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EXPERIMENTAL INVESTIGATION ON DIESEL ENGINE TO IMPROVE EMISSION AND PERFORMANCE CHARACTERISTICS BY THE USE OF HELICAL GROOVED INLET MANIFOLD PLACED AT VARIOUS ANGLES

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***Abstract*— It is believed that crude oil and petroleumproducts will become very costly and scarce. Fuel economy of engines getting improved and will continue to improve. With increased use and depletion of fossil fuels, alternatives fuels technology will become more common. This led to the search for an alternative fuels which should not only environment friendly but also sustainable without compromising on the performance. Many alternatives fuels gave improved performance ,specifically vegetable oil present a very hopeful alternative fuel for diesel oil because they are renewable,clean burning and having properties analogues to that of the diesel. Here, in this study we use cotton seed oil as a biodiesel. The main problem related with the combustion in C.I.engine is to get the homogeneous mixture of fuel and air. Air motion in compression ignition engine influences the distribution and atomization of fuel injected into the combustion chamber. This research include design and orientation of the inlet manifold, which is a major factor affecting the emission and performance of the engine .Swirl greatly enhances the mixing of diesel and fuel to give better homogeneous mixture within a short time. This paper aims at studying the performance and emission characteristics of water cooled engine by directing the airflow with helical spring in the intake manifold with waste cooking oil biodiesel blended with diesel in varying proportions on volume basis. Tests were carried out for pure diesel and biodiesel blend various parameter such as brake power,fuel consumption and mean effective pressure are calculated .The test results indicates that blend B25(25% of cotton seed oil,75%biodiesel)gives better performance and emission results compare to all fuel mixture and diesel under this study.**

Keywords:Cotton Seed Oil, Helical Spring, Swirl,Single cylinder 4 –Stroke diesel engine, Exhaust emission.

I. INTRODUCTION

Oil (and its products) is one of those commodities which face inelastic demand despite price rise, which can be understood from the fact that despite 12% price rise the demand for oil and its products has risen by 15% per annum.

It is precisely due to these reasons (and some other minor reasons) that the government has taken all the liberty in deciding the oil prices at the behest of OMC (Oil manufacturing Companies). Currently state retailers control virtually all, about 93 per cent of retail trade.

Let us look at the history of oil pricing in our country. Immediately after independence the cost realization to the oil companies in the country was linked to the 'import parity' type of pricing, known as the 'Value Stock Pricing' (VSA). This mechanism was basically a cost-plus formula to the import price, which included added elements of all the costs such as shipping charges up to the Indian ports, insurance, transit losses, import duties and other Levies and charges.

The VSA was followed by the Administered Price Mechanism (APM) which actually involved artificial price fixing by the government from time to time and hike or reduction in the prices become a political decision, rather than being a rational economic decision. The decision to dismantle the APM was aimed at gradually shifting from artificial pricing of petroleum products towards a situation where the price is determined by the market forces of demand and supply. Hence, as a conscious policy decision, the government brought into the Force a new pricing mechanism with effect from April 1, 2002.

The new mechanism was designed to partially insulate the prices of petroleum products in the country from volatile international crude oil prices. At the same time it was to ensure that the prices of certain products like kerosene and LPG remained subsidised as per the government policy. But despite the subsidies India is one those places where we have exorbitant petroleum prices.

II.TESTED ENGINE

Fig 1:TESTED ENGINE PHOTOGRAPH.

***FOUR STROKE, SINGLE CYLINDER VERTICAL WATER COOLED DIESEL ENGINE* Make & Model**	**Kirloskar TV-1**
POWER	**5.2 Kw**
SPEED	**1500 rpm**
BORE DIA.	**87.5 mm**
STROKE	**110 mm**
CR RATIO	**17.5:1**

Table 1: SPECIFICATIONS OF THE ENGINE

PROPERTIES	DIESEL	Cotton Seed OIL
Density at 15 ºC, g/cm³	**0.822**	**0.8835**
Viscosity at 40 ºC, mm²/s	**3.4**	**5.02**
Flash point, ºC	**71**	**150**
Cetane Number	**45**	**51**

Table 2: PROPERTIES OF COTTON SEEDOIL BIODIESEL & DIESEL

INLET MANIFOLD

Intake manifold in simple in design, but the processes is occurring inside manifold too complex because the air flow is not steady and is pulsating. There several restrictions in designing intake manifold as document by auto ware (1999) and are list below

i. The manifold must to be short as possible to minimize the fueldeliverylag.
ii. The air is hard to be sucked by the vacuum if the diameter of runner is too small in comparison to the combustionchamber.
iii. The wall of runner cannot be too rough and jagged than can cause friction to the air to down. There restrictions severely limited by the number of manifold tuning, however the function of intake manifold for PFI system is slightly different compared carbonated system for PFI system fuel injector is controlled electronically and only air flows inside the intake manifold, while the

fuel is injected directly intake port. Although the intake manifold for PFI system slightly different those restrictions still need to be tackled successfully the first two challenges as listed above are the main factors needed to be considered runner size (diameter) and length.

