بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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MONA MAGHRABY

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Mechanical Power Engineering

A numerical study of the effect of the compression ratio on the biodiesel fuel spray characteristics at different blending ratios, 2020.

A Thesis submitted in partial fulfilment of the requirements of the degree of

Master of Science In Mechanical Engineering

(Mechanical Power Engineering)

By

Nourhan Hesham Said

Bachelor of Science In Mechanical Engineering

(Mechanical Power Engineering)

Faculty of Engineering, German university in Cairo, 2013

Supervised By

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Cairo - (2020)

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A numerical study of the effect of the compression ratio on the biodiesel fuel spray characteristics at different blending ratios, 2020.

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Date:27 September 2020

Statement

This thesis is submitted as a partial fulfilment of Master of Science in Mechanical Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

In this thesis a Computational fluid dynamic study was done to study the influence of various compression ratios and various mixing ratios of biodiesel on the characteristics of the spray. A three dimensional numerical simulation was done using ANSYS-FLUENT by using internal combustion engine module. This simulation was done on a 4-stroke engine for a Ruggerini RD 270 engine. A cold flow simulation was carried for the engine with compression ratio 18 and it was validated against [31] . Another two cold flow simulations for compression ratios 17 and 16 were done upon this validation. After that a model for diesel spray was added to the cold flow engine with compression ratio 18 and it was validated against [31] by comparing the penetrating length for the two models. Upon that a models for sprays for Diesel and for various mixing ratios for Biodiesel 20% , 60% and 100 % were integrated to the three compression ratio engines 18 , 17 , and 16 respectively to study the effect of different compression ratios and the various biodiesel mixing ratios on the length of the penetrating spray of fuel and it is found that as the compression ratio increased the penetrating length decreased , the mass fraction increased the turbulent increased and the droplet size decreased which means that the high compression ratio enhance the performance of the biodiesel .

Key words: CFD, Biodiesel, Penetrating length, Compression ratio.

Research Paper

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List of Abbreviations

CO Carbon Monoxide

CO2 Carbon Dioxide

G100 Pure Diesel

G20 20% gasoline blended dieseline

NI National Instruments

NOx Nitrogen Oxides

CFD Computational Fluid Dynamics

KHRT Kelvin-Helmholtz & Rayleigh-Taylor

SMD Sauter Mean Diameter

DISI Direct Injection Spark Ignition