STUDY ON THE PERFOMANCE OF ENVO DIESEL IN A COMBUSTION SYSTEM

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Special dedicated to

My beloved parents

Mohd Salleh bin Mat Ludin & Zaitun Binti Shafiee

My great supervisor

Prof. Dr. Mohammad Nazri Bin Mohd Jaafar

My supportive friends

Muhammad Fauzi Bin Samsubaha & Anas Basri Bin Musthafa

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ABSTRACT

Depletion of fossil fuel, environmental pollutions and increasing fuel prices has led many countries seeking for fossil fuel substitute. The objective of this study is to present the combustion performance of an oil burner system using Envo-diesel. Palm oil used in this study is a blend of diesel and palm oil called Envo-diesel. The experiment was conducted using E5, E10, E15, E20 and E25 as fuel. The physical properties such as surface tension, kinematics viscosity, density and calorific value were determined. All fuel blends were investigated using three different types of nozzle which consists of different fuel mass flow rate. The performance of burner system using Envo-diesel is based on its temperature profile and emissions generated such as nitrous oxide (NOx) and carbon monoxide (CO). NOx is highest at lean mixture and reduce when the equivalent ratio until the rich mixture, and for CO, at lean mixture it was very low than at rich mixture. It can concluded the high content of palm oil in the blends increases its viscosity, surface tension and density and hence lower the value of emission. The high content of palm oil in the blend will also decrease the calorific value, the temperature for each blends also decrease. The example result for NOx at equivalent ratio 0.8 the percentage increment for palm oil blend compared to diesel decreased around 13% for E5, and other emission for CO for equivalent ratio 1.4, the percentage increment for palm oil blends compared to diesel was decreased around 3% for E5. The outcome of this study successfully fulfilled the scope and the objectives set earlier

ABSTRAK

Pengurangan bahan bakar, pencemaran persekitaran dan peningkatan harga minyak telah menyebabkan banyak negara mencari sumber baru bagi menggantikan bahan bakar fossil. Objektif kajian ini mempersembahkan satu penyiasatan terhadap prestasi pembakaran dengan mneggunakan system pembakar minyak. Minyak sawit digunakan dalam kajian ini dan merupakan pencampuran minyak diesel dengan minyak sawit, ia dipanggil Envo-Diesel. Pencampuran minyak tersebut diketegorikan kepada lima pencampuran iaitu E5, E10, E15, E20 dan E25. Keupayaan fizikal setiap minyak telah dikenal pasti seperti ketumpatan, kelikatan, ketegangan permukaan dan nilai kalori. Setiap campuran minyak akan dijalankan terhadap tiga nozel yang berbeza. Keupayaan sistem pembakaran Envo diesel dengan melihat profil suhu dan emisi yang dikeluarkan seperti nitrogen oksida (NOx) dan karbon monoksida (CO). setelah melakukan experiment, NOx didapati tinggi semasa campuran *lean* dan berkurangan apabila sampai kepada persamaan ratio dalam keadaan *rich*. Untuk CO, pada keadaan *lean* ia didapati sedikit jika dibandingkan pada keadaan *rich***.** Kesimpulannya, sekiranya kandungan minyak sawit adalah tinggi, ia akan meningkatkan ketumpatan, kelikatan dan ketegangan permukaan dan akan menghasilkan emisi yang sedikit. Jika kandungan minyak sawit tinggi di dalam campuran ia akan mengurangkan nilai kalori, ini menyebabkan suhu semakin rendah. Contoh keputusan NOx pada nisbah setara 0.8, ia didapati bahawa jumlah NOx berkurang sehingga 13% untuk E5 manakala bagi emisi CO pada nisbah setara 1.4, ia didapati bahawa jumlah emisi bekurang sekitar 3% untuk E5. Hasil daripada kajian ini telah berjaya mencapai objektif dan skop yang ditetapkan sebelum kajian ini lagi.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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