5.1. Performance Analysis at200 bar & 23° btdc

5.1.1 SpecificFuel Consumption (SFC)

The Specific fuel consumption decreases with increase in load. The SFC for biodiesel and its blends were lower than diesel at all loads. The minimum SFC (0.26Kg/Kw-hr) was observed at 30° which was slightly lower than that of diesel (0.28Kg/Kw-hr) at full load.

The decreasing of Specific fuel consumption with increase of load. The biodiesel SFC's and its blends were lower than diesel at all loads. The minimum SFC (0.26Kg/KW-hr) of 30° was made observation and which was slightly lower than the diesel (0.28Kg/KW-hr) at full load.

Figure 2. LOAD VS SFC AT 200 BAR & 23° BTDC

5.1.2. Brake Thermal efficiency (BTE) The higher brake thermal efficiency 34.33% for diesel at 100 % load andthe maximum brake thermal efficiency 32.64% for 30° at full load among the biodiesel blends were observed.

III. BIODIESEL PREPERATION

Biodiesel was prepared by taking one litre of waste cooking palm oil and such oil was heated at a constant temperature of 60° c. Then 2gms of KOH was mixed with 250 ml of methanol and the mixture was added to the preheated waste cooking palm oil and the solution was stirred at speed of 400 RPM and heated at a constant temperature of 60° C for 2 hrs. After that the solution was kept in a stagnant condition to separate the biodiesel and glycerine for 3 days. Then the biodiesel was washed with distilled water to remove the excess methanol, KOH. The biodiesel yield was about 85%.

IV.PERFORMANCE AND EMISSION ANALYSIS Preparation of cotton seed biodiesel was tested in the C.I.

Engine in the blending ratio of B25 And 0° ,90° and 30° inlet manifold tested at CA 23 ° btdc&200 bar injection pressure, and CA 23° btdc&210 barof injection pressures, and CA 23° btdc at a constant speed of 1500 RPM.

V. RESULTS & DISCUSSION

The analysis of performance and emission for a CI engine at various loads using cotton seed biodiesel and its various angles was carried out at 200 bar&23°btdc and 210 bar &23°btdc. The results were discussed below.

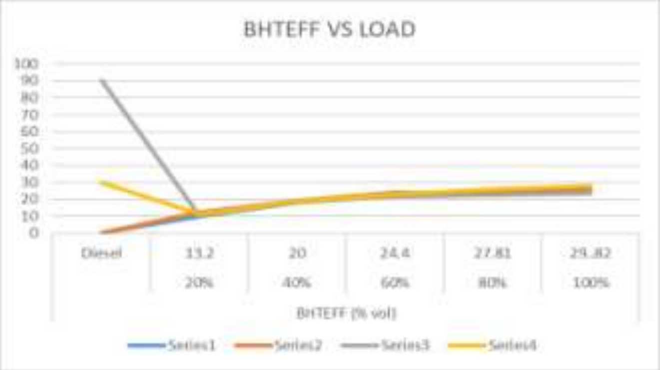

Figure 3 LOAD VS BTHEFF AT 200 BAR & 23° BTDC

The calculations of TFC, SFC, and Brake thermal efficiency were note in the graphs. The emission analysis were also been calculated by connecting the exhaust line with

a five gas analyzer and a smoke meter and the values of CO,HC,CO_2,O_2,NO_X and smoke density were noted

5.2.Emission Analysisat200 bar & 23º btdc

5.2.1. Carbon Monoxide (CO)

The CO emission was lower for biodiesel and its blends than diesel at all loads. The minimum CO 0.073 % emission for 90º was noted.

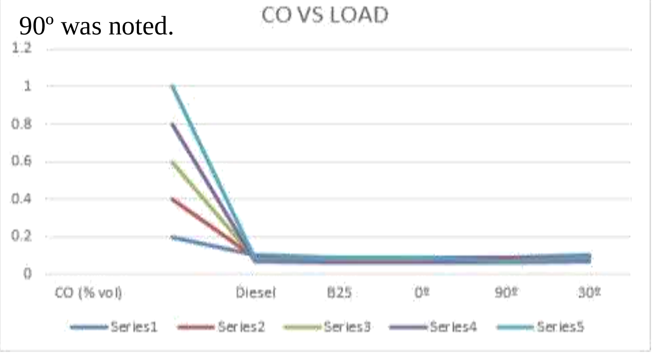

Figure 4.LOAD VS CO AT 200 BAR & 23º BTDC

5.2.2. Hydro Carbon (HC) The HC emission was found to behigher for biodiesel and its blends than that of the diesel fuel. The maximum HC emission (68 PPM) was noted for 30º at full load.

