Experimental Investigation On Effect Of Al_2o_3 Additive On The Performance Of C.I. Engine Fueled With Bio Diesel

R.GANAPATHI[1],R.NAGARJUNA[2], DR.B.OMPRAKASH[3]

[1]Professor, [2]PG Scholar, [3]Assistant Professor

[1](Dept of Mechanical Engineering, Anurag Engineering College, Kodada, TS, India)

[2](Dept of Mechanical Engineering,JNTUA College of Engineering, Anantapur, AP, India)

[3](Dept of Mechanical Engineering, JNTUA College of Engineering, Anantapur, AP, India)

***Abstract*- Now a days the usage of automobiles has been increased there by the pollution from the automobiles also increased, the fuel consumption in the world particularly in developing countries has been increased at faster rate. In order to reduce the emissions from the diesel engine and to increase the performance we can use biodiesel blends with diesel fuel. In this experimental investigation, the performance, emission characteristics of diesel engine using when aluminium oxide Nano additive added with Apricot oil as a fuel has been studied. The blends were obtained by mixing diesel and esterified apricot kernel oil in the following proportions B10D90 which indicates Apricot biodiesel 10% and Diesel 90%, Similarly B20D80, B30D70 were prepared. And these blends are dosed with Aluminium oxide. The Performance parameters such as brake thermal efficiency, specific fuel consumption, brake power were determined. Exhaust emissions like CO2, CO, NOx and smoke have been evaluated.**

Keywords: Al_2O_3, Apricot oil, Nano additive, Performance.

I. INTRODUCTION

For developing countries like India transportation is very important to become a developed country. The diesel fuelled vehicles are most used vehicles for transportation.as the vehicles are increased the requirement of diesel also increased, where as the availability of diesel fuel is decreasing day to day. The exhaust emissions coming out from the engine are causes the environmental pollution. In order to avoid the environmental pollution and to balance the demand of diesel we are going for alternative fuel to run the diesel engines. There are lot of research works already had been taken in the field of alternative fuel for diesel engine. The aim of this study is to produce methyl ester from the apricot seed oil at optimized conditions and improve the fuel's properties with Al_2O_3 additive. Diesel fuel and blend of apricot seed methyl ester doped Al_2O_3 additive with diesel fuel were tested in a direct injection diesel engine at different load conditions.

The performance and emission characteristics of biodiesel for different vegetable oils have been presented by various authors in various papers, and they have been proven successful alternative fuels (viz. mustard oil, cotton seed oil, kapok methyl ester, and waste cooking oil). Study shows that, on the mass basis, biodiesel has an energy content of about 12% less than petroleum based diesel fuel. It reduces unburned hydrocarbons (UHC), carbon monoxide (CO), and increase oxides of nitrogen (NOx) than diesel-fueled engine. The Neem methyl ester blends i.e., B10, B20, B30 and B40 are running normal during testing of diesel engine. B20 showed very close performance to diesel fuel. "Here the 100% biodiesel is termed as biodiesel and the different blends of biodiesel with diesel fuel are termed as biodiesel mixtures. A few experimental investigations have been reported with a wide variety of metal oxide additives to biodiesel to improve the fuel properties and engine performance as well as to reduce emissions.

II. MATERIALS AND METHODS

2.1 Preparation of biodiesel

The biodiesel used in this study was Apricot oil. This biodiesel was produced from Apricot kernel. In order to use biodiesel as Compression Ignition Engine Fuel, we need to done transesterification process and various blends of Apricot biodiesel and conventional diesel have been prepared by mixing different amount of biodiesel and diesel such B20D80 in which 20% of biodiesel and 80% of diesel fuel is mixed. Similarly the blends B10D90, B20D80, B30D70 were prepared. the properties of Apricot Kernel oil are given in the table

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Properties Of Apricot biodiesel

Viscosity(Mpa.s)	4.25
Density(kg/m^3)	855
Flash point (^{o}c)	68.40
Cetane index	51
Calorific value (cal/g)	9208
Steriec acid(%)	6.7
Oleic acid (%)	6.56

2.2 Doping of Al_2O_3 with biodiesel

Ultra sonication process was used for dosing of Nano additives to the biodiesel blends. The different mixture of fuel was prepared in 1000ml beaker and was kept in ultra-sonication machine for 45 minutes to prepare the homogenous mixture of various combinations. This allows to for uniform mixing of nanoparticles in fuel. Since the performance is more at B20 the Al_2O_3 additive is doped with B20 in different proportion such as 25ppm, 50ppm ,75ppm.

