# Performance Test on CI Engine By Using Honge Biodiesel and Diesel Blends

**Raghavendra Naganur[1], Jishaan D Sirsangi[2]**
[1]Dept of Energy system Engineering
[2]Dept of Machine Design
[1, 2] KLE Tech University Hubballi

***Abstract-*** *Now a days the rate of fossil fuel increases day by day and this produces hazardous emission to environment which leads to global warming. To reduce more dependency on fossil fuel Biodiesel is a best solution and also for above problem. Biodiesel are used to run CI engine because they have similar characteristics and there is no modification in engine. In this work evaluating performance of IC engine using biodiesel with different blending ratio (10%,20%, and 30%) and compare with pure diesel. Here we used honge as the biodiesel because it is easily available and have less cost. To understand the behavior of the engine with biodiesel, the engine was first tested with neat diesel fuel in conventional mode after with the biofuel. Calculating and comparing parameter like Brake power, mechanical efficiency, fuel consumption with different blend. Finally which blend is more suitable to run IC engine with biodiesel.*

***Keywords***- Biodiesel, Honge, Mechanical Efficiency, Break Power(BP).

## I. INTRODUCTION

In Present days we all are more depends on fossils fuels and we didn't think effect of fossil fuels in future, as per the research it is estimated that 2030, the per capita energy consumption may have It is estimated that by 2030, the per-capita energy consumption may have grown to a rate of 0.7% per year several studies have indicated that petroleum reserves will near an end between 2050 and 2075.

To solve above problem biodiesel is best alternative fuel to blend with diesel and use to run the IC engine because it has similar characteristics of diesel so there is no modification required in the IC engine. Biodiesel is easily available with low cost compare to diesel, nontoxic, easy to handle, biodegradable and it is good for environment because it is made from renewable resources and as less emission compare to fossils fuels.

## II. LITERATURE SURVEY

**P.G. Tewari [1]** Demonstrated the engine operation using methyl esters of Honge oil, Jatropha,sesame oils and compared with Pure diesel they reported result in poor execution related with higher emission. The brake thermal efficiency with HOME, SOME and JOME is 29.51%, 30.4% and 29%, separately, at 80% load and 31.25% with diesel. The HC and CO emission with SOME, HOME and JOME are observed to be somewhat more than the diesel operation. Every one of the esters result in marginally higher smoke emission than diesel, and it is credited to the inadequate burning on account of their lower instability and higher thickness. Every one of the esters indicate expanded start postponement and burning span when contrasted with slick diesel

**H. M. Dharmadhikari [2]** The aftereffects of test examination with biodiesel mixes with diesel are contrasted and that of diesel. The outcomes demonstrated that the CO outflows are somewhat less, HC emanations were additionally seen to be less for B10 and B20, and NOx discharges diminished by 39 % for B10 and 28 % for B20 contrasted and B100. The brake warm proficiency of the motor diminished around 6% for all mixes in correlation with diesel, and the break particular fuel utilization was somewhat more for B10 andB20. The consequences of study might be abridged as Karanja and neem based biodiesels can be straightforwardly utilized as a part of diesel motors with no adjustments. The execution is marginally decreased while brake particular fuel utilization is expanded when utilizing biodiesels.

The conclusions got from display test examinations to assess execution on four stroke single chamber diesel motor fuelled with diesel RBO mixes with Ethanol and EHN as added substances are abridged as takes after. Brake warm effectiveness expanded with all mixes when contrasted with the ordinary diesel fuel. The Brake particular fuel utilization is diminished with the mixes when contrasted with diesel. CO, CO2 and HC emanations are diminished altogether with the mixes when contrasted and diesel. From the above investigation the mix RBE35 demonstrates the better

execution contrasted with different mixes (RB25, RB35, RB45, RBE25, and RBE45) and diesel.

