International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Articles available online http://www.ijoer.in; editorijoer@gmail.com

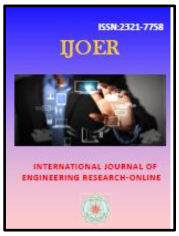
Vol.5., Issue.4, 2017
July-August

RESEARCH ARTICLE

ISSN: 2321-7758

PERFORMANCE AND EMMISION ANALYSIS OF ALGAE BIODIESEL ON VCR ENGINE BY VARING INJECTION PRESSURE

B.GANESH BABU[1], G.VENKATESWARA RAO[2], R.SAM SUKUMAR[3], M.MURALIDHAR RAO[4]
[1]PG Scholar, Mechanical Engg Dept., BVC Engineering College
[2]Assoc. Professor of Mechanical Department, BVC Engineering College,
[3]Assoc.Professor of Mechanical Department, Swarnandra College of Engineering and Technology
[4]Professor & Principal, Gandhi Institute Of Technology Gurkur, Orrisa



M.KAMRAJU

ABSTRACT

Biodiesel is a non- toxic, highly biodegradable, renewable fuel and emits less amount of CO_2 and NO_x. Burning of petroleum based fuel causes accumulation of carbon dioxide in the environment and fuel price is increasing day by day. An algae is emerging as an alternative raw material to petroleum based fuels and is the highest yielding feedstock for biodiesel. It is very much important recently because of its environmental benefits and the fact that it is made from renewable resources. It is proved that algae grown in CO2enriched air can be effectively converted to oily substances. Such an approach definitely solves major problems of air pollution resulting due to CO_2evolution and future crisis due to a shortage of fossil energy source.

In this study we used common species of algae called Dunalialla for experimentation. In this study, Biodiesel was processed from algae. The various properties of bio diesel were experimentally estimated. Performances were conducted on a Variable compression ratio single cylinder diesel engine using diesel and biodiesel. Using algae as raw material, adaptation of continuous trans-esterification process and recovery of high quality glycerol as by product may be options to be considered to lower the cost of bio-diesel.

In this project, we are using 3 compression ratios and 3 injection pressures to justify the potentiality of the algae oil Methyl Esters of as alternative fuel for compression ignition engines. However blending of this oil with diesel up to 20% (by volume) can be used safely in a conventional CI engine without any engine modification that could help in controlling air pollution.

KEY WORDS:ABD, CR, FI,

INTRODUCTION

"Biodiesel" is defined in ASTMD6751 as " a fuel comprised of mono alkyl esters of long chain fatty acids derived from vegetable oils or animal fats , designated B100" that is biodiesel is long chain fatty acids ester composed of only one alcohol molecule and one ester linkage. The majority of energy used today is obtained from fossil fuels. The environmental concern of the global warming and climate changes has greatly increased the interests of the application study of renewable fuels to internal combustion engines. The investigations have concentrated on decreasing fuel consumption and on lowering the concentration of toxic components in combustion product by using non-petroleum, renewable, sustainable and non-polluting fuels. So what is the need of hour to switch over to non-conventional energy sources such as

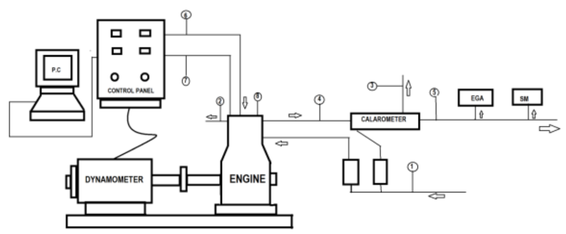
International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Articles available online http://www.ijoer.in; editorijoer@gmail.com
Vol.5., Issue.4, 2017
July-August

wind, solar energy, biodiesel, tidal energy etc. which are easily available.

II. TRANSISTERIFICATION PROCESS

Now take 1 liter of sample oil.That oil is to be heated up to 55 to 60^0 c temperature but not exceed 70^0 c. Now take 200 ml of methanol or ethanol in to that add 4.5 grams of KOH. Shake that mixture well up to KOH dissolved fully. It will become potassium meth oxide solution. Now add that solution to 1 liter sample oil with constant stirring of raw oil. Stir up to 10 to 15 minutes. Leave that solution to settle down up 8 to 10 hours. It will form two distinct layers. That upper layer is called Bio-diesel and lower dark and thick layer called glycerol which is used to make soap.