III. EXPERIMENTAL SETUP

In this experimental investigation four stroke, single cylinder, 5HP, water cooled diesel engine.This setup has the provision for electronic measurement of different parameters that eliminates manual errors while taking readings. Separate fuel tank is arranged to supply different proportions of diesel and oil.

Fig.3.1 Experimental Setup

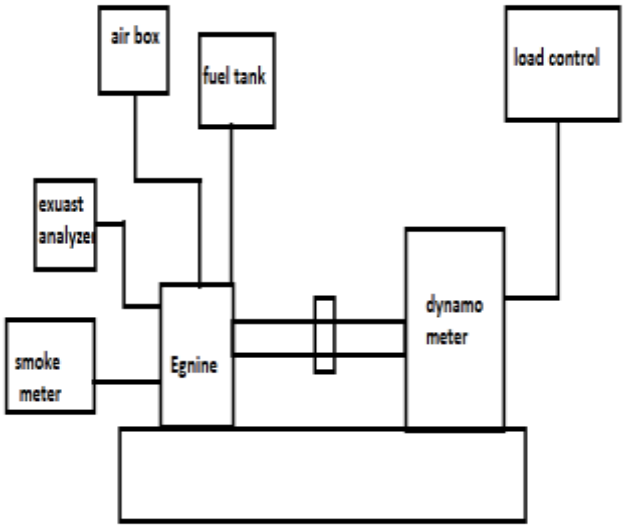

Fig.3.2 Line diagram for experimental setup

3.1 Engine specifications:

Engine	Kirloskar make 4 strokes-stationary
Type of cooling	Water cooled
Rated speed	1500 R.P.M
Bore	80mm
Stroke	110mm
Compression ratio	16.5:1
Rated power	5HP

IV. TEST PROCEDURE

The tests are carried using apricot kernel biodiesel. At first the test is carried out with standard diesel fuel to get the base line parameters, after that the test will be carried out using Apricot biodiesel blends of B10,B20,B30 as fuel in the engine. Then the experimental investigation is carried out by adding Al_2O_3 additive in various proportion i.e., 0ppm,25ppm,50ppm,75ppm.the Al_2O_3 additive is doped to the blend for which the performance. In this investigation with the use of B20, the more performance of the engine is more compared to other blends. So Al_2O_3 is added to B20 blend and the test is carried out.

V. RESULTS AND CONLUSION

5.1 Performance

The brake thermal efficiency of the engine is obtained and it is shown in Figure 5.1. From this we can observe that the brake thermal efficiency is decreased as the concentration of the apricot oil is increased. But for biodiesel B20 the brake thermal efficiency of the engine is very near to diesel fuel.

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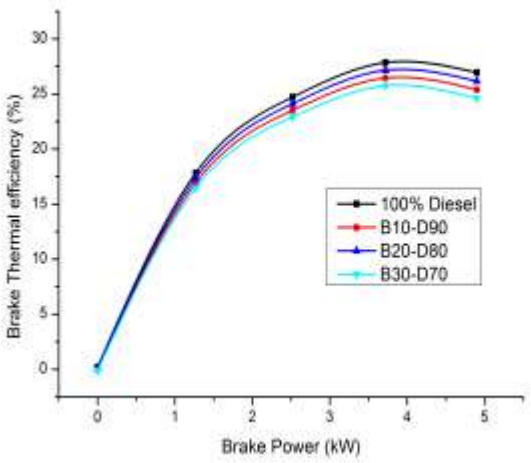
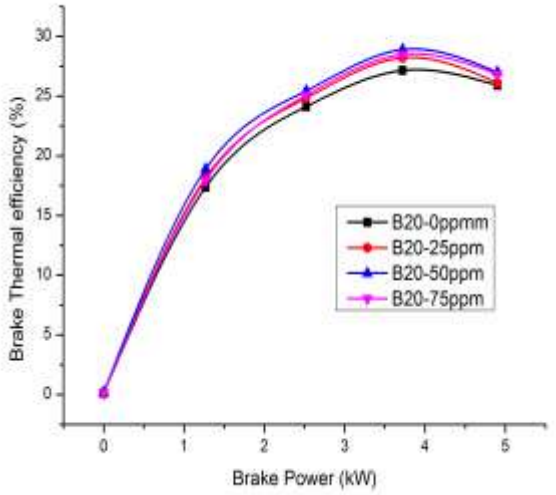


