RAILWAY VEHICLE MAINTENANCE – TRANSFORMER OILS' ANALYSIS

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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RAILWAY VEHICLE MAINTENANCE: TRANSFORMER OILS' ANALYSIS

MEGAT MUHAMMAD HAZIQ BIN OTHMAN

A report submitted
in fulfillment of the requirements for the degree of
Bachelor of Mechanical Engineering

Faculty of Mechanical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DECLARATION

I declare this project entitled "Railway Vehicle Maintenance: Transformer Oils' Analysis" is the result of my own work except as cited in the reference.

Signature :……..

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Date :……..

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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.

Signature	:……
Supervisor Name	: Professor Madya Ir. Dr. Mohd Azman Bin Abdullah
Date	:……

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DEDICATION

This report is dedicated to my parents, Othman Bin Mohd and Raja Haidah Binti Raja Ali for their ongoing support and love of finishing this project report for the final year. In addition, they also taught me to believe in Allah in whatever condition we had, especially during the completion of this report. In addition, also to my family, who always support me with unconditional love, which motivates me to set a higher goal to complete this final year project. Next I devote this study to my supervisor Professor Madya Ir. Dr. Mohd Azman Bin Abdullah, since that gives me the ability to choose this project. Apart from that, he also gives me inspiration, coaching and encouragement to explain my final year project. Always dedicated to my beloved friends, this devotion has provided me with a powerful shield of love and always protects me and never allows any sorrow to enter.

Thank you

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ABSTRACT

Rolling stock or train is one of the primary transportation in most of the country especially in Malaysia. Therefore, maintenance is needed for train in order to make sure that it can run smoothly without any failure occurred. The purpose of this study are to analyze the railway vehicle transformer, to analyze the transformer oil in the sampling duration is beyond the reference point or not and to make the recommendations for maintenance strategy if any error occurred in the oil sampling result. The research only focus on train transformer oil in the duration of five years. There were seven rolling stock are analyzed. Overall data for oil sampling in past five years were gain from the ERL Maintenance Support Sdn. Bhd, Sepang for all aspects that have been analyzed. The analysis consists of four main aspects which are dielectric strength, water content, acid number and interfacial tension and stated also the date of oil sampling. Next, the data gain is presented and analyzed by using bar graph so it will more easy to analyzed and present the data. Finally, the most critical maintenance issues can be analyzed using the bar graph.

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ABSTRAK

Kereta api merupakan salah satu kemudahan pengangkutan dalam kebanyakkan negara terutama Malaysia. Oleh itu, penyelenggaraan adalah diperlukan untuk kereta api untuk memastikan ia dapat berfungsi dengan baiknya tanpa berlaku apa-apa masalah yang tidak diingini. Tujuan pembelajaran ini dibuat adalah untuk kenal pasti jenis pengubah yang digunakan pada kereta api, kenal pasti samada minyak pengubah melebihi nilai rujukan ataupun tidak di dalam tempoh jangka masa pengambilan minyak dan membuat cadangan untuk strategi penyelenggaraan sekiranya berlaku apa-apa kegagalan yang berlaku terhadap minyak. Terdapat empat aspek kereta api telah dianalisa. Keseluruhan data untuk pengambilan minyak selama lima tahun lepas diperolehi daripada ERL Maintenance Support Sdn. Bhd, Sepang. Analisa terhadap minyak terbahagi kepada empat aspek utama iaitu kekuatan dielektrik, kandungan air, nombor acid dan ketegangan antara muka, di samping itu tarikh pengambilan minyak juga dicatat. Kemudian, nilai yang diperoleh telah dibentangkan dan dianalisa menggunakan graf bar supaya ia senang untuk dianalisa dan membentangkan data tersebut. Akhir sekali, isu penyelenggaraan boleh dianalisa menggunakan graf bar.

