SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF GRADUATE STUDIES

Modeling of Engine Lubricating Oil Degradation While In Use

Thesis Submitted to the College of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Science in Mechanical Engineering

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I would like to dedicate this work to my family
who have supported and encouraged me in all my
academic and professional endeavors.

Abstract
The objective of this research is to obtain a
model for estimating the degradation of the engine
lubricating oil, instead of the engine manufacturer recommendation [interval method]
The model was achieved by experimental data obtained from the analysis of the used lubricating oil during its useful life as applied on three trucks. The model was built by using the relationships between the changing of the oil parameters and the engine operating conditions specifically the engine coolant temperature. The oil analysis was initially conducted under regular interval during truck running at the end of each trip.

The model output results gave more understanding on how to use and extend the life time of lubricant oils.

The model findings indicated that the oil can be used in these trucks for 15,000km approximately as opposed to the previous 8,000km (as of owner regulation) and 10,000km (as of manufacturer recommendation).
الجديد

الغرض من هذا البحث عمل نموذج لتقدير التدهور في زيت تزيّبّيت الماينة بدلاً من تقنية تحليل الزيت ويوضح مدى يتم استبدال الزيت المستخدم للشاحنات.

تم تحقيق هذا النموذج بواسطة تجارب معملية لتحليل زيت التزيّبّيت المستخدم ، حيث وجدت علاقة بين التدهور في مقياس الزيت وحالة عمل الماكينة. ولقد أجريت عمليات تحليل الزيت أثناء عمل الشاحنة وفي نهاية كل رحلة.

من هذا البحث نستنتج كيفية الإستفادة من عمر زيت التزيّبّيت المتبقي بالطريقة المثلى . وبناءً لهذه النتائج يمكن استخدام الزيت المستعمل في هذه الشاحنات حتى 15.000 كلم بالتقريب بدلاً عن 8.000 كلم (على حسب تعليمات المالك) 10.000 كلم (تعليمات المصّنع للشاحنات ) .
Acknowledgement

The most important acknowledgement goes to the God for being my main support, guide and the light during my college career. Without the God I never reach anything of what I proposed. All my achieved goals during my life are thanks to the God.

My time at Sudan University for Science and Technology has been rather short but none the immensely fulfilling. I have learned a lot, not just about my academic field of study, but also and possibly more importantly, about my self and others. Sudan University for Science and Technology is a very unique special place that compares to nothing else. I am so glad that I had the chance for me to know so many wonderful people. I would like especially to thank Dr. Hassan Elobaid Hassan, my supervisor, for his guidance and support must also thank Dr. Khawad, head department, who listen to my thoughts. Thanks for all the staff of the faculty whose provided me with new information's. Thank also for the labor Gafar, room's lectures keeper, who help us during my staying.

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Abbreviation

amu atomic mass unit
ACEA European Automobile Manufacturers' Association
API American Petroleum Institute
SAE Society of Automotive Engineers
ARAIBA Elnefeidi Truck Company
CPU Computer programmer unit

Trucks Company code numbers 1060, 1131, 1053
   A For truck 1053
   B For truck 1131
   C For truck 1060
ANOVA Analysis of Variance
S.O.V Source of variation
TBN Total base number (mg (KOH/g of lubricant
TAN Total acid number (mg/g
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