III.EXPERIMENTAL SET UP

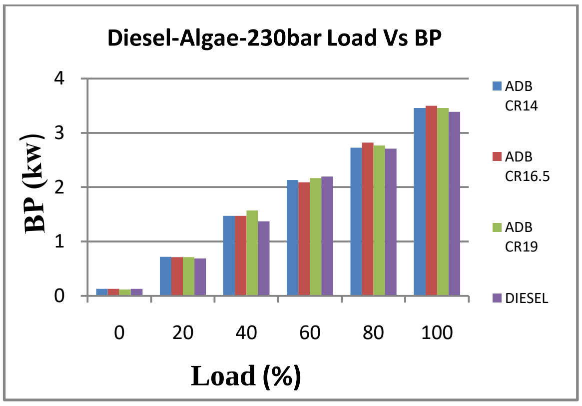


The setup consists of single cylinder, four stroke, VCR diesel engine connected to an eddy current and hydraulic cooling type dynamometer for loading. A tilting cylinder block arrangement is used for varying the CR without stopping the engine and without altering the combustion chamber geometry. Instrumentations for combustion pressure and crank-angle measurement are provided along with the setup. The signals are interfaced to crank-angle measurement are provided along with the setup. The signals are interfaced to computer through engine indicator for pressure-crank angle (P-θ) and pressure-volume (P-V) diagrams for each of 360° rotation of crank. Provisions are also made to quantify airflow, fuel flow, temperatures and load measurements. The set up has stand-alone panel box consisting of air box, fuel tank, manometer, fuel measuring unit, transmitters for air and fuel flow measurements, process indicator and engine indicator. Rotameters are provided for cooling water and calorimeter water flow measurement. The schematic diagram of the VCR diesel engine experimental setup is shown in the Fig. The brief specification of the engine is added in the Table.

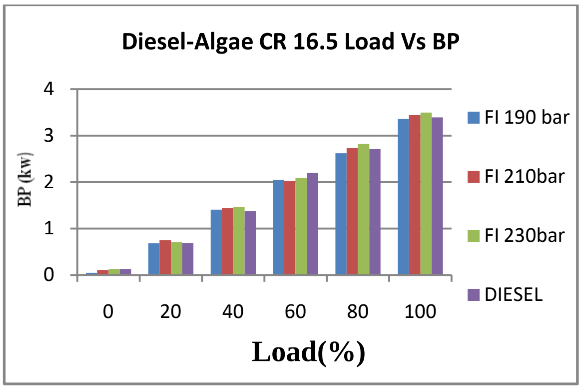
IV. RESULTS

Brake Power

The variation of brake power with loads for different CR and FI combinations are included in the below charts. The engine is run for constant speed for both diesel and ABD20 at each loading condition. However, with the increase in load, BP increases. For ABDCR16.5 at 230 FI it shows similar brake power.

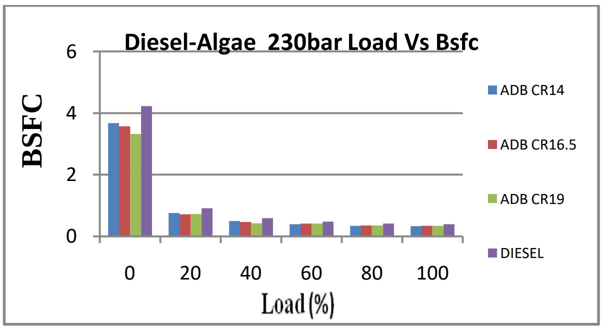


Variation of Shaft output with engine Load(FI-230bar)



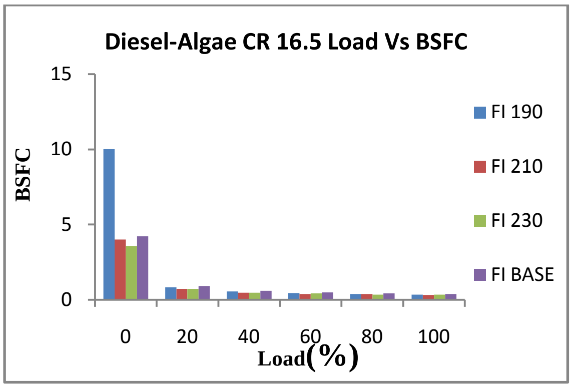
Break Specific Fuel Consumption

The Break Specific fuel consumption is plotted for BSFC Vs Load for different FI combinations shows that for all combinations the BSFC decreases with load.



