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

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JUDUL: EFFECTIVENESS OF OIL CONSUMPTION AT MOTORING TEST CASE STUDY: AUTOMOTIVE COMPANY

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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
ACKNOWLEDGEMENTS

Assalamualaikum W.B.T

I would like to extend my warmest gratitude to my supervisor, Ms. Zuhriah Bt. Ebrahim for her excellent supervision, invaluable guidance, trust, advice and constant help, support, encouragement, and assistance towards me throughout this project.

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# TABLE OF CONTENTS

Abstract ........................................................................................................... i
Dedication ...................................................................................................... ii
Acknowledgement ........................................................................................ iii
Table of Contents ........................................................................................... iv
List of Tables ................................................................................................. viii
List of Figures ................................................................................................ ix
List of Abbreviations, Symbols, Specialized Nomenclature ........................ xii

## CHAPTER 1: INTRODUCTION

1.1 Project Overview ....................................................................................... 1
1.2 Outline of Project ..................................................................................... 1
1.3 Background Problems ............................................................................. 2
1.4 Objectives ............................................................................................... 3
1.5 Scope of Project ..................................................................................... 3
1.6 Importance of Project ........................................................................... 3
1.7 Background of Company ...................................................................... 3

## CHAPTER 2: LITERATURE REVIEW

2.1 Definition .............................................................................................. 5
  2.1.2 The Function ................................................................................... 7
  2.1.3 How Transmission Works? ............................................................. 8
  2.1.4 Type of Transmission .................................................................. 20
2.2 PERODUA Engine Manufacturing Sdn. Bhd. ....................................... 24
  2.2.2 The Motoring Test ......................................................................... 28
  2.2.3 Transmission Oil .......................................................................... 32
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.3.1 Definitions</td>
<td>32</td>
</tr>
<tr>
<td>2.2.3.2 How It Works?</td>
<td>34</td>
</tr>
<tr>
<td>2.2.3.3 The Service Life</td>
<td>34</td>
</tr>
<tr>
<td>2.2.3.3.1 Lubricant Technical Societies</td>
<td>36</td>
</tr>
<tr>
<td>2.2.3.4 The Function</td>
<td>37</td>
</tr>
<tr>
<td>2.2.4 Mobil Velocite Oil No. 6</td>
<td>38</td>
</tr>
<tr>
<td>2.2.5 The Transmission Oil Consumption at PERODUA before New Motoring Test is Implemented</td>
<td>40</td>
</tr>
<tr>
<td>2.2.6 Oil Viscosity</td>
<td>42</td>
</tr>
<tr>
<td>2.2.6.1 Definitions</td>
<td>42</td>
</tr>
<tr>
<td>2.2.6.2 How it works?</td>
<td>43</td>
</tr>
<tr>
<td>2.2.6.3 How to measure viscosity?</td>
<td>44</td>
</tr>
</tbody>
</table>

**CHAPTER 3: METHODOLOGY**

3.1 Introduction                                                      | 46   |
3.2 The Methodology                                                  | 48   |
  3.2.1 Define the Oil Trap Problem                                   | 48   |
  3.2.2 Identify the Oil Consumption                                  | 48   |
  3.2.3 Identify the Solutions                                        | 50   |
  3.2.4 Implement the Idea                                            | 54   |
  3.2.5 Collect the Data                                              | 55   |
  3.2.6 Data Analysis                                                 | 56   |
  3.2.7 Result                                                        | 56   |
  3.2.8 Conclusion                                                    | 56   |
3.3 PERODUA Method in Measuring Oil Viscosity                        | 57   |
  3.3.1 Viscometer                                                    | 57   |
CHAPTER 4: RESULTS
4.1 Introduction
4.1.1 Oil Consumptions
4.1.2 The Cycle Time
4.1.3 The Viscosity
4.1.4 Manpower

CHAPTER 5: DISCUSSIONS
5.1 Introduction
5.1.1 Oil Consumption
5.1.2 The Cycle Time
5.1.3 The Viscosity
5.1.4 Manpower
5.2 Problem Aroused
5.2.1 Improper Viscosity Measurement Method
5.2.2 Remove Trapped Oil Process (After Implementation)
5.3 Suggestions for Improvements
5.3.1 Viscometer for Viscosity Measurement
5.3.2 Standardize the Operation Procedure

