Single Cylinder Analysis Performance Diesel Engine

[1]B. NAGAMMA,[2]Mr. B. VENKATA NARAYANA

[1]PG SCHOLAR, DEPEARTMENT OF MECHANICAL ENGINEERING, SRISAI EDUCATIONAL SOCIETY'S GROUP OF INSTITUTIONS-KODAD

[2] ASSISTANT PROFESSOR, DEPEARTMENT OF MECHANICAL ENGINEERING, SRISAI EDUCATIONAL SOCIETY'S GROUP OF INSTITUTIONS-KODAD

ABSTRACT: Automobiles are growing day by day it means usage of automotives are increasing, so usage of fuel also increasing. In this paper will be discuss the use of diesel with ethanol and castor seed oil blends in diesel four-stroke engine. This alternative fuel contains castor oil and ethanol so it reduces the emission compared to diesel. Ethanol is a good cooling agent due to blending of ethanol so the NOx will be reduced. For those mixtures the brake thermal efficiency, brake specific fuel consumption and combustion characteristics are calculated. The gas emissions of NOx , carbon monoxide (CO), carbon dioxide (CO2), hydrocarbons (HC), are being measured by the use of AVL smoke meter. The experimental investigation has been done on single cylinder CI Engine coupled with an eddy current dynamometer, data acquisition system (Kirolskar high speed four stroke diesel engine with 3.2 KW, 1500rpm.) and the result has been recorded

INTRODUCTION:

Energy comes in a variety of renewable forms like wood, biomass, wind, sunlight. It also comes in the non-renewable form of fossil fuels- oil and coal and their use is a major source of pollution of land, sea and above all the air we breathe. Already castor oil was used as a alternative fuel after the esterification process was completed and experimental investigation has been carried out on single cylinder CI Engine and the results has been recorded. They observed lower HC and NO emissions. Brake thermal efficiency and exhaust gas temperature are less compared to diesel [1,6]. In IC engine the addition of diethyl ether and ethanol on engine performance and emissions of a bio-diesel diesel blended fuel engine. It can be used in diesel engine without any modification [2,10]. Two centuries of unprecedented industrialization, driven mainly by fossil fuels, have changed the face of this planet. The present civilization can’t survive without motor cars and electricity. The increasing rate at which the changes in human lives are occurring has important consequences for the environment and carrying capacity of earth. The industrial revolution has brought greatly increased wealth to one quarter of the population and severe inequalities. Pollution and accelerating energy consumption has already affected equilibrium of earth's land masses, oceans and atmosphere. Particularly, important is the loss of biodiversity. Fortunately, the last 25 years has seen growing awareness of some of these consequences. Since the dawn of oil age man has burnt about 800 million barrels of petroleum. About 71 barrels are burnt everyday throughout the world. And this consumption rate goes on increasing by 2% every year. The 2% doubles the quantity every 34 years. Somewhere between 1000 to 1600 billion barrels of fuel consumption are assumed to be in formation where economic recovery is possible. By 2010 the world would have consumed about one-half of the total amounts that is technically and economically feasible to extract. And at the current rate of consumption 1600 billion barrels would be depleted in 60 years. Hence use of castor biodiesel will increase the use of waste land and will generate rural employment [3]. Performance, emission and combustion characteristics of a variable compression ratio engine using methyl esters of waste cooking oil and diesel blends is slight increase in NOx emission, but it is still compare with that of standard diesel fuel and is also in the acceptable range[4,5]. It's high time to think about the alternative fuels. Castor methyl ester blends showed performance characteristics close to diesel. Therefore castor methyl ester blends can be used in CI engines in rural area for meeting energy requirement in various agricultural operations such as irrigation, threshing etc., [7]. Carbon nano particles addition with diesel increases SFC and pressure and decreases the CO emission compare to neat diesel [8]. Some other blends of castor oil experiments give some positive results and addition of three various oils like jatropha oil, palm oil and castor oil increases the yield and obviously give the same diesel emission level [9]. Every research is focusing the NOx and other emissions that the same way corn oil blended with Diesel used as a alternative fuel and the result is CO2 is increased gradually when the load is increased [16]. Everyone was tried to replace the diesel fuel. So, this is the time to think about Alternative fuels.