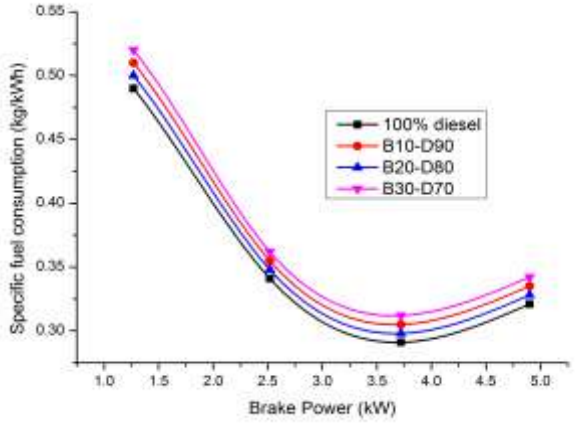
(a)



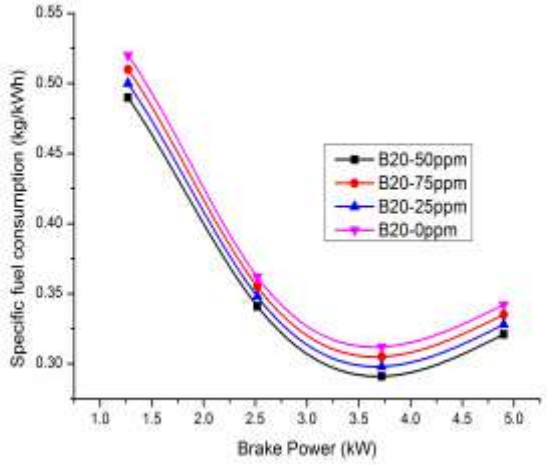
(b)

Fig.5.1 Brake thermal efficiency (a) without Al_2O_3 (b) with Al_2O_3

So Al_2O_3 is added to B20 biodiesel and the graph is drawn for brake thermal efficiency for various proportions of Al_2O_3. From graphs we can observe that Brake thermal efficiency is more for 50ppm of Al_2O_3 with B20 biodiesel



(a)



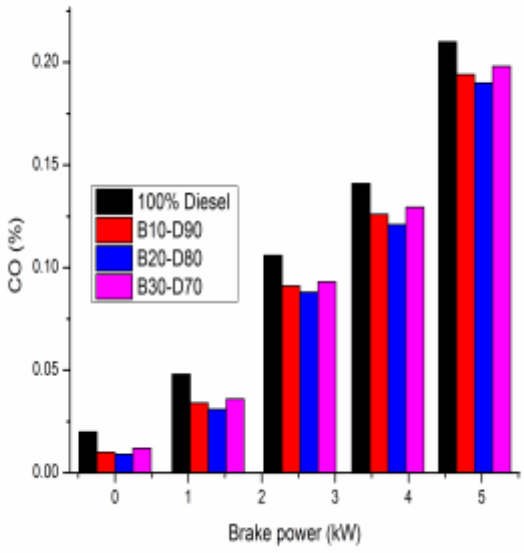
(b)

Fig.5.2 specific fuel consumption (a) without Al_2O_3 (b) with Al_2O_3

Figure 5.2 shows the specific fuel consumption for different Brakepower.specific fuel consumption is compared with 100% diesel and biodiesel blends and effect of Al_2O_3 on fuel consumption is found from this graphs. From grapghs we can observe that SFC is less for B20(in graph (a)),and for 50ppm of Al_2O_3 with B20 (in graph (b))

5.2 Emissions

5.2.1 CO Emissions



(a)