CHAPTER 6: CONCLUSION

REFERENCES

APPENDICES
Appendix A: Ghant Chart
A1 Ghant Chart For PSM I
A2 Ghant Chart for PSM II
Appendix B: Data Collection
B1 Mobil Velocite No. 6 Oil Usage Record (January 2006 to May 2006)
B2 Mobil Velocite No. 6 Oil Usage Record (January 2007 to February 2007)
B3 Data Collection After Implementation Process During Initial Trial
B4 Oil Viscosity Inspection Sheet (January 2007)
B5 Oil Viscosity Inspection Sheet (February 2007)
B6 Spinder Mobil Velocite No. 6 Oil (Used Oil)
B7 Spinder Mobil Velocite No. 6 Oil (New Oil)
B8 Spinder Mobil Velocite No. 6 Oil Viscosity Checking

Appendix C: PERODUA Standard Operation Procedure and Engine Organization For Year 2007
C1 Engine Transmission and Work Operation Procedure 2007
C2 PERODUA Engine Organization 2007
C3 Work Instruction Sheet for Gears Rotation

Appendix D: Others
D1 Brookfield Dial Reading Viscometer with Electronic Drive Manual
D2 Visit Letter to PERODUA
D3 “Pindaan Tajuk/ Penyelia Projek” Form
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>PERODUA standard test speed for motoring test (PERODUA Standard Operation Procedure)</td>
<td>30</td>
</tr>
<tr>
<td>2.3</td>
<td>Specifications for Manual Transmission Gears (commercial vehicles) (D.M Pirro and A.A Wessol (2001))</td>
<td>37</td>
</tr>
<tr>
<td>2.4.1</td>
<td>The Features and Benefits / Advantages of Mobil 1 Synthetic Gear Lubricant LS Oil (<a href="http://www.mobil.com/velociteoilnumberedseries.htm">www.mobil.com/velociteoilnumberedseries.htm</a> (2006))</td>
<td>39</td>
</tr>
<tr>
<td>3.1</td>
<td>PERODUA Activity Planning</td>
<td>54</td>
</tr>
<tr>
<td>3.2</td>
<td>Result of Time Taken for Mobil Velocite No. 6 Oil before being used</td>
<td>59</td>
</tr>
<tr>
<td>4.1</td>
<td>The PERODUA Car Models, Quantity and Days for Trial after Implementation</td>
<td>63</td>
</tr>
<tr>
<td>4.2</td>
<td>Average Amount (overall) of the Removed Trap Oil for Three types of Models</td>
<td>65</td>
</tr>
<tr>
<td>4.3</td>
<td>Time Taken for the Oil Removal Process after Implementation is made During Trial</td>
<td>68</td>
</tr>
<tr>
<td>4.4</td>
<td>Oil (Mobil Velocite Oil No. 6) Viscosity Checking for Used Oil Based on Time Taken</td>
<td>70</td>
</tr>
<tr>
<td>4.5</td>
<td>The Number of Manpower before and after Implementation</td>
<td>72</td>
</tr>
<tr>
<td>5.1</td>
<td>The Comparison of Oil Consumption and Cost between Before and After Implementation</td>
<td>76</td>
</tr>
</tbody>
</table>
**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The PERODUA Sdn. Bhd. Organization Structure</td>
<td>4</td>
</tr>
<tr>
<td>2.1</td>
<td>A Cross Section Diagram of Manual Transmission (Wikipedia the free encyclopedia (2006))</td>
<td>6</td>
</tr>
<tr>
<td>2.2</td>
<td>The Position of Transmission in an Automotive System.</td>
<td>8</td>
</tr>
<tr>
<td>2.3</td>
<td>Simple Two-Speed Transmissions in Neutral Position</td>
<td>9</td>
</tr>
<tr>
<td>2.4</td>
<td>Five-Speed Manual Transmission.</td>
<td>11</td>
</tr>
<tr>
<td>2.5</td>
<td>Rotation Point of the Stick-Shift in an Automotive System.</td>
<td>11</td>
</tr>
<tr>
<td>2.6</td>
<td>Shifts Forks and Shift Rails (Don Knowles, 2005)</td>
<td>12</td>
</tr>
<tr>
<td>2.7</td>
<td>Shift Lever and Linkages (Don Knowles, 2005)</td>
<td>13</td>
</tr>
<tr>
<td>2.8</td>
<td>Interlock Mechanism in a Transmission Shift Assembly for Left Handed Steering (Don Knowles, 2005)</td>
<td>15</td>
</tr>
<tr>
<td>2.9</td>
<td>Power Flow in First Gear (Don Knowles, 2005)</td>
<td>16</td>
</tr>
<tr>
<td>2.10</td>
<td>Power Flow in Second Gear (Don Knowles, 2005)</td>
<td>17</td>
</tr>
<tr>
<td>2.11</td>
<td>Power Flow in Third Gear (Don Knowles, 2005)</td>
<td>18</td>
</tr>
<tr>
<td>2.12</td>
<td>Power flow in Fourth Gear (Don Knowles, 2005)</td>
<td>18</td>
</tr>
<tr>
<td>2.13</td>
<td>Power Flow in Fifth Gear (Don Knowles, 2005)</td>
<td>19</td>
</tr>
<tr>
<td>2.14</td>
<td>Power Flow in Reverse (Don Knowles, 2005)</td>
<td>20</td>
</tr>
<tr>
<td>2.15</td>
<td>Manual Transmission (<a href="http://www.carcare.org">www.carcare.org</a>, 2007)</td>
<td>21</td>
</tr>
<tr>
<td>2.17</td>
<td>Mercedes-Benz CLK, Automatic Transmission</td>
<td>22</td>
</tr>
</tbody>
</table>
2.18 Hydrostatic Transmission (www.deere.com, 2007)  
2.19 A+CVT Prototype (Dual Cone Version) (www.answers.com, 2007)  
2.20 MyVi transmission (left) and Kenari transmission (right)  
2.21 The environment of transmission line 2  
2.22 The Process Flow for Transmission Assembly in PERODUA  
2.23 The motoring test station  
2.24 Parts where oil is trapped (left: transmission cover case and right: between gears inside the transmission)  
2.25 Left: The exceed oil from the transmission on dolly/pallet. Right: 180 milliliter of trapped oil after removed from a transmission unit  
2.26 Mobil Velocite Oil No. 6 that are used in motoring test  

