ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

Review on Performance Parameter and Emission Characteristics of Four Stroke Diesel Engine Fuel Blended with Sesame Oil and Diesel.

Nilesh Kumar Sharma*, Prof. A.C.Tiwari
*P.G. Student, Prof., Mechanical Department, UIT-RGPV,Bhopal, India
nsharma12525@gmail.com

Abstracts

When vegetable oil used in CI engine causes some problem due to their high viscosity compared with conventional diesel fuels. Various techniques & methods are used solve the problems of high viscosity. One of these techniques fuel blending. The vegetable oil used in blending is sesame oil is blended with diesel fuel in diesel engine & showing its effects on performance parameter and emission characteristics of single cylinder 4 stroke diesel CI engine. The sesame oil blended in varying proportion with diesel fuel in the CI engine and performance parameter & emission characteristics are evaluated and compared with diesel operation.

Keywords: Sesame oil, Alternative fuel, Single Cylinder four Stroke CI engine, Performance parameter, Exhaust Emission.

Introduction

The depletion of Fossil Fuels takes place because they are widely used in the world so the necessitate the usage of alternative renewable energy sources in present day. By using vegetables oil in diesel engine produces same amount of power with slightly lower thermal efficiency. The major advantages of vegetable oil are that hazardous engine emissions reduced. Vegetable oils are organic compounds which are composed of simple straight chain to complex structure of proteins & fat-soluble vitamins. Vegetable oils are triglycerides with a no. of branched chains of different lengths. Vegetable oil creates some problem when it is used in engine; these problems are high viscosity, low volatility & polyunsaturated character of neat vegetable oil. Some common problems arising in engine when it run by vegetable oil are coking and trumpet formation on the injectors, carbon deposits, oil ring sticking & thickening & gelling of lubricating oil as a result of contamination by the vegetables oils. Different techniques are used to reduce the viscosity & make them suitable for engine application. Second largest producer of sesame oil is India in the World. 3rdlarghest producer of sesame seeds is India but 2nd largest producer of oil just because of faulty harvesting practices associated with the seed production. Sesame being a sub continental shrub can grow anywhere in waste lands, low laying planes and region with scarcity of water.

Properties of Sesame oil

The properties of sesame and diesel oil are shown in table no. 1

Property	Diesel	Sesame
Heating Value(Kj/Kg)	42900	39349
Density(Kg/I)	0.815	0.913
Viscosity(mm^2/s)	4.3 at 27^0C	35.5 at 38^0C
Cetane No.	47	40.2
Flash Point (^0C)	58	260
Sulfur(%)	<0.01	0.01
Carbon Residue(%by weight)	<0.35	0.25

Sehmus Altun et. al.(2008) evaluated in his performance test, using blending of 50% sesame oil & 50% Diesel fuel. As seen from the figures, engine torque & power are low at low engine speed but when engine speed is increased, the engine torque and power increases. Power reaches its peak value then it decreases. Engine Torque & power are slightly lower when compared with ordinary diesel fuel. This is because of lower heating value of blend fuel and not mixing of air and fuel properly which cause bad combustion. Specific fuel consumption is high at low speed. By increasing the speed of engine fuel consumption decreases then it reaches maximum value. Friction and heat losses increases at high speed, That's why SFC increases it is due to low heating value and high density of sesame oil. CO is the toxic product of combustion due to the improper burning of

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

hydrocarbon(HC). CO emission is less when engine speed is high & blend produces significantly lower CO emissions than that of diesel fuel. Wanget al. also investigated that only on the point of engine full load, the CO emission of vegetable oil and its blends are lower than that of diesel fuel.

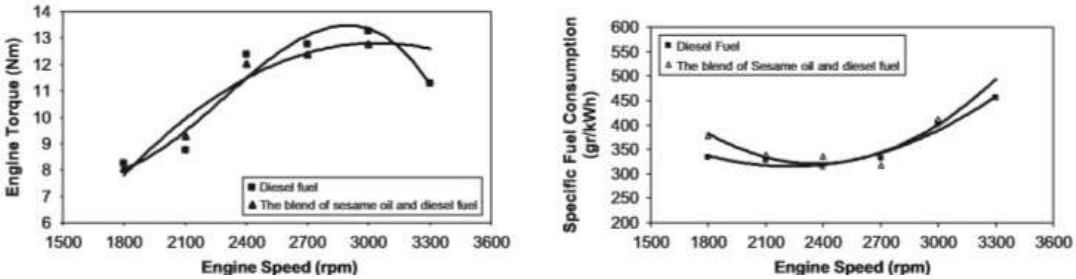

Fig.1&2 shows the variation of engine torque and SFC with engine speed for sesame oil and its blends with diesel.