Variation of Brake Specific Fuel Consumption with engine Load (FI-230bar)

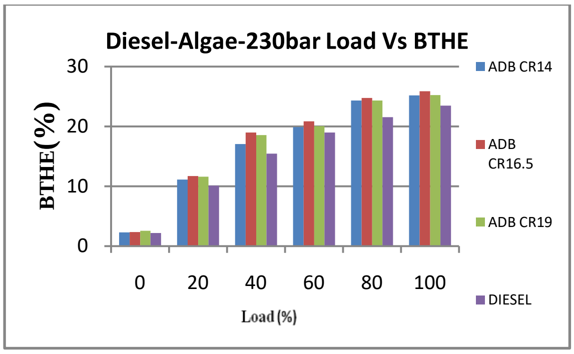
International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Articles available online http://www.ijoer.in; editorijoer@gmail.com
Vol.5., Issue.4, 2017
July-August



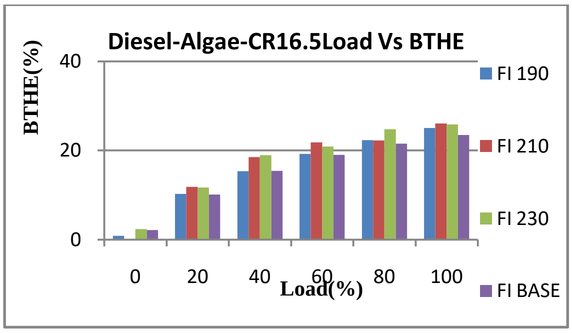
Variation of Brake Specific Fuel Consumption with engine Load (CR-16.5)

Brake Thermal efficiency

The variation of Brake Thermal efficiency for all loads ABDCR16.5 at 230 shows better results.



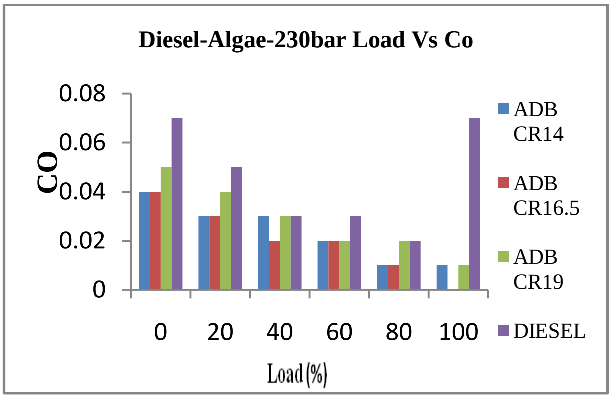
Variation of Brake Thermal Efficiency with engine Load (FI-230bar)



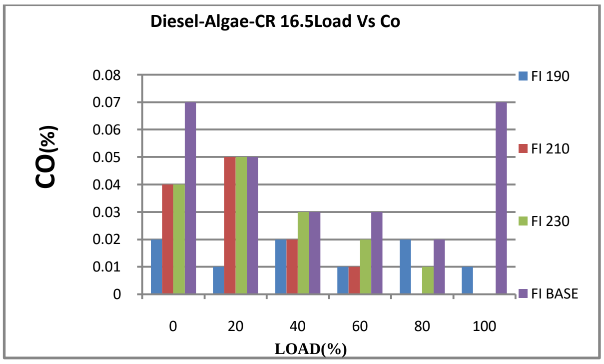
Variation of Brake Thermal Efficiency with engine Load (CR 16.5)

Carbon Monoxide (CO)

The comparison of carbon monoxide for various biodiesel with respect to loads shows in fig. Carbon monoxide (CO) occurs only in engine exhaust, it is a product of incomplete combustion due to insufficient amount of air or insufficient time in the cycle complete combustion. In diesel engine combustion takes places normally at higher A/F ratio, therefore sufficient oxygen is available to burn all the carbon in the fuel fully to CO_2. It was noticed that CO emission of diesel is very high compared to ABD20 at all compression ratios.



