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## EXPERIMENTAL INVESTIGATION ANALYSIS OF BIODIESEL FROM JATROPHA OIL

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### ABSTRACT

The growing industrialization & motorization of the world has lead to gradual reduction of world petroleum reserves and impact of increasing exhaust emissions, which have given rise to global warming issues so there is an urgent need for renewable alternative fuels for use in automotive . Petroleum based fossils fuels are obtained from limited reserves. Biodiesel has as one of the alternative bio-fuels to non-renewable fuels, and the typical method of producing bio-diesel is by transesterification process. This process are employed in the present work to analyse the production cost of bio-diesel from the jatropa seed oil and to identify the optimum operating conditions. Considerable efforts have been made to develop Jatropa oil derivatives that near the properties & performance of the hydrocarbon-based diesel. Bio-diesel fuel is an substitute of petroleum fuels derived from animal fats, Vegetable oils, and waste cooking oil with triglycerides. Bio-diesel fuel production technique is a very modern and technological part for researchers due to the significance that it is winning everyday due to the enhance in the petroleum fuel price & the environmental benefits. Transesterification is the mainly popular process and guides to monoalkyl esters of fats & vegetable oils now called bio-fuel when we used for fuel purposes. . The performance parameters of Jatropa oil and variable blends with diesel fuel was done on a, 4 stroke, single cylinder, kirloskar diesel engine with eddy current dynamometer with variable loads also assisted with Enginesoft analysis software. The performance characteristics of the engine had been evaluated using varying proportions blend. 20 B Jatropa has been suggested for use in CI engine.

**Key words:** Jatropa bio diesel, Mechanical Efficiency, performance, emission, combustion characteristics, Diesel engine, Blends, Enginesoft.

### Inrtoduction

Rudolf Diesel invented Combustion Ignition (CI) engine during 1892. He tested it with peanut oil as fuel, but with the advent of cheap petroleum, appropriate crude oil fractions were refined to serve as fuel and people did not pay much attention over fuel potential of vegetable oils. Diesel became known worldwide for his innovative engine which could use a variety of fuels. The concept of bio fuel dates back to 10 August 1893 when Dr. Rudolf Diesel built the first diesel engine with the full intention of running it on vegetative source (Peanut oil). In 1912 he observed, "The use of vegetable oils for engine fuels may seem insignificant today. But such oils may in the course of time become as important as petroleum and the coal tar products of present time."

But gradual depletion of world petroleum reserves, increase in crude oil prices, and impact of environmental pollution results in renewed focus on vegetable oils.

### **Importance of Jatropha Bio-Fuel**

Jatropha is a valuable multi-purpose crop to alleviate soil degradation, desertification and deforestation, which can be used for bio-energy to replace petrodiesel, for soap production and climatic protection, and hence deserves specific attention. Other renewable lipid sources. These resources have less environmental impact than the traditional ones. Presently cost of petrol and diesel is going to increase with present depletion rate. So that it's our responsibility to search other sources of energy for automobiles. Then bio-diesel is the main alternative source which is easily available and eco-friendly