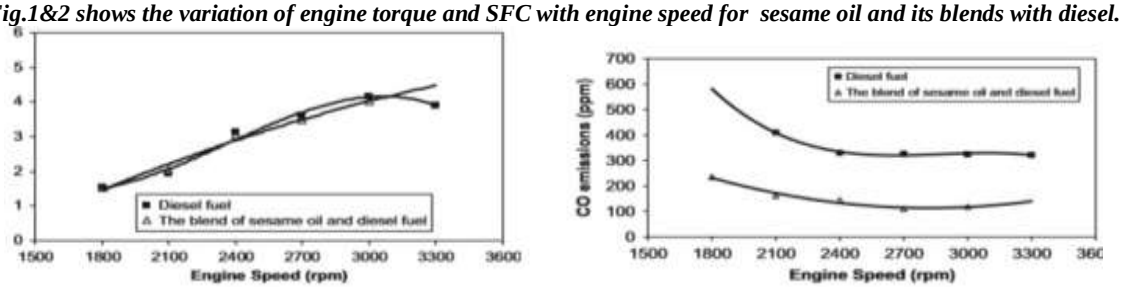

Fig.3&4 Shows the variation of engine power & CO emission with engine speed for sesame oil blends with diesel.

N.R. Banapurmath, P.G.Tewari(2007) evaluated in his performance by using blending of Honge oil; Jatropha oil;Sesame oil;in the diesel fuel. There is gradullay incresase in efficiency as the load increases in the diesel ,HOME,JOME,and SOME operations. The BTE always lowest with the JOME as compared to the other fuels. Among othe biodiesel fuels, the BTE was recorded with SOME is 30.4% at 80% power output compared to 31.25% for diesel.For HOME and JOME were 29.51% & 29% respectively at 80% load. The BTE is less for biodiesel due to poor mixture formation as a result of the low volatility, higher viscosity & density. It is clear from the fig. that smoke opacity for JOME is 70.0 HSU,which is higher in comparison with oter fuels. For SOME it is 62.0 HSU. This is least among the biodiesel tested. Smoke opacity values for JOME,SOME& HOME were 67,70& 62 HSU at 80% load respectively, compared to 53 HSU with diesel operation. The effects of Brake Power on HC & CO emissions for diesel, methyl ester of HONGE JATROPHA & Sesame oils are shown in figures respectively. Hydrocarbon emissions were higher than standard diesel oil. HC emission values were67,60& 65 ppm for JOME,SOME & HOME respectively,compared to 40.5ppm with diesel operation at 80% load, emission of HC is High as compare to ordinary diesel due to poor atomization & lower volatility of biodiesel. Formation of nitrogen oxides depends on maximum temperature inside the cylinder. From experimentally it was observed that NO_x emissions were higher for diesel operation compared to biodiesels, because of heat releasing rate is very lower for biodiesel. So temperature is minimum as compare to diesel fuel. Nitrogen oxides emission values were 970,1000& 990ppm for JOME ,SOME & HOME respectively, compared to 1080 ppm with diesel operation at 80% load.

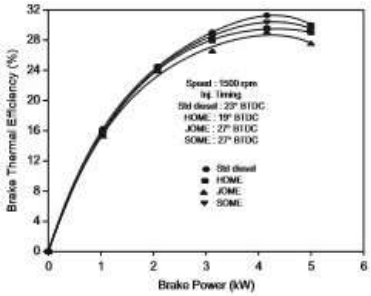

Fig. 1 shows the variation of BTE with brake power for JOME,SOME biodiesel blended with diesel fuel

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

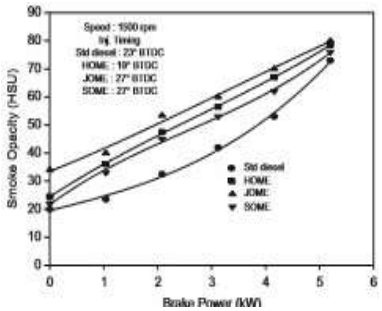

Fig. 2 shows the variation of smoke opacity with brake power for JOME,SOME biodiesel blended with diesel fuel