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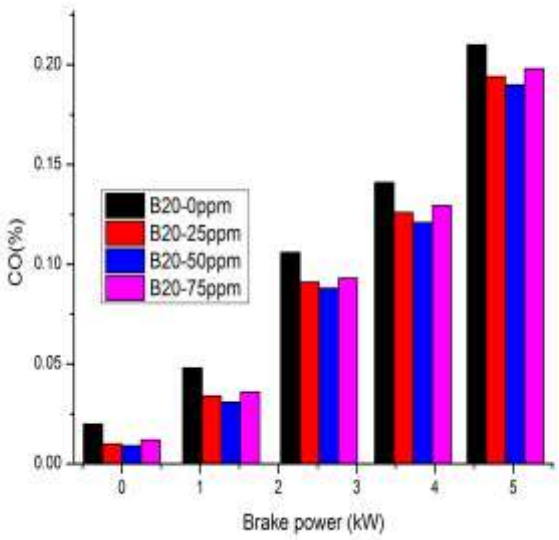


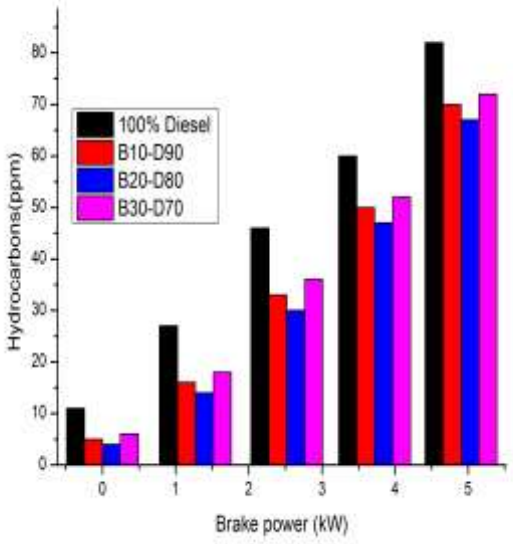
(b)

Fig.5.3 CO emissions (a) without Al_2O_3 (b) with Al_2O_3

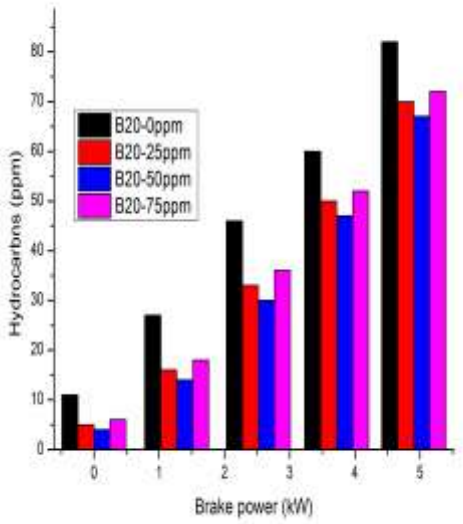
CO emissions from the engine has been decreased with the use of biodiesel compared to diesel fuel. From graph we can observe that CO emissions are reduced with B20 biodiesel compared to B10 and B30. By adding Al_2O_3 with B20 the CO emissions are reduced. For 50ppm of Al_2O_3, CO emissions are less compared to other proportions.

5.2.2 HC Emissions

From figure we can observe the the HC emissions from the diesel engine also reduced with Apricot biodiesel compared to diesel fuel, for B20Apricot oil with Al_2O_3 additive the HC emissions reduced in some extent compared biodiesels with out the additive



(a)

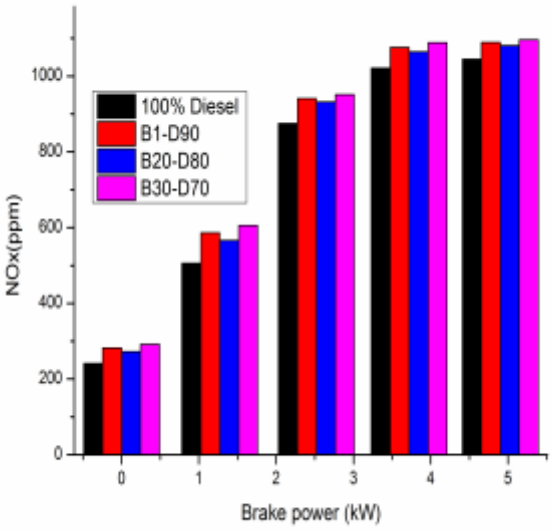


(b)