MATERIALS AND EXPERIMENT

Commercial diesel fuel used in India which was obtained locally is used as a base line fuel for this study. Test fuel samples are

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 03 Issue 17
November 2016

prepared at B. S. Deore College of Engineering and properties are tested from the third party Horizon Services, Chemical Lab at Pune (MS). Density and Heating value of test fuels is as given in the table 1. 20% biodiesel fuel and 80% diesel fuel is called as a BK20 and 80% biodiesel and 20% diesel fuel is called as a BK80. D is referred as pure diesel and K is for Karanja fuel. Viscosity, Density, Moisture and Total acid number in the blended fuel have shown higher value than diesel while the Sulphur level decreased. This is due to higher Viscosity, Density, Moisture and Total acid number and less Sulphur content in Bio-diesel.

ENGINE TEST RESULTS AND DISCUSSION

A. Effect on Break Power of the Engine Experimental results shows that the break power developed by the engine at all the loads for different blends of the fuel is more or less is same. Fig 02 represents the effect of break power vs the load on the engine. Brake power for Karanja fuel is observe to be slightly higher compare with diesel. At 70% loading the brake power Karanja fuel is 1.75% higher than that of diesel. For other blends the brake power for Karanja is also observed to be at higher side

B. Effect on Fuel Consumption of the Engine shows the effect of fuel consumption of the engine for various blends. Results shows that about 20 % loading of the engine fuel consumption for Karanja fuel for all the blends is smaller compare with higher load on the engine. With increase in load on the engine, fuel consumption for Karanja is more. For a blend of BK 40 it is observed that the fuel consumption is less than that of pure diesel. At maximum loading @ 70% the fuel consumption for pure diesel is lower than any other blend. Fig 04 represents Break Specific Fuel Consumption BSFC with respect to the loading of the engine.

C. Effect on Fuel Consumption of the Engine Fig 05 shows the effect on Mechanical Efficiency with respect to the load on the engine. No any significant changes are observed over the entire range of the loading of he engine and different blend %.

D. Effect on Break Thermal Efficiency of the Engine Fig 06 shows the effect on break thermal efficiency of the engine. It is observed that the efficiency of the pure Karanja Biofuel (K) is more than that of the diesel engine. Pure Karanja fuel is having a more fuel consumption as compare with the diesel fuel how ever the heating value is less than that of the diesel fuel. It is also observed that the break power developed by the engine is almost same at all the loads. Theses observations may be the cause that the thermal efficiency of he Karanja fuel is more than that of the diesel fuel. It is also observed that the break thermal efficiency is quite better for biodiesel blends (BK 20 to BK60) compare with the Karanja fuel only. The break thermal efficiency at above 60 % loading is observed as quite high this may be due to the lower exhaust gas temperature as compare with diesel.

E. Effect on Volumetric Efficiency of the Engine Fig 07 shows the effect on Volumetric Efficiency of the engine. Efficiency of the engine with pure karanja biodiesel is observed to be greater than that of the diesel fuel. This may be de to low exhaust gas temperature. Irrespective of the load on the engine volumetric efficiency is observed to be maximum for the blends of BK 40 and BK 60. Maximum volumetric efficiency at about 70% loading of the engine with BK 60 blend the efficiency is observed as 81% where as for the diesel it was 70.13% only. The volumetric efficinecy of Karanja fuel is improved to 5% to 6% compare with diesel fuel at all the loads, however for the blends of B60 K the efficiency is improved at about 10% to 40%