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TABLE OF CONTENT

		PAGE
DECLARATION		
APPROVAL		
DEDICATION		
ABSTRACT		**i**
ABSTRAK		**ii**
ACKNOWLEDGEMENT		**iii**
TABLE OF CONTENTS		**iv**
LIST OF TABLES		**vii**
LIST OF FIGURES		**xi**
LIST OF ABBREVIATIONS		**xv**
LIST OF APPENDICES		**xvi**
CHAPTER		
1.	**INTRODUCTION**	1
	1.1 Background of study	1
	1.2 Problem Statement	2
	1.3 Objectives	3
	1.4 Scope of Study	3
	1.5 General Methodology	4
2.	**LITERATURE REVIEW**	6
	2.1 Railway Maintenance	6
	2.2 Railway Transformer Maintenance	8
	2.3 Transformer oil	13
	2.3.1 Condition Based Maintenance on oil analysis	16
	2.3.2 Proactive maintenance on oil analysis	16

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2.4 Oil Analysis 17

2.5 Dielectric Comparison 19

3. METHODOLOGY 22

3.1 Introduction 22

3.2 Literature Review 22

3.3 General Experiment Setup 23

3.4 Procedure and Result for Oil Analysis 24

3.5 Procedure for the Test 25

3.6 Preliminary Result for Oil Analysis 31

4. RESULTS AND ANALYSIS 38

4.1 Introduction 38

4.2 Result for Oil Analysis 39

4.2.1 Transit Train T101 A1 and T101 B1 39

4.2.2 Transit Train T102 A1 and T102 B1 47

4.2.3 Transit Train T103 A1 and T103 B1 55

4.2.4 Transit Train T104 A1 and T104 B1 63

4.2.5 Express Train X102 A1 and X102 B1 71

4.2.6 Express Train X104 A1 and X104 B1 79

4.2.7 Express Train X108 A1 and X108 B1 87

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4.3 Discussion 101

4.4 Preventive Maintenance Strategy 104

5. CONCLUSION AND RECOMMENDATION 109

5.1 Conclusion 109

5.2 Recommendation for Future Studies 111

REFERENCES 112

APPENDICES 116

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LIST OF TABLES

TABLE	TITLE	PAGE
2.1	How Test is Used in Three Main Oil Analysis Categorized	17
2.2	Dielectric Constant Common Materials	20
2.3	Dielectric Constant of Lubrication Oils	21
3.1	Result for chemistry test (Dexron oil)	32
3.2	Result for wear and contamination test (Dexron oil)	32
3.3	Result for particle count test (Dexron oil)	33
3.4	ISO cleanliness data test (Dexron oil)	34
3.5	Result for viscometer test (Dexron oil)	34
3.6	Result for chemistry test (Motul oil)	35
3.7	Result for contamination test (Motul oil)	36
3.8	Result for particle count test (Motul oil)	36
3.9	Result for ISO cleanliness code test (Motul oil)	37

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TABLE	TITLE	PAGE
3.10	Result for viscometer test (Motul oil)	37
4.1	Dielectric strength result for transit train T101 A1 and T101 B1	39
4.2	Water content result for transit train T101 A1 and T101 B1	41
4.3	Acid number in transformer for transit train T101 A1 and T101 B1	43
4.4	Interfacial Tension in transit train for T101 A1 and T101 B1	45
4.5	Dielectric strength reading for transit train T102 A1 and T102 B1	47
4.6	Water content in transit train for T102 A1 and T102 B1	49
4.7	Acid number in transformer oil for transit train T102	51
4.8	Interfacial Tension for transit train oil T102	53
4.9	Dielectric Strength for transit train T103	55
4.10	Water content in transformer oil for T103	57
4.11	Acid number for T103 A1 and T103 B1	59

