LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE**

|         |  |
|---------|--|
| PERODUA | Perusahaan Otomobil Kedua Sdn. Bhd.                                      |
| PSSB    | PERODUA Sales Sdn. Bhd.  |
| PMSB    | PERODUA Manufacturing Sdn. Bhd.  |
| PEMSB   | PERODUA Engine Manufacturing Sdn. Bhd.                                   |
| CMK     | Casting, Machining and K-Shop(Assembly)                                  |
| TM1     | Transmission Line 1, transmission assembling for Rusa and Kancil         |
| TM2     | Transmission Line 2, transmission assembling for Kelisa, Kenari and MyVi |
| SOP     | Standard Operation Procedure   |
| EP      | Extreme Pressure   |
| SAE     | Society of Automotive Engineers  |
| ASTM    | American Society for Testing and Materials                               |
| API     | American Petroleum Institute   |
| RM      | Ringgit Malaysia   |
| %       | Percent  |
| F       | Fahrenheit   |
| °C      | Celsius  |
| Pa      | Pascal   |
| RPM     | Rotation per minute  |
| >       | More than  |
| <       | Less than  |
| Km      | Kilometer  |
| h       | Hour   |
| V       | Velocity   |
| A       | Acceleration   |

W Maximum low-temperature viscosity , maximum viscosity pumping temperature and the minimum viscosity at 100°C, viscosity grades without “W” are rated only according to viscosity at 100°C

RM Ringgit Malaysia

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Project Overview**

This project is about the productivity improvement study on transmission oil consumption effectiveness at the motoring test processor. The study was carried out at PERODUA Sdn. Bhd., an automotive company in Malaysia.

This project was divided into two phase; Phase I (PSM I) which is the phase of study on oil transmission utilization, transmission system and developing the methodology. Phase II (PSM II) will cover on the implementation of the improvement idea in order to increase the effectiveness of the oil utilization at motoring test process.

### **1.2 Outline of Project**

This improvement project can be divided into six chapters. The first one is about the introduction of the research, problem statement, objectives, scope of project, importance of the project, project outlines and company background.

The next chapter is the literature review. This is based on the references gathered from books, websites and also from the automotive company itself. This chapter will also discussing about the definition and introduction to the project, which is the

transmission and the oil utilization. It will also discuss the method on how the project will be done based on the information gathered.

Chapter three will be covering about the review of the project methodology, which includes the design and framework of the study. This chapter will also discuss about the suggested solution to the problem project such as the parameters.

In the next chapter, the data that has been gathered from the company will be discussed briefly. This will include the setup for the data collection, the data collection for the oil utilization, and the standard operation procedure for the motoring test station and so on. In chapter five, the data and the findings during the project will be discussed in details and in the last chapter, conclusion and recommendation will be reviewed.

### **1.3 Background Problems**

Recently, the management of PERODUA Sdn. Bhd. has realized on the increment of the oil transmission oil usage at the motoring test process. Some of the transmission's oil will trap in the manual transmission. For example, about 3 liters of Mobil Velocite Oil No. 6 oil are used in the motoring test process for each transmission. However, there were about 180 milliliters of oil have been trapped in the transmission. This is a waste to the Engine Assembly Shop section and to the company itself. And because of this, it brings to increment in production cost and car production as well. Every time, operator has to manually throw the oil by putting the transmission on the rack for 5.5 minutes before it is brought to the docking line (where engine and transmission are assembled together). As the result, 5 drums of Mobil Velocite Oil No. 6 were used per month. This is a big amount transmission oil usage in PERODUA.

## **1.4 Objectives**

The objectives of this project are:

- i. to reduce trapped oil for 50% of per unit transmission.
- ii. to reduce oil consumption for 50% of current average usage per month.
- iii. to determine the lifecycle of the used transmission oil.

## **1.5 Scope of Project**

This project studies the utilization of transmission oil for manual transmission only, which is done at transmission Line 2, TM2 in PERODUA Engine Manufacturing Sdn. Bhd. In this study, the oil consumption is calculated, which is based on the number of transmission unit that having oil trapped after the motoring test.

## **1.6 Importance of Project**

The importance of the project is to come out with improvement for automotive industry. Based on the problem, the exceed oil consumption has brought to company loss in cost. Thus, by having an improvement towards this project, it is not only saving time and energy but the most important thing is to save cost to the company.