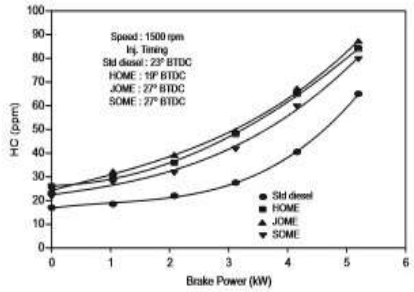

Fig. 3 shows the variation of HC with brake power for JOME,SOME biodiesel blended with diesel fuel

H.Rahmen el. at (2007) concluded that in his experiment , he was taken a mahua oil blended with diesel oil in single cylinder four stroke diesel engine. The Changes of BSFC with load for different blends of mahua oil in diesel is shown in fig.1 Fig1. Shows the BSFC increases with increasing amount of mahua oil & maximum for B100, But with increase of load BSFC decreases for all fuels. At higher loads heat losses is minimum for engine. So amount of required fuel decreases with increase in load. The mean BSFC for the Blends was higher than that of pure HSD by 4.3%, 18.6%,19.6%.,31.7% & 41.4% respectively for every 20% additional blending of biodiesel in diesel. BTE in general, reduced with increasing concentration of B100 in the blends. The maximum BTE observed were 25 & 24 for B20 and B40, respectively, as compared to 24% for diesel. This is due to presence in of increased amount of oxygen in B20 which improves the combustion as compared to pure diesel. The mean BTE of B100 was about 10.1% lower than that of HSD.

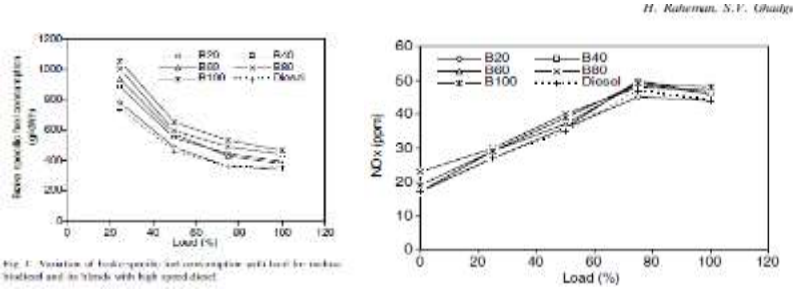

Fig.2 Variation of NO_x emission with load for mahua biodiesel and its blends with high speed diesel.

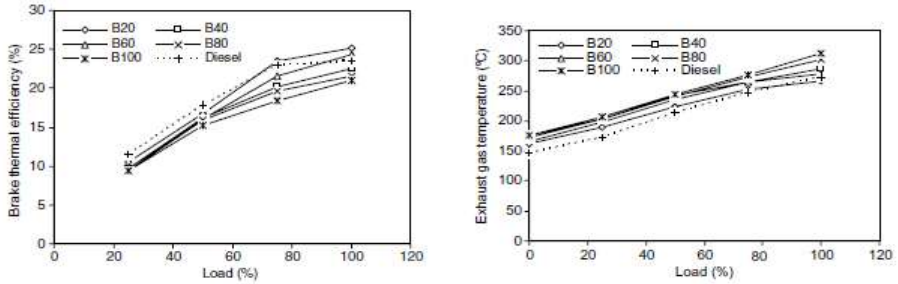

Fig. 3&4 the variation of BTE and EGT with engine load of mahua biodiesl and its blends with high speed diesel.

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

Md.Nurun Nabi el. at (2009) investigated in his experiment in single cylinder four stroke diesel by using cotton seed oil and evaluate engine performance & exhaust emission. Fig. shows the viscosity of diesel and biodiesel blends with respect temperature. It is clear from the figure that viscosity of all the fuels decreases with increase in temperature because at high temperature intermolecular attraction between different layers of the fluid decreases, thus viscosity decreases. High viscous fluid will not break into fine particle. On the other hand when the viscosity is too low, the fuel will not lubricate the moving parts of the injection pump & injection nozzle. So due to low viscosity rapid wear those part. For operating temperature range 20-40^{0}C up to B50 can be effectively used. Fig. shows the efficiency increases with increase the engine torque & after reaching peak value efficiency decreases with increase of torque. With increasing engine torque BSFC decreases & becomes minimum and then increase again. It is clear from the figure that in case of biodiesel mixtures, the BSFC values were determined to be higher than those of ordinary diesel fuel.

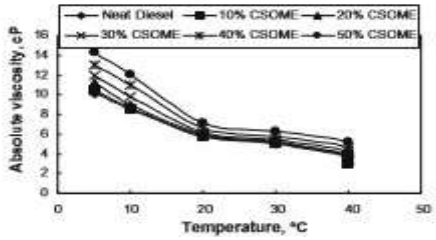

Fig. 1 Shows the variation of absolute viscosity with temperature for Cotton seed oil blended with diesel fuel.