F. Effect on Exahust Gas Temperature of the Engine Fig 08 shows the effect on the exhaust gas temperature of the engine. With increase in load on the engine the exhaust gas temperature increases how ever for Karanja biodiesel the gas temperature is lower than that of the diesel fuel at higher load, where as at low and part load operation it is observed to be greater than that of the diesel fuel. For other blends not much more variation is observed for the gas temperature except for the higher loading. The exhaust gas temperature for the diesel fuel is higher than that of Karanja fuel. However for the blends of BK40 and BK60 are observed to be lower than that of diesel. This may be the results of high A/F. The lower exhaust gas temperature indicates that the effects of dissociation are signifcantly reduced that may reduces the pollutant CO

CONCLUSION

Experimental investigations were performed on single cylinder DI diesel engine. Test where conducted on water cooled 3.75 kW diesel engine. Different fuel blends of Karanja biodiesel, diesel and Karanja biodiesel only where tested. Result shows that the break power of the engine was almost same for all the loads. However break thermal efficiency of the Karanja biodiesel where improved by 3 to 8%, Volumetric efficiency is also improved with reduction in exhaust gas temperature.

Results obtained here shows that the Karanja biodiesel can itself directly used in the engine without any major modification. It is also observed that the blends of BK40 and BK 60 will have the optimum performance for the given conditions as explained earlier.

REFERENCES

[1] M.N. Nabi, M.S. Akhter, M.M.Z. Shahadat, "Improvement of engine emissions with conventional diesel fuel and diesel–biodiesel blends", Bioresource Technology, 2006, 97, 372–378.

[2] J.-H. Ng, H.K. Ng, S. Gan, "Advances in biodiesel fuel for application in compression ignition engines, Clean Technology and Environmental Policy" (2009), doi:10.1007/s10098-009-0268-6.

[3] Government of India. Press information bureau, National policy on Biofuels,. http://pib.nic.in/release/release.asp?relid=56469&kwd. Accessed on Sept 2010

[4] International Energy Agency Energy Balance for India; 2007. http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=IN.

[5] Leduc S, Nataraja K, Dotzauer E, McCallum I, Obersteiner M. "Optimizing biodiesel production in India", Applied Energy, 2009, 86, S125–31.

[6] Wouter M.J. Achten Joana Almeida, Vincent Fobelets, Evelien Bolle, Erik Mathijs,Virendra P. Singh, Dina N. Tewari, Louis V. Verchot, Bart Muys, "Life Cycle Assessment of Jatroha biodiesel as transportation fuel for rural India", Applied Energy, 2010, 87, 3652 – 3660

[7] Dennis Y.C. Leung, Xuan Wu, M.K.H. Leung, "A review on biodiesel production using catalyzed transesterification", Applied Energy, 2010, 87, 1083 – 1095

[8] Coronado CR, de Carvalho Jr JA, Silveira JL, "Biodiesel CO2 emissions: a comparison with the main fuels in the Brazilian market. Fuel Process Technol", Applied Energy, 2009, 90, 204–11.

[9] J. Yan, "Biofuels in Asia", Applied Energy, 2009, 86, S1-S10

[10] Ejaz M. Shahid, Younis Jamal, "A review of biodiesel as vehicular fuel", Renewable and Sustainable Energy Reviews, 2008, 12(9) 2484–2494.

[11] F. Karaosmanoglu, "Vegetable oil fuels: a review", Energy Sources 1999, 21 (3).

[12] A.S. Ramadhas, "Use of vegetable oils as I.C. engine fuels – a review", Renewable Energy 2004, 29 (5), 727–742.

[13] L.C. Meher, D. Vidya Sagar, S.N. Naik, "Technical aspects of biodiesel production by transesterification—a review", Renewable and Sustainable Energy Reviews, 2006, 10, 248 – 268.

[14] Hüseyin Aydin, Cumali Ilkılı, "Effect of ethanol blending with biodiesel on engine performance and exhaust emissions in a CI engine" Applied Thermal Engineering, 2010, 30, 1199 – 1204.

[15] Christian Rodriguez Coronado, João Andrade de Carvalho Jr., Juliana Tiyoko Yoshioka, José Luz Silveira, "Determination of ecological efficiency in internal combustion engines: The use of biodiesel" Applied Thermal Engineering, 2009, 29, 1887 – 1892.