## **1.7 Background of Company**

Perusahaan Otomobil Kedua Sdn. Bhd. or known as PERODUA, was established in 1993 in the line with the nation's vision towards 2020 and to enhance Malaysia's automotive capabilities. PERODUA has are two divisions. They are PERODUA Sales Sdn. Bhd. (PSSB) and PERODUA Corporation Sdn. Bhd. (PCSB). Focus to PCSB, it

can be divided into 2 more groups, which are PERODUA Manufacturing Sdn. Bhd. (PMSB) and PERODUA Engine Manufacturing Sdn. Bhd. (PEMSB)

This project was done at PERODUA Engine Manufacturing Sdn. Bhd. The company consists of three sections; Assembly Shop, Machining Shop, and Casting Shop. The study of the oil transmission utilization was done at Engine Assembly Shop which is divided into two sections; Transmission Assembly and Engine Assembly. Here, all transmission units are assembled. There are two assembly lines in the Transmission Assembly unit; TM1 for assembling the transmission unit for Rusa and Kancil model while TM2 for Kelisa, MyVi and Kenari. Figure 1.1 has shown the organization structure of PERODUA Sdn. Bhd. It also indicates the location where the project was carried out by looking at the shaded boxes.

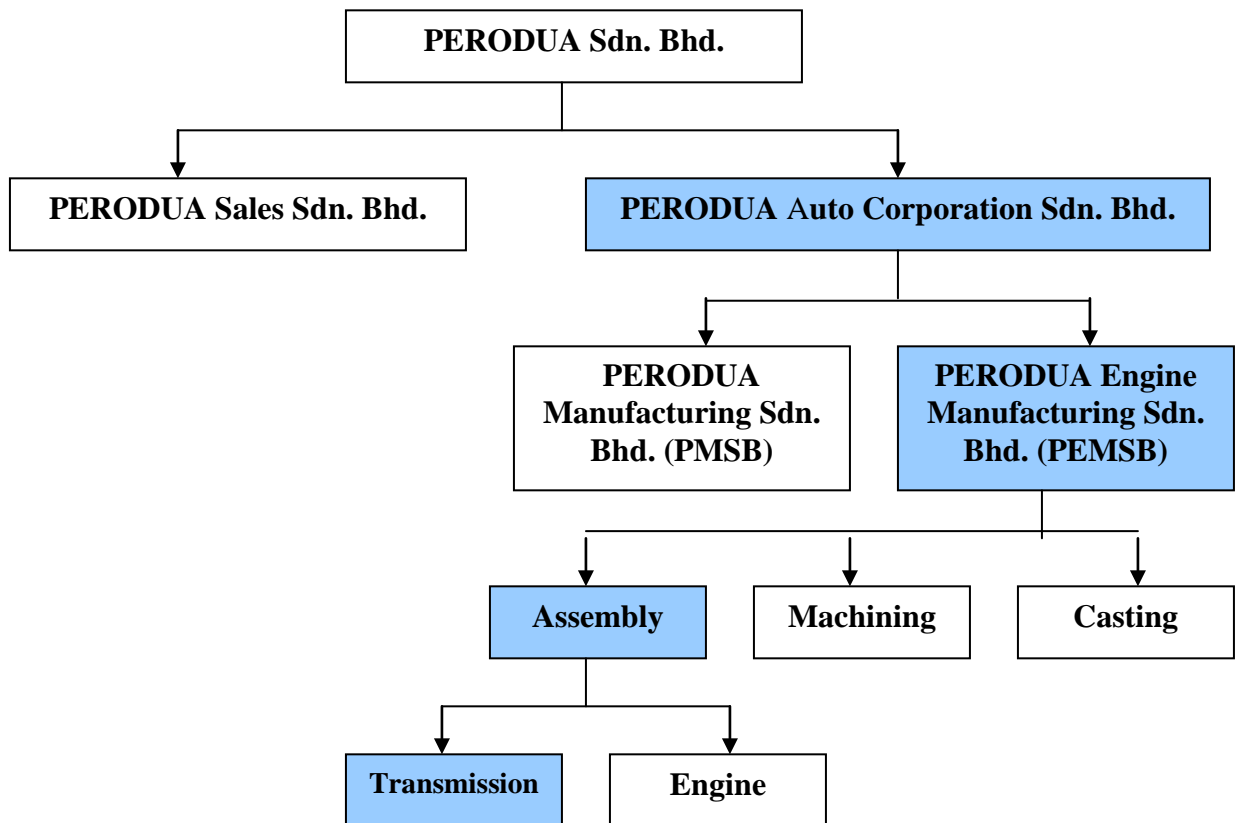


Figure 1.1: The PERODUA Sdn. Bhd. Organization Structure



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Transmission**

##### **2.1.1 Definitions**

Encyclopedia defines transmission where as in mechanics, a transmission or gearbox is the gear or hydraulic system that transmits mechanical power from a prime mover, which can be an engine or electric motor to some form of useful output device. There are two types of transmission, manual transmission and automatic transmission. Manual transmission requires human to select the speed, while for automatic transmission, work in automatic for the change of speed. Recently, there are five levels of speed in both manual and automatic transmission as follows;