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TABLE	TITLE	PAGE
4.12	Interfacial tension value for transit train transformer oil, A1 and B1	61
4.13	Dielectric strength for T104 A1 and T104 B1	63
4.14	Water content in T104 A1 and T104 B1	65
4.15	Acid number for T104 A1 and T104 B1	67
4.16	Interfacial Tension for T104 A1 and T104 B1	69
4.17	Dielectric Strength for express train for X102 A1 and X102 B1	71
4.18	Water content in express train for X102 A1 and X102 B1	73
4.19	Acid number for A1 and B1 transformer for express train X102	75
4.20	Interfacial tension for transformers in express train X102	77
4.21	Dielectric strength for express train X104 transformers	79
4.22	Water content for express train, X104	81
4.23	Acid number for transformer A1 and B1 in express train X104	83
4.24	Interfacial tension for express train X104 transformers	85
4.25	Dielectric strength transformers for express train X108	87

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TABLE	TITLE	PAGE
4.26	Water content in both transformers for express train X108	89
4.27	Acid number in express train, X108 for both transformers	91
4.28	Interfacial tension data for express train X108	93
4.29	Oil sampling duration	105

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LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	General methodology for the overall study	5
2.1	TT AC and DC transformers for Electro-locomotives	9
2.2	TT HEP transformers for Diesel-locomotives	9
2.3	TT transformers for High-speed trains	10
2.4	TT transformers for Electrical Multiple Unit (EMU)	10
2.5	Basic diagram for transformer	11
2.6	Block diagram of electric locomotive	12
2.7	Information provided by in-service oil analysis	14
2.8	Off-site oil analysis flow chart	15
2.9	ISO Cleanliness Code	19
3.1	Front view of model 5200	23
3.2	52DV model for viscosity test	24

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FIGURE	TITLE	PAGE
3.3	NASA automatic transmission Dexron oil	31
3.4	Motul oil Technosynthese 4T	34
4.1	Dielectric Strength for transit train T101 A1 and T101 B1	40
4.2	Water Content for Transit Train T101 A1 and T101 B1	42
4.3	Acid Number for T101 A1 and T101 B1	44
4.4	Interfacial Tension for T101 A1 and T101 B1	46
4.5	Dielectric strength for T102 A1 and T102 B1	48
4.6	Water content for T102 A1 and T102 B1	50
4.7	Acid number for T102 A1 and T102 B1	52
4.8	Interfacial tension for T102 A1 and T102 B1	54
4.9	Dielectric Strength for T103 A1 and T103 B1	56
4.10	Water Content for T103 A1 and T103 B1	58

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FIGURE	TITLE	PAGE
4.11	Acid Number for T103 A1 and T103 B1	60
4.12	Interfacial Tension for T103 A1 and T103 B1	62
4.13	Dielectric Strength for T104 A1 and T104 B1	64
4.14	Water Content for T104 A1 and T104 B1	66
4.15	Acid Number for T104 A1 and T104 B1	68
4.16	Interfacial Tension for T104 A1 and T104 B1	70
4.17	Dielectric strength for X102 A1 and X012 B1	72
4.18	Water content for Xo12 A1 and X102 B1	74
4.19	Acid Number for X102 A1 and X102 B1	76
4.20	Interfacial Tension for X102 A1 and X102 B1	78
4.21	Dielectric strength for X104 A1 and X104 B1	80
4.22	Water Content for X104 A1 and X104 B1	82

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FIGURE	TITLE	PAGE
4.23	Acid Number for X104 A1 and X104 B1	84
4.24	Interfacial Tension for X104 A1 and X104 B1	86
4.25	Dielectric Strength for X108 A1 and X108 B1	88
4.26	Water Content for X108 A1 and X108 B1	90
4.27	Acid Number for X108 A1 and X108 B1	92
4.28	Interfacial Tension for X108 A1 and X108 B1	94
4.29	Comparison dielectric strength for T102 A1 and X102 A1	95
4.30	Dielectric strength comparison between T102 B1 and X102 B1	96
4.31	Comparison water content data for T102 A1 and X102 A1	97
4.32	Comparison water content for X102 B1 and T102 B1	98
4.33	Comparison interfacial tension value for transit train T102 A1 and express train X102 A1	99
4.34	Interfacial tension data for transit train T102 B1 and express train X012 B1	100
4.35	Maintenance Process	104
4.36	Decision Process in Cases of Oil Test Returning “Abnormal Values”	106

