ISSN 2395-1621

Investigation Of Performance And Emission Of CI Engine Using Palm Oil Methyl Ester as fuel and Emission Reduction using EGR

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ABSTRACT

Using biodiesel can help to reduce the world's dependence on fossil fuels and which also has significant environmental benefits. The reasons for these environmental benefits are: using biodiesel instead of the conventional diesel fuel reduces exhaust emissions such as the overall life circle of carbon dioxide (CO2), particulate matter (PM), carbon monoxide (CO), sulphur oxides (SOx), volatile organic compounds (VOCs), and unburned hydrocarbons (HC) significantly. On the other hand, most of the researchers have reported that 100% biodiesel emits lower tail pipe exhaust emissions compared to the diesel fuel; nearly 50% less in PM emission, nearly 50% less in CO emission and about 68% less in HC emission.

ARTICLE INFO

Article History

Received : 29th February 2016

Received in revised form :

1st March 2016

Accepted : 4th March 2016

Published online :

6th March 2016

I. INTRODUCTION

Biodiesel, a clean renewable and environment friendly fuel, has recently been considered as the best substitute for the diesel fuel. It is produced from oil or fats by transesterification process. It is the reaction of a triglyceride (fat/oil) with an alcohol to form esters and glycerol. During the esterification process, the triglyceride is reacted with alcohol in the presence of a catalyst, usually a strong alkaline like sodium hydroxide. The alcohol reacts with the fatty acids to form the mono-alkyl ester, or biodiesel and crude glycerol.

II. LITERATURE REVIEW

The internal combustion engine designed, built, and demonstrated by Rudolf Diesel at the 1900 Paris World's Fair ran on peanut oil. This was powered by crude oil or even vegetable oil. Vegetable oils have considerable potential to be considered as appropriate alternate fuel as they possess fuel properties similar to that of diesel. Moreover, review of literature reveals that use of vegetable oils as a fuel in diesel engines is more beneficial because these are non-toxic, biodegradable, eco-friendly, renewable in nature and reduces engine emissions. India has rich and abundant forest resources with wide range of plants and oil seeds. There are more than 300 different species of trees available in India [1, 2]. The oils can be obtained from many oil seeds. Based on the application or use of vegetable oils, the vegetable oils are classified in to two types, namely edible and non-edible oils. Economics of the biodiesel production process can be improved, if non-edible oils are used. Use of edible oils in diesel engines is not encouraged as it is in great demand for human consumption [3, 4, 5 and 6].A literature survey carried out reveals that most of the researchers have focused their work in various techniques to develop biodiesel having similar characteristics to that of diesel fuel and assessing their performance, emissions and

combustion characteristics under various loading conditions of the direct injection diesel engine and Low Heat Rejection Engine (LHRE).Some of notable work done using Bio diesel fuel and their properties,its performance and emission characteristics have been studied and discussed as follows.

III.EXPERIMENTAL PROCEDURE

The experimental test rig consists of a variable compression ratio compression ignition engine, eddy current dynamometer as loading system, fuel supply system, water cooling system, lubrication system and various sensors and instruments integrated with computerized data acquisition system for online measurement of load, air and fuel flow rate, instantaneous cylinder pressure, injection pressure, position of crank angle, exhaust emissions and smoke opacity. Fig 3.1 is the photographic image of the experimental setup used in the laboratory to conduct the present study and Fig.3.2 represents the schematic representation of the experimental test setup. Table 3.1 gives the technical specifications engine used. The setup enables the evaluation of thermal performance and emission constituents of the VCR engine. The thermal performance parameters include brake power, brake mean effective pressure, brake thermal efficiency, volumetric efficiency, brake specific fuel consumption, exhaust gas temperature. Commercially available lab view based Engine Performance Analysis software package -"Engine softLV" is used for on line performance evaluation. The exhaust emissions of the engine are analyzed using an exhaust gas analyzer. The constituents of the exhaust gas measured are CO (% and ppm), CO2 (%), O2 (%), HC (ppm), NOx (ppm) and SOx (ppm).

IV.CALCULATIONS

Load (kg)	Fuel	BMEP (bar)	BSFC (kg/kWh)	BTHE (%)	HBP (%)	BP KW
0	Diesel	0.01	0	0.45	0	0
3	Diesel	0.55	0.6	15.72	11.04	0.45