**N. Stalin [4]** Here they carried out experiment to evaluate the performance of IC engine using karanja oil. They carried out experiment prony brake-diesel engine set up. They were measured parameter like torque, fuel consumption for different load and calculated parameter like Brake power, brake specific fuel consumption and brake thermal efficiency.

Torque increase as the load increases up to 70% of the load. As they carried out noted torque with different mixture of biodiesel and compared with pure diesel, they observed that for B5 to B40

As load increases Torque also increase this is because of high calorific value of diesel and honge oil causes complete combustion fuel.

For other blends like B40 to B100 mixture contain more biofuel so decrease in calorific value result is decrease in torque value. And also brake power increases up to B40 and then it decreases due to low calorific value of mixture.

For 70% load brake specific fuel consumption decreases to the minimum and increases for other mixture this can be correlated to the conclusion that the brake power increases as the load increases.

The recommended that up to B40 can be for use in the diesel engines without making any engine modifications and this leads to reducing pure diesel cost. All the parameter like torque, BP, and thermal efficiency observed good results at 70% of the load

**Gaurav Dwivedi [5]** In this paper they carried out expriment on IC engine using different biodiesel blends(B0,B10,B20,B30,B40,B50,B100).Here they use 2.6kw kirlosker made, AA35 model and pongemia biodiesel.
Finally they observed that BSFC variation with respect to blend from B10 to B100.here B100 observed highest BSFC which is 30% more than that of diesel this is because of low calorific value of pongemia oil.

Break thermal efficiency of biodiesel is almost same, for B10 (22.8), B20 (22), B30 (21.03) which is similar to diesel (23.39) this is because of low viscosity of biodiesel when blend with diesel so increase in atomization, fuel vaporization, and combustion.

To analyze exhaust gas emission of IC engine when blended they used the AVL exhaust gas analyzer. This analyzer is placed at exhaust port of the engine, they got result that there is huge reduction of greenhouse emission like $CO_2$ compare to pure diesel and also HC, CO emission are less as the blend increases compare to diesel.

## III. SELECTION OF BIODIESEL

Increasing petroleum prices, increasing threat to the environment from exhaust emissions and global warming have generated intense international interest in developing alternative nonpetroleum fuels for engines. The use of vegetable oil in engines is not a recent innovation. Diesel said, ‘‘the use of vegetable oils as engine fuel may seem negligible today nevertheless, such oils may become, in the passing years, as important as oil and coal tar presently”. Recent report says that lower smoke levels and higher thermal efficiencies are offered more by the methyl ester of vegetable oils than neat vegetable oils. Further, it has been reported that the thermal efficiency of the engine increases with an increase in the methanol fraction in diesel.

### 3.1 Honge Oil

Oil is extracted from mechanical process which is bitter in taste so it is treated as non edible oil. In our nation this oil can be utilized as a fuel for cooking and lights, The oil has restorative incentive in the treatment of ailment and in skin illnesses. The raw petroleum for examination is gathered from Indian Biodiesel Corporation, Baramati and Maharashtra, India.

**Table 1 Components of honge oil (12)**

| Components | Percentage |
|---|---|
| Oil | 27% - 39% |
| Protein | 17% - 37% |
| Starch | 6% - 7% |
| Crude fiber | 5% - 7% |
| Moisture | 15% - 20% |
| Ash | 2% - 3% |

**Table 2 Properties of Honge oil (1)**

| Property | Unit | Value |
|---|---|---|
| Calorific Value | kcal/kg | 35900 |
| Density | $Kg/m^3$ | 890 |
| Viscosity | $m^2/s$ | $40.2*10^{-6}$ |
| Flash Point | °C | 225 |
| Fire Point | °C | 230 |
| Boiling Point | °C | 316 |