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LIST OF ABRREVIATIONS

PM	-	Preventive Maintenance
CBM	-	Condition Based Maintenance
EMU	-	Electrical Multiple Unit
TAN	-	Total Acid Number
TBN	-	Total Base Number
FTIR	-	Fourier-Transform Infrared Spectroscopy
VI	-	Viscosity Index
ISO	-	International Organization for Standardization
ASTM	-	American Society for Testing and Materials
ERL	-	Express Rail Link
TT	-	Traction Train
HEP	-	Head-End Power

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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A1	Gantt Chart for PSM 1	116
A2	Gantt Chart for PSM 2	117
B	Site Visit to Express Rail Link (ERL), Salak Tinggi, Selangor	118

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Railway vehicle is one of the pioneers of modern mechanical transportation around the world including Malaysia. The movement of the railway vehicle is using track and monitored by the railway maintenance workers to make sure that all the moves are smooth. In Malaysia, the railway transport is owned by the Malaysian government and is operated by the Keretapi Tanah Melayu Berhad (KTMB). Therefore, the railway played its significant role in the economic, social and political development. It also can reduce traffic congestion and not wasting time in traffic jams. In Malaysia have several types of railway vehicle such as KTM, Light-Rail Transit (LRT), Mass Rapid Transit (MRT) and Electric Train Service.

Next, maintenance is one of the important parts to make sure that the railway vehicle is in good condition and can reduce the operating cost for transportation companies. Therefore, the preventive maintenance scheduling is very important in maintaining the reliability for the railway vehicle maintenance. The aim is focusing on the medium-term planning, to identify the preventive maintenance that will be performed within the periods (month/week/hours) that have been scheduled (Budai et al., 2006). Moreover, this preventive maintenance can be divided into small routine works and projects that consist of inspection and repairs for example inspection of rails, level crossing, switch, signaling system and switch lubricating.

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Besides that, the transformer also important for all railway vehicle, and it is located below the railway vehicles. The transformer is used to transfer electric power from the catenary to the motor by lowering the network's high voltage to low voltage for use by the converters (Ho et al., 2006). For the transformer oil, it has several types of oil are used as insulators such as mineral, ester and silicon oils. The insulator is very important to maintain the reliability of the transformer because its function as a conductor for the electricity. Therefore, the insulating liquids contain their own dielectric constant, particle counts and viscosity reading. On the other hand, it is important to do preventive maintenance for the insulating liquid to get the best performance transformer.

1.2 Problem Statement

Power transformers are one of the most costly and critical electrical power system components (Murugan & Ramasamy, 2019). A better maintenance planning allows for higher utilization of railway infrastructure and improved services and customer quality (Shift2Rail, 2015). According to D'Ariano et al. (2017) during the growing demand for railway transportation, the safety, punctuality, reliability of the freight and passenger service are important. Therefore, the scheduling maintenance or Preventive Maintenance (PM) will increase the availability of rail transportation and also reduce the maintenance cost during the breakdown. The study of the transformer oil analysis issues for the railway vehicle can improve the performance of the railway vehicle because the transformer oil is one of the important liquid functions as an insulator.

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1.3 Objectives

This study has three main objectives that must be accomplished in order to complete the study. The first objective is to analyze the railway vehicle transformer oil. Second objective is to study the trend for the transformer oil. Lastly, the third objective is to make the recommendations for transformer oil whether the oil still can be used, need to replace or need to filter.

1.4 Scopes of study

To achieve this aims of the research, the study has been done in local commuter rail transit company. This study is focusing on the railway transformer oil analysis between the new and used oil. Then, it focused on general transformer oil analysis which investigate the different between general transformer and railway transformer. Lastly to achieve this aims, comparison between the used transformer oil and new transformer oil is needed to investigate the reliability of the oil.

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