1) $BP=\frac{2*\pi*N*T}{60}$

$=\frac{2*3.14*1500*5}{60}$

=785.39watt

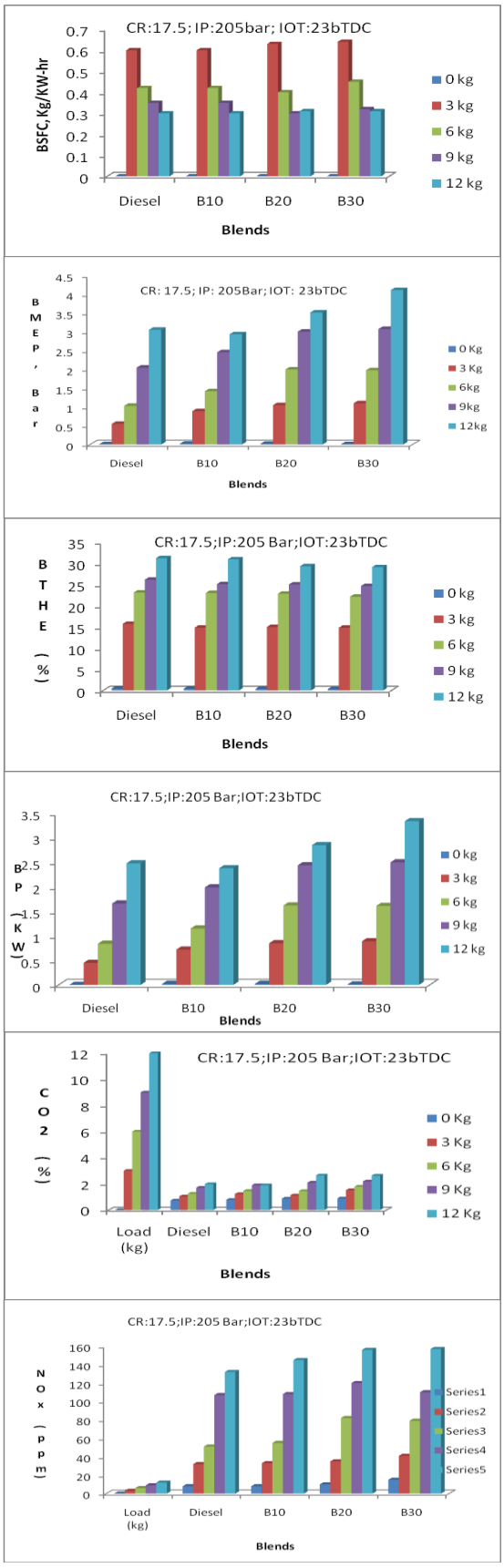
=0.785 KW

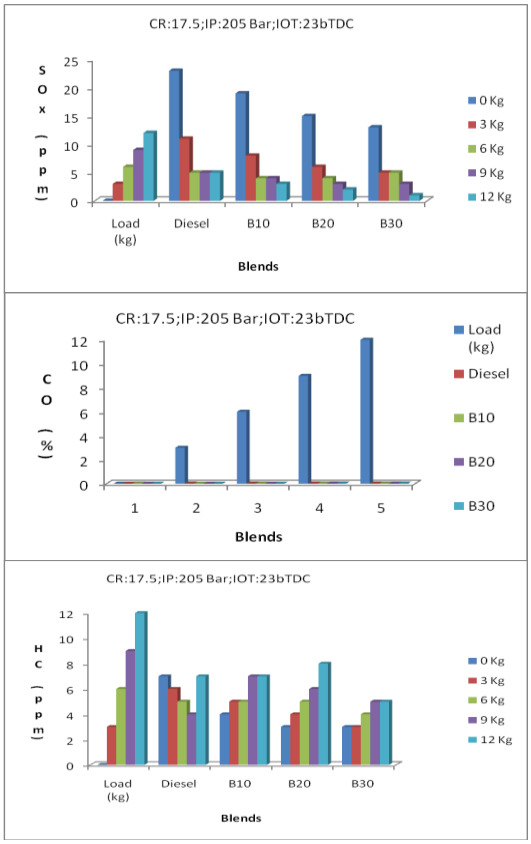
2) $BMEP=\frac{BP*60}{A*L*N}$

$=\frac{785.3*60}{\frac{\pi}{4}*(0.08)*(0.08)*0.11*1500}$

=0.8293bar

V. GRAPHS





VI. CONCLUSION

Thus it can be concluded that biodiesel is the best alternative fuel to diesel and petrol from the experiments conducted on VCR engine. The advantages of using vegetable oils as an alternative to diesel are it is nontoxic, contains no aromatics, has higher biodegradability than diesel, causes less pollution to water and soil and sulphur free.

VII. ACKNOWLEDGEMENT

We wish to thank many people who have extended their kind co-operation and guidance to us for preceding our final year project .Our foremost thanks to **Prof. S.R.Jadhav** as a guide. His valuable guidance and keen interest inspired us to perform best in project work .Sincere thanks to **Prof. M.V.Khot** as The Head Of Department and **Dr. K.N.Barbole** as The Principal, their efforts made us technically sound to go for our project. We wish to express our special thanks to all the people who directly or indirectly helped and encouraged us.

REFERENCES

1. M.A. Kalam, H.H. Masjuki, Biodiesel from Palmoil – an analysis of its properties and potential, Biomass and Bioenergy, Vol 23, pp. 471 – 479, 2002
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2. C.D. Rakopoulus, K.A. Antonopoulus, D.C. Rakopoulus, D.T. Hountalas, E.G. Giakoumis, Comparative performance and emissions study of a direct injection diesel engine using blends of diesel fuel with vegetable oils or biodiesel of various origins, Energy conversion and management, Vol 47, pp. 3272-3287, 2006.
3. H.C. Onga, T.M.I. Mahlia, H.H. Masjukia, R.S. Norhasyimab, . Comparison of palm oil, Jatropha curcas and Calophyllum inophyllum for Biodiesel. *Renewable and Sustainable Energy Reviews* , 15;3501–3515
4. L. Niranjan, Shijo Thomas and V. Sajith (2011)Experimental investigation on the effects of cold and hot EGR using diesel and bio-diesel as Fuel, International Journal of Engineering Science Invention; pp no 55-62 vol 6; ISSN 2319-6714 www.ijesi.org