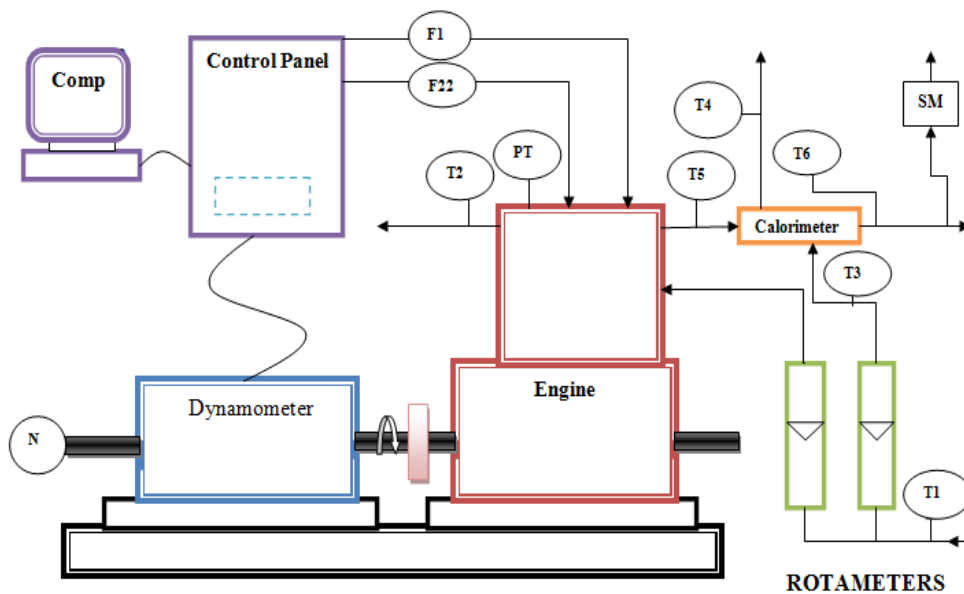
Fig – 1 Jatropha seeds

### **Biodiesel Production Cost Analysis**

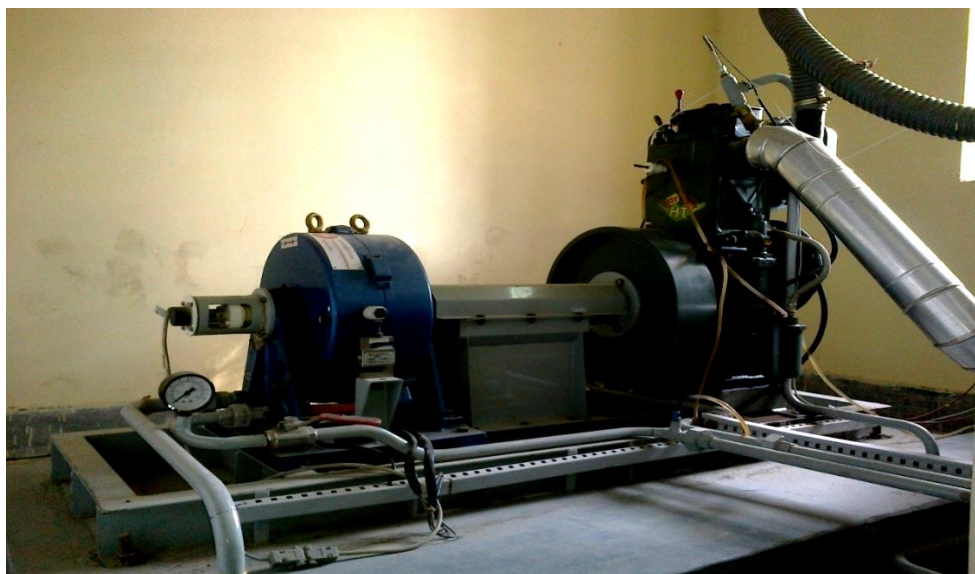
In this analysis estimation has been made for monthly production cost of biodiesel from Jatropha oil in a small production unit having raw material consumption capacity of 805 Kg Jatropha seed per day. Overall cost of Biodiesel is divided mainly two categories:

- 1) Raw material cost
  - Jatropha Oil production cost.
  - Jatropha Oil transportation cost.
- 2) Biodiesel cost
  - Biodiesel production cost.
  - Biodiesel distribution cost.
  - Vehicle use.

## Description of experimental set up



**Figure 2:** Schematic Diagram of the Experimental set-up



**Figure 3:** Experimental set-up of Kirloskar diesel engine test Ri



## Engine Specification

Sr. no.	Items	Specifications
1	Model	KIRLOSKAR, AV1
2	Compression ratio	17.5:1
3	Method of starting	Hand starting
4	Type, no. of cylinders	Vertical – 4 stroke, 1 cylinder
5	Bore x stroke(mm)	87.5x110
6	Cubic capacity	661 cc
7	Maximum power	7 BHP
8	Nominal speed	1500 rpm
9	Cooling system	Water-cooled
10	Fuel filter	Present
11	Lube oil filter	Present
12	Dynamometer Type	Eddy Current
13.	Calorimeter Used	Pipe in pipe
14.	Torque	33.121Nm