3.1 The Project Process Flow of the Project  
3.2 Mobil Velocite No. 6 Oil usage from January to May 2006 Chart  
3.3 Air coupler (drain plug and pneumatic sockets) and hose; subparts from unwanted parts  
3.4 Coupler (socket) and drain plug are taken from impact gun – to tighten bolts  
3.5 The original part of hose at machining station  
3.6 Picture of where the hose will be inserted and the source of the air pressure  
3.7 Water flows from a bottle to measure the flow’s speed out from the bottle by using a stop watch  
3.8 (left): New Mobil Velocite Oil No. 6 is placed into a clean case before being poured into an empty mineral water  
3.9 Right: Oil flows out from the bottle are measured by using a stop watch  
3.10 Left: this is how the oil is look like after being used for motoring test as it mixed with the scrap of the assembled parts  
3.11 Right: Oil flows out from the bottle are measured by using a stop watch
4.1 Process Flow of the Installation Process 62
4.2 The Different Between Before and After Implementation 64
4.3 The Average Amount of the Removed Trapped Oil for Kelisa, MyVi and Kenari Models 66
4.4 Results of Oil Consumption Before and After Implementation 67
4.5 The Amount of Collected Trap Oil for One Transmission Unit 67
4.6 Time Taken after the Implementation (Initial Trial) 69
4.7 Oil Viscosity Checking Result for Used Oil Based on Time Taken 71

5.1 Views of The Bottle that is used for Measuring Viscosity 81
5.2 Viscotester 1 Plus and 2 Plus 83
5.3 A complete set of Viscotester 1 Plus and 2 Plus 84
5.4 Thee Brookfield Dial reading Viscometer 85
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERODUA</td>
<td>Perusahaan Otomobil Kedua Sdn. Bhd.</td>
</tr>
<tr>
<td>PSSB</td>
<td>PERODUA Sales Sdn. Bhd.</td>
</tr>
<tr>
<td>PMSB</td>
<td>PERODUA Manufacturing Sdn. Bhd.</td>
</tr>
<tr>
<td>CMK</td>
<td>Casting, Machining and K-Shop (Assembly)</td>
</tr>
<tr>
<td>TM1</td>
<td>Transmission Line 1, transmission assembling for Rusa and Kancil</td>
</tr>
<tr>
<td>TM2</td>
<td>Transmission Line 2, transmission assembling for Kelisa, Kenari and MyVi</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operation Procedure</td>
</tr>
<tr>
<td>EP</td>
<td>Extreme Pressure</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>RM</td>
<td>Ringgit Malaysia</td>
</tr>
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<td>Percent</td>
</tr>
<tr>
<td>F</td>
<td>Fahrenheit</td>
</tr>
<tr>
<td>°C</td>
<td>Celsius</td>
</tr>
<tr>
<td>Pa</td>
<td>Pascal</td>
</tr>
<tr>
<td>RPM</td>
<td>Rotation per minute</td>
</tr>
<tr>
<td>&gt;</td>
<td>More than</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometer</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>V</td>
<td>Velocity</td>
</tr>
<tr>
<td>A</td>
<td>Acceleration</td>
</tr>
</tbody>
</table>
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 wills 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 wills also discussing 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.
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.
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.