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PERFORMANCE TEST FOR LEMON GRASS OIL IN TWIN CYLINDER DIESEL ENGINE

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ABSTRACT

At present every country is facing two major challenges namely energy crisis and environmental degradation. Carrying need of the day is to mean fuel, more fuel and cheaper fuel. More over the growing use of petroleum fuels in the ever increasing number of automobiles is causing rapid degradation of environment in every country due to vehicle exhaust pollution. To meet this twin problem of fuel oil scarcity and air pollution caused by the growing use of petroleum fuel, alternate renewable clean burning fuel should be explored for using motor vehicles. Alternate fuel is very essential that of alternatives for the fossil fuels such as jatropha, pongamia, lemongrass oil, etc. It has been found that now a day's bio-diesel plays an important role in the automobile industry. This project aims at reducing the cost of the fuel consumers by blending the lemongrass oil with diesel with different proportions and testing the performance of blended diesel. The tests were carried out for raw lemongrass oil, 20% lemongrass oil, 40% lemongrass oil, 80% with diesel. The performance were studied and it is concluded that, the bending of 20%, 40%, 60%, 80% and 100% at room temperature gives better fuel consumption and also improves emission norms.

Keywords: lemongrass oil (geranial), neral β-myrcene, hydrodistillation.

INTRODUCTION

Bio - diesel is methyl or ethyl ester of fatly acid made from virgin or used vegetable oil (both edible and non edible) and animal fats. In our lemongrass oil, there is no fatly acid, no wax content. The other name of the lemongrass oil is citral, geranial, neral, etc., B 20 (a blend of 20% by volume Bio-diesel with 80 % by volume petroleum diesel) as an demonstrate significant environment benefits in US with a minimum increase in cost for fleet operation and other consumers. Bio-diesel is registered as a fuel and fuel additives with the US environmental protection agency and clean diesel standards established by the California Air Resources Board. Neat (100%) the department of energy and department of transportation of US have designed Bio-diesel as an alternate fuel. Studies conducted with Bio-diesel on engine have shown substantial reduction in particulate matter (25 to 50%). However a marginal increasing on NOx (1 to 6%) is also reported, but it can be take care of either by optimization of engine parts or by using De-NOx catalyst. HC and CO emissions were also reported to be low here. On regulated emissions like PAH etc were found to lower.

Bio - diesel has been accepted as clean alternative fuel by US and its production is about 100 million gallons. Each state has passed specific bills to promote the use of Bio - diesel by reduction of taxes sunflower oil, rapeseed etc., Thailand uses palm oil. Ireland uses fired oil and animal fats. Due to its favourable properties can be used as a fuel for diesel engine (as either B5- a blend of 5% Bio - diesel in petroleum diesel fuel or B20 or B100).

USA uses B20 and B100 Bio - diesel. France uses mandatory in all diesel fuels it can also be used as additive to reduce the overall sulphur content of blend and to compensate for lubricity lost due to sulphur removal from the diesel fuel. The viscosity of Bio - diesel is higher (1.9) to 6 cst) and it is reported to result in to gum formation on injector, cylinder liner etc if used in neat form. However blends up to 20% should not give any problem. While an engine can be designed for 100% Bio-diesel use, the existing engines can use 20% Bio- diesel blend without modification and reduction in torque output. In USA 20 % Bio-diesel blend is being is used, while in European countries 5-15% blends have been adapted.

MATERIALS AND METHODS

Properties of lemongrass oil

Lemongrass oil has a lemony, sweet smell and is dark yellow to amber and reddish in colour with a watery viscosity.

Specific gravity	0.9253
Density	925.3 kg/m^3
Calorific value	8829 kcal/kg (37000 kJ/kg)
Viscosity	4.16 Ns/m^2

Engine specification

Engine manufacturer	Kirloskar oil engines ltd
Bore and stroke	87.5 x 110 (mm)
Number of cylinders	2
Compression ratio	17.5: 1
Speed	1800 rpm
Cubic capacity	0.661 litres
Method of cooling	water cooled
Fuel timing	27º by spill (btdc)

Experimental procedure

a) The lubrication oil level, fuel supply and water supply are ensured.

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b) The engine is started by opening the two decompressor lever and cranking with the help of handle.
c) After the engine reaches the minimum speed another decompressor lever is opened.
d) The engine is allowed to run on no load for sometimes.
e) At no load conditions the following readings are noted.
f) The experiment is repeated for the various loads and corresponding readings are noted.
g) Check the lubricating oil level, Fuel level and cooling water supply.
h) Crank then engine using handle oat no load condition.
i) Readings were taken for the following:

(i) Time taken for 10cc of fuel consumption.
(ii) Voltage required(volts)
(iii) Current required(amps)

j) Change the load conditions according to our requirements and readings were taken.
k) The specific fuel consumption and Brake thermal efficiency were calculated.
l) The above procedure is followed for other tests.