## IV. EXPERIMENTAL SET UP AND PROCEDURE

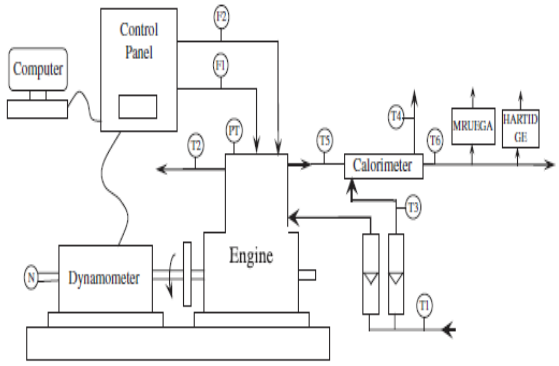


**Fig.1 Block diagram of experimental setup**

- **Wt**- Weight
- **PT**, pressure transducer
- **F1**- Fuel flow
- **F2**- Air flow
- **T1,T3** - Jacket water inlet temperature
- **T2**- Jacket water outlet temperature
- **T4**- Calorimeter water outlet temperature
- **T5**- Exhaust gas to calorimeter temperature
- **T6**- Exhaust gas from calorimeter temperature
- MRU Exhaust gas analyzer

4.1 **Table 3 Engine specification**

| Type | TV1 (Kirloskar water cooled engine) |
|---|---|
| No. of cylinders | Single cylinder |
| No. of strokes | Four stroke |
| Rated power | 5.2 kW (7 HP at 1500 RPM) |
| Cylinder diameter (Bore) | 0.0875 m |
| Stroke length(m) | 0.11 |
| Compression ratio | 17.5:1 |

### 4.2 Experimental procedure

- Checking the diesel level in the tank and sufficient lubricating oil in the sump.
- Lifting the decompression lever.
- Now the motor is driving the engine and the engine getting sufficient speed discharging the decomposition valve now the engine gets started.
- Loading the engine by operating the mechanical loading switches mounted on the control panel.
- Note down the necessary readings.

Repeat the above steps for different blends of biodiesels.

## V. RESULT AND DISCUSSION

The engine test were conducted with biodiesels by using blends 10%,20%,30% and 30% with varying load condition. For comparison the test were also conducted without the blend of biodiesel i.e. with pure diesel as same as above condition

### 5.1 Break Power

It was observed that brake power is higher when engine operated with pure diesel. When engine operated with blends of honge biodiesel (B10, B20, and B30) it was observed that brake power will be high for B20 blend compare to all other blends and for 80% of load the percentage of decrement of break power with respect to pure diesel is 42.85%, 22.13% and 33.37% for B10, B20 and B30 respectively.

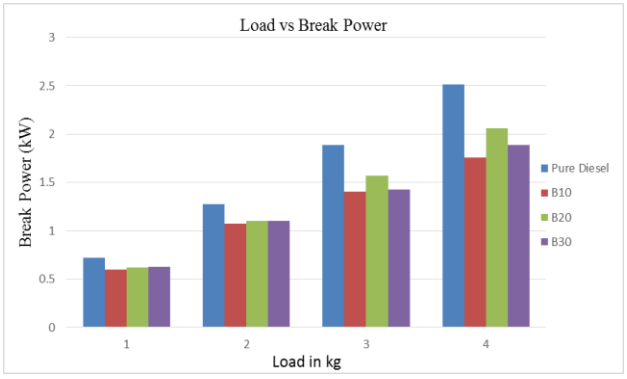


Fig 2 Variation of Break Power with Load

### 5.2 Torque

As the load increases the torque also increases for all blends and here observed that for 20% blend gives better value compare to all other blend it was observed Percentage of

reduction of torque for B20 is 22.12% ,B10 is 43.42% and for B30 is 33.33%.