- i. Gear 1 – Lowest speed (1km/h ~ 20km/h)
- ii. Gear 2 – 2nd lower speed (20km/h ~ 40km/h)
- iii. Gear 3 – 3rd lower speed (40km/h ~ 60km/h)
- iv. Gear 4 – Normal speed (60km/h ~ 80km/h)
- v. Gear 5 – higher speed (> 80km/h)
- vi. Gear Reverse – For reverse purpose

Figure 2.1 shows a cross section diagram of manual transmission.

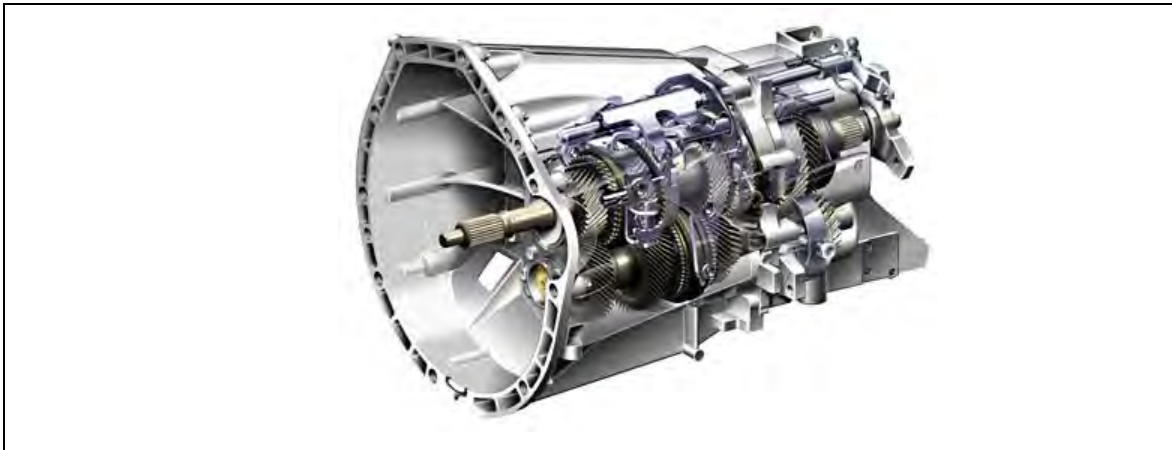


Figure 2.1: A Cross Section Diagram of Manual Transmission  
(Wikipedia the Free Encyclopedia, 2006)).

According to Kevin Clemens (2005), manual transmission is pretty simple - their gears are located along parallel shafts inside the transmission housing. Power flows when gears are meshed. During gear changes, or when the car is stationary and the engine is idling, a clutch is used to interrupt the flow of power from the engine to the transmission. When it is time to shift, the driver slides one gear forward or back until it engages a different gear on the other shaft. Gear speeds can be synchronized to aid in their engagement.

While according to Jack Erjavec (2002), A transmission is a system of gears that transfers the engine's power to the drive wheels of the car.

Don Knowles (2005) has stated that manual transmission transfers engine torque to the differential and provide gear reductions for smooth vehicle acceleration. Depending on the transmission, in third or fourth gear depending on the transmission, engine torque is transmitted directly without providing a reduction or an overdrive. In fifth or sixth gear, depending on the transmission, overdrive gear ratios provided to improve fuel economy at cruising speed.