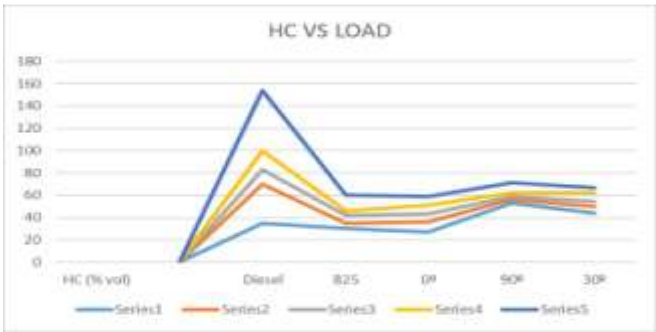

Figure 5.LOAD VS HC AT 200 BAR & 23º BTDC

5.2.3. Oxides of Nitrogen (NO_X) The maximum NO_X emission of biodiesel and its blends was higher than that of diesel for all loads. The maximum NO_X emission (1100PPM) for 90° at full load was observed.

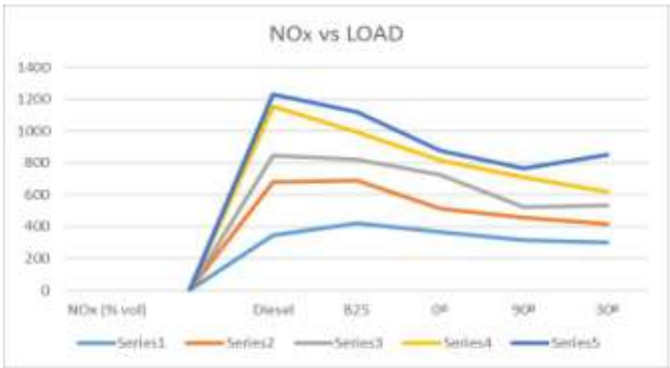

Figure6. LOADVS **NO_XAT 200 BAR & 23° BTDC**

5.3. Emission Analysis at 210bar&21 ° btdc

5.3.1. Carbon-di-oxide (CO_2)

The maximum CO_2 emission (0.79%) was observed for 0°. It was higher for diesel than biodiesel and its blends.

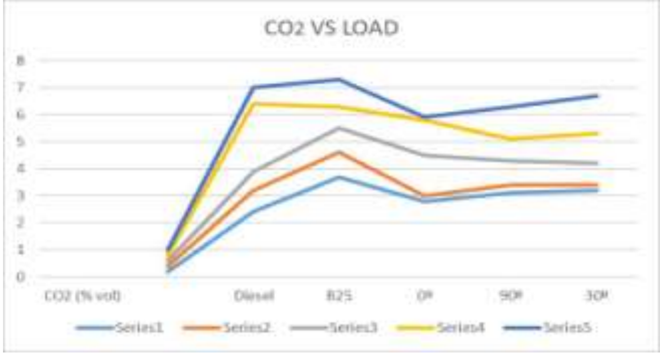

Figure7. LOAD VS CO2 210 BAR & 210 BTDC

5.3.2. Oxygen (O2) The maximum O2 emission of biodieseland its blends was higher than that of diesel for all loads. The maximum O2 emission for 30º at full load was observed.

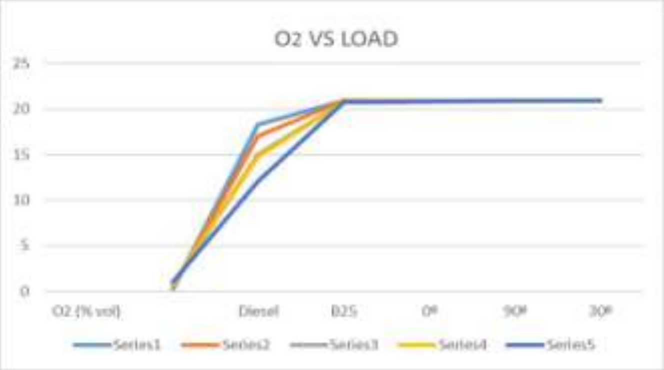

Figure 8.LOAD VS O_2 AT 200 BAR & 23º BTDC

VI. CONCLUSION

While completion of engine experimental test, the following conclusion were analysed from various parameters .

The maximum brake thermal efficiency in 200 Bar & 23^0btdc, 34.33% for diesel at maximum load and the maximum brake thermal efficiency 32.64% for 30º at maximum load among the biodiesel blends were observed. Brake Thermal efficiency (BTE) The higher brake thermal efficiency 34.33% for diesel at 100 % load and the maximum brake thermal efficiency 32.64% for 30º at full load among the biodiesel blends were observed.

The Specific fuel consumption decreases with increase in load. The SFC for biodiesel and its blends were lower than diesel at all loads. The minimum SFC (0.26Kg/KW-hr) was observed at B100 which was slightly lower than that of diesel (0.28Kg/KW-hr) at full load.

The maximum NO_x emission of biodiesel and its blends was higher than that of diesel for all loads. The maximum NO emission (1070 PPM) for 90º at full load

Temission was lower for biodiesel and its blends than diesel at all loads. The minimum CO 0.073 % emission for 90º was noted.

The HC emission was found to be higher for diesel and its blends than that of the diesel fuel. The minimum HC emission (49 PPM) was noted for 90º at full load.

At 210 Bar& 21º btdc, the NO emission was reduced and CO, HC emission were increased. X

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