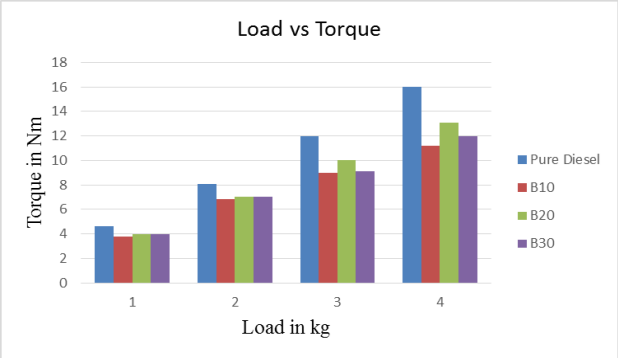


Fig 3 variation of Torque with respect to Load

### 5.3 Brake thermal efficiency

It was observed that brake thermal efficiency is higher when engine operated with pure diesel. When engine operated with blends of honge biodiesel (B10, B20, and B30 ) it was observed that brake thermal efficiency will be high for B20 blend compare to all other blends.Break thermal efficieny for B20 is 20.82% which nearer to diesel(21.87%) and other blends we got less value B10 (15.71%), B30(16.83%) when 80% of load is applied.

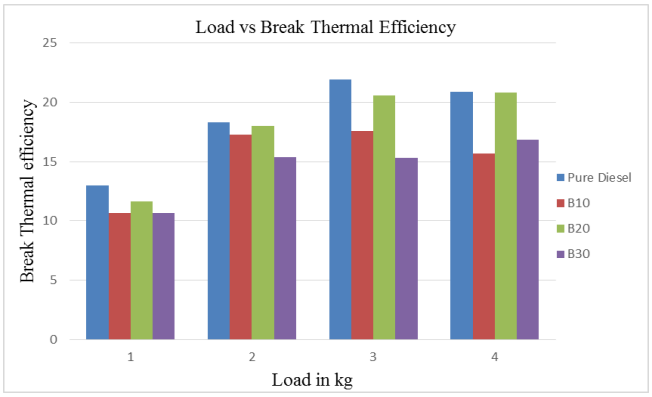


Fig 4 Variation of Brake Thermal Efficiency with respect to Load

### 5.4 Mechanical efficiency

It was observed that mechanical efficiency is higher when engine operated with pure diesel. When engine operated with blends of rice bran biodiesel (B10, B20, B30) it was observed that mechanical efficiency will be high for B20 blend compare to all other blends with respect to pure diesel. Mechanical efficiency decreases 4.2% for B10, 2.11% for B20 and 5.23% for B30 when 80% of load is applied.

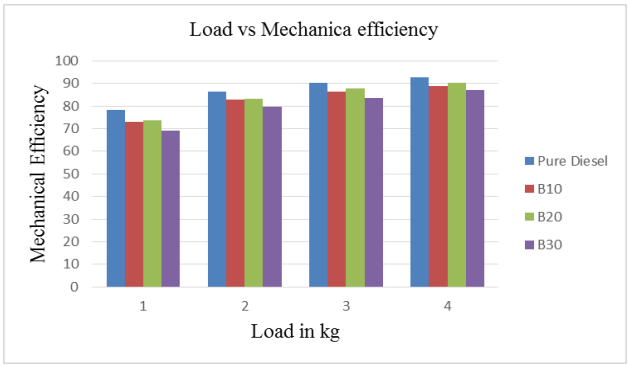


Fig 5 Variation of Mechanical Efficiency with respect to Load

## VI. CONCLUSION

- It was observed that all performance parameter of diesel engine gives better values for B20 blend compare to all other blends
- It was observed that brake power will be high for B20 blend compare to all other blends and for 80% of load the percentage of decrement of break power with respect to pure diesel is 42.85%, 22.13% and 33.37% for B10, B20 and B30 respectively.
- Mechanical efficiency decreases 4.2% for B10, 2.11% for B20 and 5.23% for B30 when 80% of load is applied.
- It was observed that brake thermal efficiency will be high for B20 blend compare to all other blends.Break thermal efficieny for B20 is 20.82% which nearer to diesel(21.87%) and other blends we got less value B10 (15.71%), B30(16.83%) when 80% of load is applied.
- Considering all performance parameter 20% of Biodiesel blend with diesel is more suitable to run diesel engine compare to other blends

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