## Result and discussion

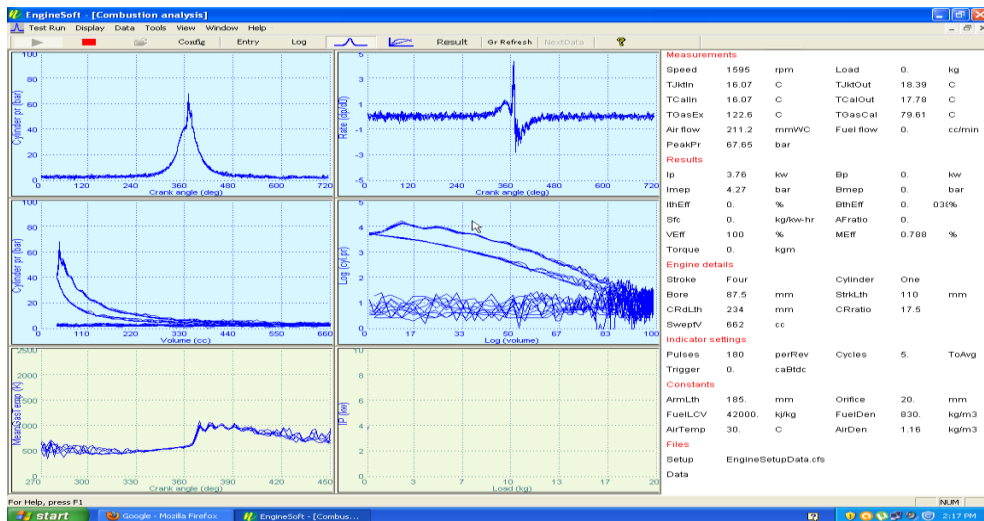


Fig. 4: Simulated performance data of test run

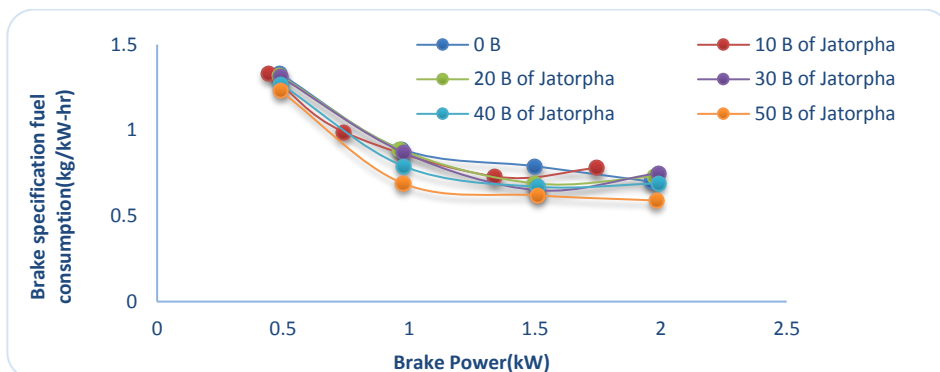


Fig 5. BSFC with Brake Power for different blend of Jatropha oil and Diesel fuel

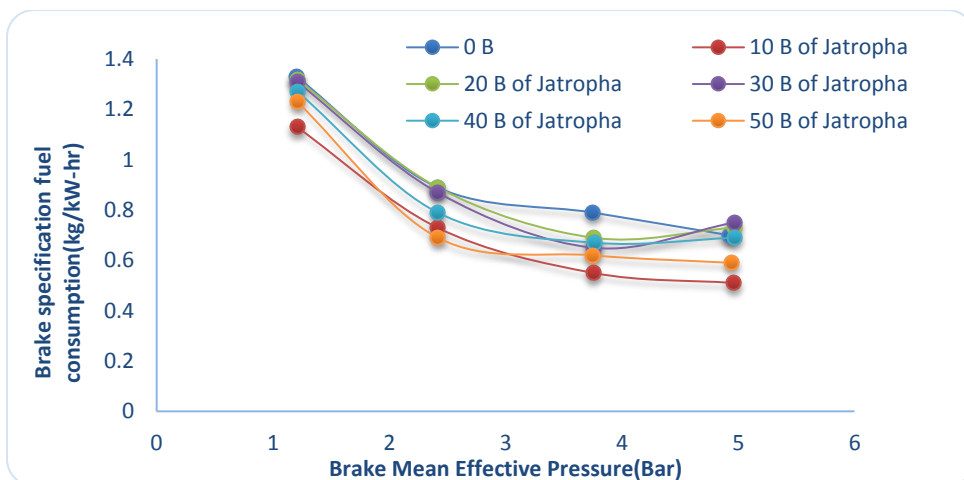


Fig 6 :Variation of BSFC with BMEP for different blend of Jatropha oil with Diesel