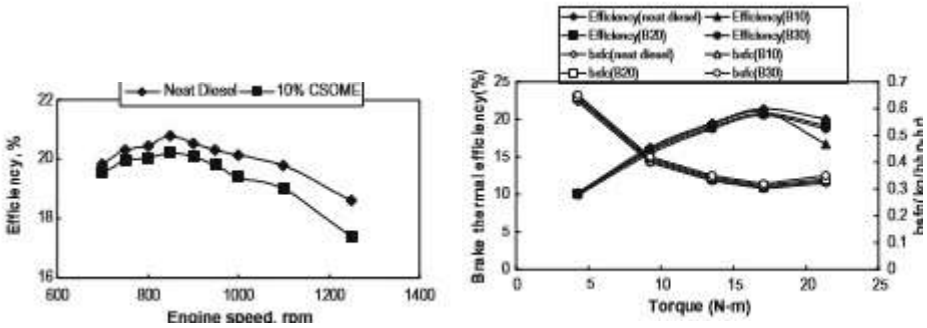

Fig. 2 Shows the variation of efficiency with engine speed for cotton seed oil blended with diesel fuel & Fig.3 shows the variation of BTE & BSFC with engine torque for sesame oil blended with diesel fuel.

Conclusion

From the above review it is concluded that the blend of sesame oil and diesel improve the engine performance and emission characteristics. The sesame oil has ability to be used as a blending. The properties of the sesame oil are heating value 39349(kJ/kg),viscosity 35.5(at 38^{0}C)mm^2/s, density(kg/I)0.913,cetane no.40.2and flash point 260^{0}C. From above we can say that sesame oil has all the ability to blend with diesel engines. The main aim of this work is to find out the blended fuel for diesel & to make economical blend which gives improved performance and emission characteristics.

References

1. Srivastava A, Prasad R. Triglycerides-based diesel fuels. Renew Sustain Energy Rev 2000;4:111–33.
2. Vellguth G. Performance of vegetable oils and their monoesters as fuels for diesel engines. SAE paper no. 831358, 1983.
3. Demirbas A. Biodiesel production from vegetable oils via catalytic and non-catalytic supercritical methanol transesterification methods. Int J Prog Energy Combust Sci 2005;31:466–87.
4. Jajoo BN, Keoti RS. Evaluation of vegetable oils as supplementary fuels for diesel engines. In: Proceedings of the XV national conference on I.C. engines and combustion, Anna University, Chennai, 1997.
5. Recep A, Selim C, Huseyin SY. The potential of using vegetable oil fuels as fuel for diesel engines. Int J Energy Convers Manage 2000; 42:529–38.
6. Pramanik K. Properties and use of Jatropha curcas oil and diesel fuel blends in

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

compression ignition engine. Int J Renew Energy 2003; 28:239–48.
7. Nabi MdN, Akhter MdS, Mhia Md, Zaglul S. Improvement of engine emissions with conventional diesel–biodiesel blends. Int J Bioresource Technol 2006;97:372–8.
8. Agarwal D, Agarwal AK. Performance and emission characteristics of a Jatropha oil (preheated and blends) in a direct injection compression ignition engine. Int J Appl Therm Eng 2007;27:2314–23.
9. P.G. Tewari,N.R. Banapurmath Performance and emission characteristics of a DI compression ignition engine operated on Honge, Jatropha and sesame oil methyl esters
10. H. Raheman, S.V. Ghadge Performance of compression ignition engine with mahua (Madhuca indica) biodiesel
11. Sehmus Altun, Husamettin Bulut, The comparison of engine performance and exhaust emission characteristics of sesame oil–diesel fuel mixture with diesel fuel in a direct injection diesel engine.
12. Hamid Yeganeh, Mohammad Reza Mehdizadeh Synthesis and properties of isocyanate curable millable polyurethane elastomers based on castor oil as a renewable resource polyol.
13. Md. Nurun Nabi, Md. Mustafizur Rahman, Md. Shamim Akhter, Biodiesel from cotton seed oil and its effect on engine performance and exhaust emissions.
14. K. Nantha Gopal, Arindam Pal, Sumit Sharma, Charan Samanchi, K. Sathyanarayanan, T. Elango, Investigation of emissions and combustion characteristics of a CI engine fueled with waste cooking oil methyl ester and diesel blends.