

UNIVERSITI TEKNOLOGI MARA

**THE CHARACTERISTICS EFFECT OF PALM
OIL WITH NANOCCLAY ADDITIVES AS
LUBRICANT IN JOURNAL BEARING**

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MSc

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ABSTRACT

Lubricant is important in the study of two moving surfaces that will produce friction and wear. In this study, palm olein was tested to study its capability as a lubricant to replace the mineral oil. To enrich the performance of this oil, nanoparticles additives were added. Previous studies proved that by adding small size of additives into lubricating oil can lessen the friction and improve anti-wear properties. The adjustment of lubricating oil with nanoparticle additives will reduce the friction between two contact surfaces and produce less heat. In this research, size of the nanoparticle used was below 20nm. Four ball tester following ASTM D4072-94 was conducted to determine the optimum concentration of palm oil bio-lubricant with Nanoclays additive ranged between 0.02% and 0.08%wt. The optimum concentration of palm olein with Nanoclays was also tested in journal bearing to characterize the hydrodynamic lubricant and compared to mineral oil (Diesel 20W-40). The properties that have been observed were the coefficient of friction (CoF), pressure profile (MPa) and temperature profile (°C) in journal test rig. Results discovered that 0.04 wt% of Nanoclays additive added into palm olein was the optimum concentration of the lubricant with coefficient of friction 0.081 where it reduced 22.16% compared to mineral oil. It also promoted better wear scar diameter that recorded 0.692mm which was 32.16% smaller compared to mineral oil with 1.02mm. As in journal bearing application, results showed that modified palm olein with Nanoclays provided better performance with low coefficient of friction (reduced 40%-55% compared to mineral oil) and also temperature profile (reduced 19%-21% compared to mineral oil) according to each load applied. As for the pressure profile, mineral oil had lowest pressure due to its high viscosity. Due to the improvement by adding Nanoclay additive into the palm olein, it shows a massive potential as an alternative lubricant to the same range of current industrial mineral oil.

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TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF SYMBOLS	xi
LIST OF ABBREVIATIONS	xii
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Objectives	5
1.4 Significance of Study	6
1.5 Limitation of Study	6
CHAPTER TWO: LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Lubricants	7
2.3 Palm Oil as Lubricant	9
2.4 Additives	13
2.5 Tribo-testing	14
CHAPTER THREE: RESEARCH METHODOLOGY	16
3.1 Introduction	16
3.2 Sample Preparation	18
3.2.1 Kinematic Viscosity	20