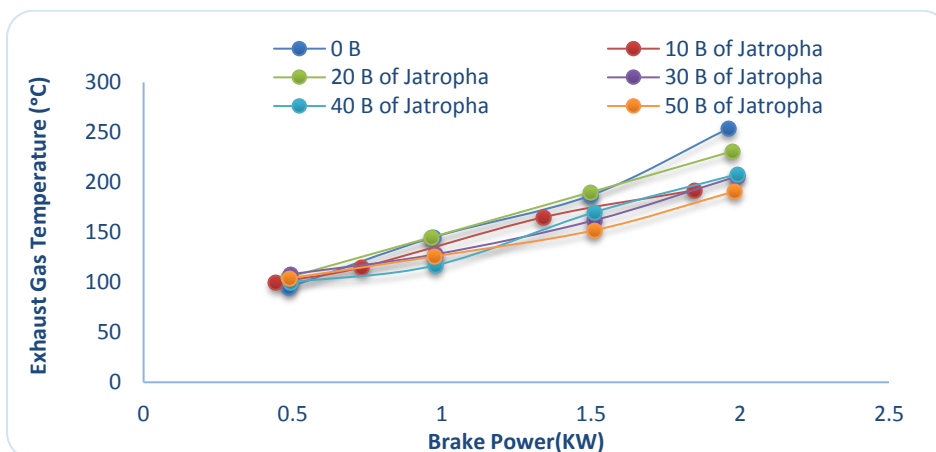


Fig 7 :Exhaust gas Temperature with Brake Power for different blend of Jatropha oil and Diesel fuel



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## Conclusions

- ▶ It has been found by using Jatropha Carcus oil with pure diesel IC engine can run with optimum performance
- ▶ It is also found from the experiments that 20 B Jatropha has good result as compared to 30 B oil in Brake power v/s BSFC.
- ▶ India has gone biggest importer of edible oil so it is not favour to use edible as bio diesel
- ▶ Blending of jatropha cost as lower than the cost of blending of other biodiesel.
- ▶ In the engine test rig tests were carried out using diesel and biodiesel to find out the effect of various blends on the performance of the engine.
- ▶ Investigations are carried out on the engine mainly to the effect of brake specific fuel consumption, bake thermal efficiency and exhaust gas temperature.
- ▶ From the experimental analysis it was found that the blends of the Jatropha oil with diesel could be successfully used with acceptable performance on 20 B.
- ▶ On the result of this study properties of Jatropha oil suggest that it can be used directly as C.I. engine, fuel
- ▶ It is possible to run diesel engine with Jatropha Carcus bio-diesel blends with out any modification in it.

Brake thermal efficiency is higher for neat diesel at all loads and lowers for blends of bio-diesel and difference of brake thermal efficiency between neat diesel and blended bio-diesel decreases as load increases.

## Scope for Future Work

- ▶ The experimental analysis it was found that the blends of Jatropha oil with diesel could be used with higher performance up to certain extent.
- ▶ Analysis of composition of exhaust emission can be done with prolonged service with neat bio-diesel.
- ▶ Performance of engine can be compared for various blends of biodiesel with neat diesel; present study is focused only to blend bio-diesel fuels.
- ▶ By computation analysis performance parameters can be extrapolated and compared with experimental results.
- ▶ Performance can be measured after with preheating fuels and/or mixing additives in them.



- ▶ Design changes can be studied and can be proposed after studying the problems encountered after prolonged service of engines with these alternate fuels.
- ▶ Emission studies can also be done.
- ▶ Other bio fuel blends along with Jatropha oil can be analysed

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