بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

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MONA MAGHRABY

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

Enhancement of Dual Fuel Diesel Engine Performance by the Electronic Control of Hydrogen Percentage

By

Wael Wadie Eskander

Mechanical Power Department, Faculty of Engineering, Ain Shams University, Cairo,

A Thesis Submitted in Accordance with the Requirements for the Degree of Master of Science in Mechanical Engineering

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Date: 10/7/2021

STATEMENT

This dissertation is submitted to Ain Shams University in fulfilment of the requirements degree Master of Science in Mechanical Engineering.

The work included in this thesis was made by the author during the period from February 2015 to July 2021, at the Mechanical Power Engineering Department, Ain Shams University.

No part of this thesis has been submitted for degree or qualifications at any other university or institute.

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ABSTRACT

Experimental investigations were introduced on a diesel engine to examine the effects of addition of used lubricating oil (ULO) on diesel engine combustion. This thesis presents the experimental results of utilizing a mixture of ULO as a supplementary fuel with diesel fuel (DF), to provide a way to use this waste fuel as alternative energy.

Different experiments were investigated to show the impacts on the emissions and the performance of diesel engine with a mixture of 5 % of ULO + 95 % DF (S2), 10 % of ULO + 90 % of DF (S3) and 20 % of ULO+ 80 % DF (S4) that used with 100 % diesel fuel (DF) (S1). These are used as experimental samples.

To carry out this experimental study, a diesel engine generator (DEUTZ / F2L-511), compression-ignition engine, twin-cylinder, 4- stroke, naturally-aspirated, and direct-injection was used.

Comparative study between the four samples on the performance of engine emissions and experiments performed were introduced at different engine operating loads.

The results showed that the use of ULO is promising as a supplementary fuel for diesel engines, especially at part loads with some deficiency in the engine performance at full load. The presence of ULO percentage blends in DF caused some higher emissions of NO_x .The NO_x emissions values increase with

increasing the engine load as the exhaust temperature increases. It was observed that as the ULO percentage increased in the fuel sample blends, the HC_s in the exhaust emissions increased. The highest percentages increase in HC emissions were obtained for 20 %, 10 % and 5 %, ULO respectively. Such increase may be due to low cetane number, high viscosity and high distillation temperature of ULO which leads to larger droplets and poor atomization, that in turn leads to incomplete combustion of ULO compared to S1 (100 % DF).

A mixture of hydrogen and air was introduced into the engine, in addition to the ULO- DF blends. The load was stabilized once at 90% of the full load and another at 60% of the full load. Both performance factors and exhaust emissions were recorded.

The results indicate that the use of ULO is a promising additional fuel for diesel engines, especially at 60% of full load. With the use of hydrogen, a decrease and improvement in emissions are observed, but with an increase in nitrogen oxides emissions, because hydrogen enhances the combustion process and causes an increase in the combustion temperature.

Keywords *used lubrication oil–hydrogen blends · Combustion · Diesel engine .Emission. Heavy fuel*

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