

بسم الله الرحمن الرحيم

: قال تعالى

( اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ مِثْلُ نُورِهِ  
كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ الْمِصْبَاحُ فِي زُجَاجَةٍ  
الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ  
مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا  
يُضِيءُ وَلَوْ لَمْ تَمْسَسْهُ نَارُ نُورٍ عَلَى نُورٍ  
يَهْدِي اللَّهُ لِنُورِهِ مَن يَشَاءُ وَيَضْرِبُ اللَّهُ  
الْأَمْثَالَ لِلنَّاسِ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ )

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## **DEDICATION**

To the great soul of my mother...

To my dearest father.....

To my brother and sisters.....  
To my lovely wife.....  
To all my family.....  
To all my teachers.....  
I dedicate this humble work.....

## Abstract

This study became to examine the possibility of benefiting from used oil by using it as fuel in some industries that require the burning of fuel for thermal energy conversion to any of the existing form of the various forms of energy, especially in the Sudan that has increased in the rate of the cars numbers in this period, which is an indicator of the large quantities of used oils , In this study, Three samples of used oils were taken, namely ( Turbine oil, transformer oil and engine oil ) by focusing more in the engine oil because of the abundance of this type there are a number of (536,745 cars in the Khartoum state as in the statistic of the traffic administration until 2007 ,

also the average quantity of lubrication oil used in the Sudan from 2006 until 2008 is 42,672 Ton. The samples of used oil were analysed to determine their properties as a fuel results showed good indicators of this species to be used as fuel, the heat content of these oils are reach a very large amount (45,352 kj/ kg) also during the analysis the presence of sulfur and ash content resulting from the combustion process found was very low.

These types were tested through the combustion test and thus the analysis of combustion gases from the combustion process to determine the impact of pollution on the environment and human health, and the results are in the range permitted by the World Bank for the sulfur dioxide and Nitrogen oxides. The study concluded that the used oils can be used as fuel in many industries to take advantage of the thermal energy inside it.

The study has also concerned about a new product of the fuel produced in Sudan from Khartoum Refinery Company (K.R.C), by analyzed and tested it, economic and technical feasibility as a major alternative to the heavy fuel Sudanese oil which is produced from Elubaid refinery, used in Dr. Mahmud Sheriff thermal power station as a fuel for the boilers in phase I.

## مُستَخْص

هذه الدراسة تبحث إمكانية الاستفادة من الزيوت المستخدمة كوقود يمكن الاستفادة منه في بعض الصناعات التي تحتاج إلى حرق ووقود لتحويل الطاقة الحرارية الموجودة بها إلى أي شكل من أشكال الطاقة المختلفة، خاصة أنه في السودان قد إزداد معدل عدد السيارات بصورة كبيرة في هذه الفترة وهو مؤشر إلى كميات كبيرة من الزيوت المستخدمة. في هذه الدراسة أُخِزَت ثلاثة عينات من الزيوت المستخدمة وهي (: زيت ترباين ، زيت محول وزيت محرك) حيث كان التركيز أكثر على زيت المحرك نسبة لوفرة هذا النوع يوجد عدد 536,745 سيارة في ولاية الخرطوم حسب إحصاء إدارة المرور لعام 2007 والذي تزايد الآن ، كما أن متوسط كمية زيوت التزيت والتبريد المنتجة والتي تم إستهلاكها في السودان منذ عام 2006 وحتى عام 2008 بلغت 42672 طن في العام حُللت هذه العينات لمعرفة خواصها كوقود حيث أظهرت النتائج مؤشرات جيدة لهذه الأنواع كي يتم إستخدامها كوقود ، وُجِد أن المحتوى الحراري لهذه الزيوت كبير جداً يصل إلى {45,352 كجول / كجم} أيضاً من خلال

التحليل وُجد ان محتوى الكبريت والرماد الذي ينتج من عملية الإحتراق قليل جداً.أيضاً أُختُبرت هذه الأنواع وذلك من خلال إختبار الإحتراق ومن ثم تحليل الغازات الناتجة من عملية الإحتراق لمعرفة مدى تأثيرها على تلوث البيئة ومن ثم صحة الإنسان ، و قد جاءت النتائج في المدى المسموح به من قبل البنك الدولي بالنسبة لغازات ثاني اكسيد الكبريت واكاسيد النايتروجين، خلصت الدراسة إلى أنه يمكن إستخدام الزيوت المستخدمة كو قود يمكن الإستفادة منها في كثير من الصناعات للإستفادة من الطاقة الحرارية الموجودة بها.

أيضاً عمدت الدراسة على التعرف على منتج جديد من الو قود بالسودان يتم إنتاجه في مصفاة الخرطوم,وذلك بتحليل خواصه وإختباره كو قود ذي جدوى إقتصادية وفنية كبيرة كبديل لو قود الفرنس السوداني الثقيل المنتج من مصفاة الأبيض والذي يتم إستخدامه في محطة دكتور محمود شريف الحرارية كو قود لغلايات المرحلة الأولى.

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### List of Abbreviations

Symbol	Description	Page No
CCR	Conradson carbon residue	44
KNPS	Khartoum North Power Station	5
HCGO	heavy coke gas oil	2
LSHS	low sulphur heavy stock	13
L.D.O	Light Diesel Oil	11
GCV	Gross calorific value	12
NCV	Net calorific value	12
ISO	International standard organization	28
NEC	National Electricity Corporation	28
ESV	emergency stop valve	30
TBN	Total base number	33
SAE	Society Automotive Engineer	31
API	American Petroleum Institute	33
LPG	Liquid Petroleum gas	43
HFO	Heavy Fuel Oil	7
TAN	Total Acid Number	50
SAN	Strong Acid Number	52
K.R.C	Khartoum Refinery Company	IV
Ta	Temperature of Air	78
Tg	Temperature of gas	78
ER	Error	79
Z ER	Zero Error	79