Fig.5.4 HC Emissions (a) with out Al_2O_3 (b) with Al_2O_3

5.2.3 NOx Emissions

From the graphs (a),(b), we can observe the NOx are increased with use of Apricot oil and compared to diesel. Also we can observe that by adding 50ppm Al_2O_3 additive along with Apricot oil NOx emissions are decreased compared to 25 ppm and 75ppm Of Al_2O_3



(a)

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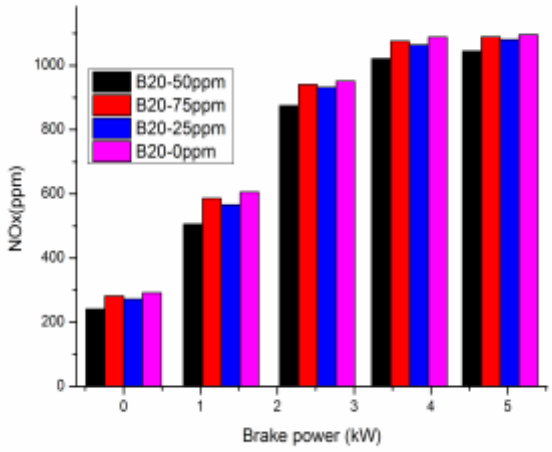

(b)

Fig.5.5 NOx emissions (a) without Al_2O_3 (b) with Al_2O_3

From all the above grapghs we can observe that with the use of AL_2O_3 with B20 biodiesel the performance is increasd and the emissions from the engine has been decreased.

VI. REFERENCES

[1]Mr.S.V.Channapattana,Dr.R.R.Kulkarni. (2009, May) " Bio-diesel as a fuel in I.C. engines". International Journal of Computer Science and Applications Vol. 2,

[2] Dr. B. Omprakash Dr. R. Ganapati." performance and emission characteristics on 4-stroke lhr diesel engine", international journal for science and advance research in technology (IJSART) vol. 3 issue 12.

[3] R. Ganapathi D. Dhanunjaya, B.Omprakash." Performance and emission characteristics of C.I. Engine Using simarouba biodiesel with sc5d additive", National Conference on Emerging Trends in Mechanical Engineering (NC-e TIME-16)

[4] L. Zhu, C. S. Cheung, W. G. Zhang, and Z. Huang, "Combustion, performance and emission characteristics of a DI diesel engine fueled with ethanol–biodiesel blends," Fuel, vol. 90, no. 5, pp. 1743-1750, 2011

[5] Umesh G. Gharat, Raj Kumar Gupta, K. Madhu Murthy "Experimental investigation to reduce emissions of direct injection diesel engine fueled with methyl ester of jatropha oil using antioxidant".

[6] K.M. Shereena, T. Thangaraj, Biodiesel: an alternative fuel produced from vegetable oils by transesterification, Electron. J.Biol. 3 (2009) 67–74.

[7] Swarup Kumar Nayak, Bhabani Prasanna Patta Naik, "Experimental Investigation on Performance and Emission Characteristics of a Diesel Engine Fuelled with Mahua Biodiesel Using Additive." Energy Procedia 54 (2014) 569 - 579.

[8] Mr. Prabhu L, S.Satish Kumar, A.Andrerson and K.Rajan. "Investigation on Performance and Emission analysis of TiO2 Nanoparticle as an additive for biodiesel blends". Journal of Chemical and Pharmaceutical Sciences. Available: www.j chps.com.

[9] Mr.Deresse Firew, N. Ramesh Babu and Mukesh Didwania. (2016, June). "The performance evaluation of (DEE) additive with Diesel blends using Diesel Engine test rig". International Journal of Scientific & Engineering Research, Volume 7, Issue 6.

[10] 1 Sandeep Singh, " Study of various methods of biodiesel production and properties of biodiesel prepared from waste cotton seed oil and waste mustard oil", Thesis of M.E. in Thermal Engineering, Thapar University, 2012.

[11] Mr. Nishant Mohan, Mayank Sharma, R. C. Singh, R. K. Pandey. (2015). "Performance Study of Diesel Engine Using Nanofuel", International Journal of Advance Research and Innovation. Volume 3, Issue 4, pp.665-668.

[12] JV Kumar, B Omprakash, R Ganapathi "Estimating the Performance of a 4-Stroke Si Engine Blending Shale Gas with LPG" International Journal of Engineering Technology Science and Research, Volume 4, Issue 11.

 DOI : 10.18231/2454-9150.2018.0731