RESULTS AND DISCUSSIONS

Load Vs TFC

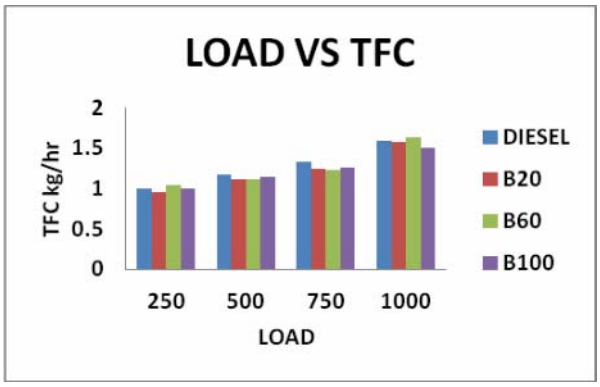

Figure-1. Load Vs TFC.

When compared to diesel with blended lemongrass oil in the ratio of B20, B60 and B100, the Figure-1 shows that the diesel has more TFC in heavy load and B100 have less TFC. Comparing of B100 with diesel the 0.08% of TFC is decreased in B100.

Load Vs SFC

Compare to diesel with B100 of lemongrass, the SFC value is very much closer to the diesel is shown in Figure-2.

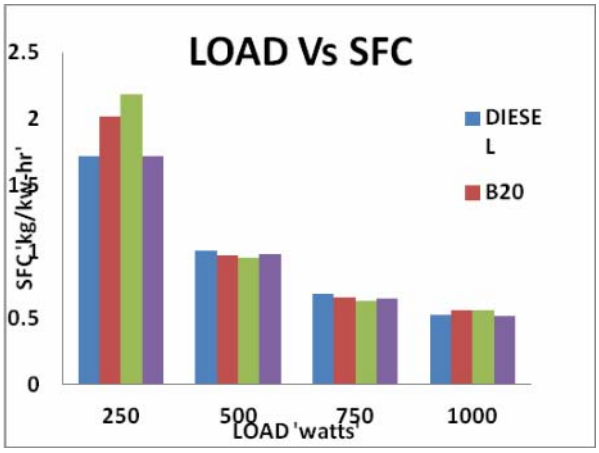

Figure-2. Load Vs SFC.

Load Vs BTE

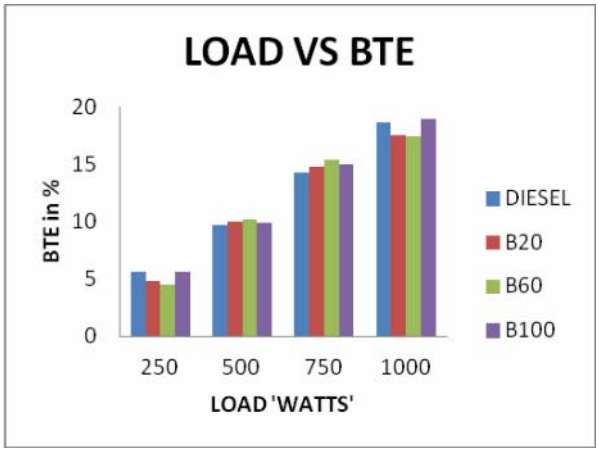

Figure-3. Load Vs BTE.

The brake thermal efficiency is increased in the blended lemongrass for B100 is shown in Figure-3. The brake thermal efficiency is high in lemongrass oil compared to diesel, because of the present of oxygen in lemongrass oil, the combustion efficiency is increases, so the brake thermal efficiency also increased.

Load Vs ME

As the load increases for diesel and blended lemongrass in the range of B20, B60, B100, the mechanical efficiency is very much closer to the diesel is shown in Figure-4. When compared to B100 and diesel all the values of mechanical efficiency is very much closer to the diesel.

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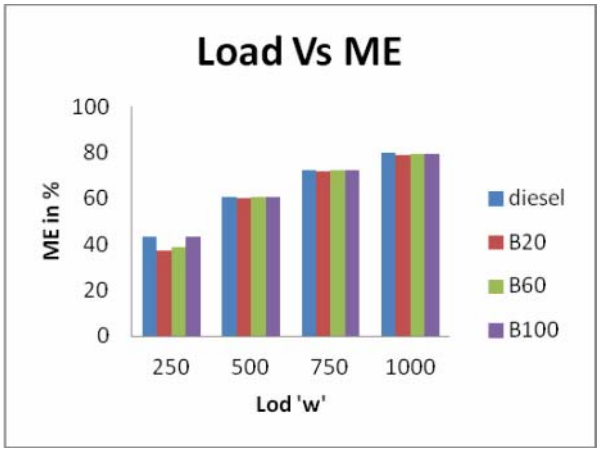

Figure-4. Load Vs ME.

CONCLUSIONS

From the results and discussions the blended lemongrass B100 has high brake thermal efficiency is high for all the blended lemongrass oil, all mechanical efficiency values were very much closer to diesel for B20, B60-B100. Only in B40 the mechanical efficiency is high compared to diesel. In B20 and B 60 for high load, the specific fuel consumption is high compared to diesel.

We have taken the calculation only at the room temperature. If the oil may be preheated to 400, 500, and 600 may be increased the efficiencies.

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