Variation of CO with Loads Using 230bar



Variation of CO with loads using CR16.5

V CONCLUSIONS

The experiments were conducted with Algae biodiesel (ABD) by various injection pressure, CR, loads etc. Almost all the experiments were conducted at a constant speed of 1500 rpm. Based on this study on Algae biodiesel, we can conclude that the Algae oil can be used as an alternative fuel for diesel engine without any modification. Finally we conclude that the ABDCR16.5 at 230 gives the better performance and less emissions have been to justify the potentiality of the Algae oil methyl esters of as alternative fuel for compression ignition engine fuel.

VI. REFERENCES

[1]. R.SamsukumarPerformance and Emission Analysis on C.I Engine with Palm Oil Biodiesel Blends at Different Fuel Injection Pressures Vol. 4, Issue 4, April 2015

[2]. Yi; Alex C. “Pollution control system for an internal combustion engine”, Patent no.5517978, 1996.

[3]. Anand, K., Sharma, R.P. and Mehta. P.S. (2011) Experimental investigations on combustion, performance and emissions characteristics of neat karanji biodiesel and

its methanol blend in a diesel engine. *Biomass and Bioenergy,*35, 533-541.

[4]. Farag, H.A. El-Maghraby, A. and Taha, N.A. (2011) Optimization of factors affecting esterification of mixed oil with high percentage of free fatty acid. *Fuel Processing Technology*, 92, 507-510.

[5]. Ilkilic, C. (2011) An analysis of exhaust emissions on a diesel engine operation by biodiesel. *Energy Sources, Part A*, 33, 298–306.

[6]. 6.J. Xue. Combustion characteristics, engine performances and emissions of waste edible oil biodiesel in dieselengine. Renew. Sustain. Energy Rev. 2013, 23: 350–365.

[7]. A. M. Liaquat, H. H., Liaquat, M. A. Masjuki, I. M. R. KalamFattah, M. A., Hazrat, M. Varman, M. Mofijur, and M. Shahabuddin. Effect of Coconut Biodiesel Blended Fuels on Engine Performance and Emission Characteristics. Procedia Eng. 2013, 56: 583–590.

[8]. G. Tüccar, K. Aydın. Evaluation of methyl ester of microalgae oil as fuel in a diesel engine. Fuel. 2013, 112:203–207.

[9]. R. Behçet. (2011). Performance and emission study of waste anchovy fish biodiesel in a diesel engine. FuelProcess. Technol. 2011, 92: 1187–1194.

[10]. C. D. Rakopoulos, A. M. Dimaratos, E. G. Giakoumis, D. C. Rakopoulos. Study of turbocharged diesel engine operation, pollutant emissions and combustion noise radiation during starting with bio-diesel or n-butanol diesel fuel blends. Appl. Energy. 2011, 88: 3905–3916.

[11]. D. C. Rakopoulos, Combustion and emissions of cottonseed oil and its bio-diesel in blends with either n-butanol or diethyl ether in HSDI diesel engine. Fuel, 2013, 105: 603–613.

[12]. E. Sukjit, J. M. Herreros, K. D. Dearn, A. Tsolakis, K. Theinnoi. Effect of hydrogen on butanol–biodiesel blends in compression ignition engines. Int. J. Hydrog. Energy. 2013, 38: 1624–1635.

[13]. M. H. Mat Yasin, T. Yusaf, R. Mamat, A. Fitri Yusop. Characterization of a diesel engine operating with a small proportion of methanol as a fuel additive in biodiesel blend. Appl. Energy doi:10.1016/j.apenergy.2013.06.012

[14]. G. Knothe, and J. Krahl, The biodiesel handbook. AOCS Press, 2010.

[15]. A. Atmanlı, B. Yüksel, E. İleri. Experimental investigation of the effect of diesel–cotton oil–n-butanol ternary blends on phase stability, engine performance and exhaust emission parameters in a diesel engine. Fuel. 2013, 109:503–511.