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# STUDY OF PERFORMANCE AND EMISSION CHARACTERISTICS OF SINGLE CYLINDER DIESEL ENGINE FUELED BY DIFFERENT BLENDS OF BIODIESEL AS COMPARED TO DIESEL

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**ABSTRACT**

*As an alternative, biodegradable, renewable and sulphur free biodiesel is receiving increasing attention. Biodiesel is known as the mono-alkyl esters of long chain fatty acids derived from renewable feedstock, such as, vegetable oils or animal's fats, for use in compression ignition engines. . Bio fuels are a good replacement of petroleum fuels. In this study, Rice Bran a waste product of the rice milling industry is used for biodiesel production. Punjab has abundant availability of rice bran oil. This study has conducted to evaluate the properties of rice bran biodiesel and effect of rice bran bio-diesel and diesel blend on the performance and emission characteristics of C.I. engine. The biodiesel blends are B20, B40, and B60 on a volume basis performed at different load conditions and compared with diesel. The result shows that biodiesel blend B40 shows better performance parameters than B20, B60. At full load B40 has 24.4% brake thermal efficiency (BTE) which is more than diesel. So Rice Bran biodiesel B40 blend can be used in engine without modification. The results also showed that Carbon monoxide (CO) and carbon dioxide ($CO_2$) emission reduces up to 40% in case of biodiesel than that of diesel. Unburned hydrocarbons (HC) reduce up to 50% in case of biodiesel blends. So rice bran oil biodiesel is renewable and eco-friendly fuel.*

***Keywords*: - Biodegradable, *Biodiesel, eco-friendly, renewable, rice bran.***

## I. INTRODUCTION

Biodiesel is the name of a clean burning alternative fuel produced from domestic, renewable resources. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics. Most of the western countries use soya bean, sunflower, saffola, rapeseed, palm oil, etc. for production of biodiesel and investigation on the engine. The oils are edible in nature and developing countries like India cannot afford edible oils as a fuel substitutes. Then developing nations have to focus their intentions on oils of non-edible nature which are cheaper.

## II. NEED OF BIODIESEL

Petroleum resources are finite and therefore search for alternative is continuing all over the world.. Petroleum-based fuels are limited reserves concentrated in certain regions of the world. These sources are in the verge of

getting extinct. The scarcity of known petroleum reserves will make renewable energy resources like biodiesel more attractive. Since blends below 20% of biodiesel do not present any problem and reduce harmful emission.There is universal acceptance of the need for reducing such emissions by adopting ways to reduce emission without affecting the process of growth and development. One of the ways in which this can be achieved is through the use of biodiesel and blending them with diesel. With domestic crude oil output stagnating, the momentum of growth experienced a quantum jump since 1990s when the economic reforms were introduced paving the way for a much higher rate of development leading the demand for oil to continue to rise at an ever increasing pace. The situation offers us a challenge as well as an opportunity to look for substitutes of fossil fuels for both economic and environmental benefits to the country.

## III. PRODUCTION OF BIODIESEL

.Direct Blending

In this method, vegetable oils are directly mixed with the diesel.

.Transesterification

To obtain biodiesel, the oil or animal fat is subjected to a chemical term termed as transesterification. In this reaction, the vegetable oil or animal fat is reacted in the presence of a catalyst with an alcohol to give the corresponding alkyl esters methanol, of the FA (fatty acid) mixture that is found in the parent vegetable oil or animal fat.

## IV. METHODOLOGY

- First of all collect the waste cotton seed oil from various sources.
- Catalyst is dissolved in the alcohol using a standard agitator or mixer.
- The alcohol/catalyst mix is then charged into a closed reaction vessel and the waste cotton seed oil is added.
- The reaction mix is kept just above the boiling point of the alcohol (around 70 °C, 158 °F) to speed up the reaction.
- Once separated from the glycerine, the biodiesel is purified and then testing will be done.

## V. LITERATURE REVIEW

Transesterification is an attractive and widely accepted technique**.** The use of waste cooking oil to produce biodiesel reduced the raw material cost. The biodiesel fuel will be like a boon to India ultimately it will reduces the pollution amount in environment, reduces the several health diseases which are caused by air pollution of crude oil like kerosene oil, diesel, petrol etc.

## VI. PROPOSED WORK

First of all a sample of waste cooking cottonseed oil is to be collected from various sources. This cottonseed sample will be taken to MERADO (Mechanical Engineering Research and Development Organisation) Laboratory situated at Ludhiana (Punjab).Check for the free fatty acid (FFA) value, it should be less than 0.5 for

vegetable oil to convert it into biodiesel otherwise acid is to be added. Now the waste cotton seed oil is reacted in the presence of a catalyst (KOH) with an alcohol (methanol $CH_3OH$) to give the biodiesel through the reaction known as transesterification.

## VII. PERFORMANCE CHARACTERISTICS TO BE CHECKED ARE

- Brake power (BP)
- Indicated power (IP)
- Brake specific fuel consumption (BSFC)
- Indicated specific fuel consumption (ISFC)
- Brake mean effective pressure (BMEP)
- Indicated mean effective pressure (IMEP)
- Brake thermal efficiency (BTE)

## VIII. EMISSION CHARACTERISTICS TO BE CHECKED ARE

- Carbon dioxide ($CO_2$)
- Carbon monoxide (CO)
- Nitrogen oxides ($NO_x$)
- Sulphur content
- Particulate matter
- Water particles

## IX. RESULTS AND DISCUSSION

The performance and emission tests are carried out on the C.I. engine using various blends of diesel-biodiesel blends as fuels. First, the experimentation was performed with diesel (for getting the base line data of the engine) and then blends of different percent volumes of Biodiesel B20, B40, B60, were carried out. The performance of the engine is evaluated in terms of, brake power, brake specific fuel consumption, brake specific energy consumption, brake thermal efficiency. Emission of the engine is analyzed (HC, CO, $CO_2$, $O_2$ and lambda).

## X. CONCLUSION AND FUTURE SCOPE

### Conclusion

The biodiesel blends are B20, B40, and B60 on a volume basis performed under constant speed at different load conditions. Brake thermal efficiency of B40 fuel is 24.4% where diesel has 23% at full load.The results shows that biodiesel blend B40 shows better performance parameters such as brake thermal efficiency, brake power, BSFC, than B20, B60 fuels. HC emissions reduced up to 50% in case of biodiesel blends than that of diesel. Biodiesel blends showed lesser emissions as compared to diesel. In case of biodiesel blends carbon monoxide

(CO) and carbon dioxide ($CO_2$) emission reduces up to 40% than that of diesel. Biodiesel blends show higher oxygen emissions than diesel.

.Future scope

Biodiesel has distinct advantage as an automotive fuel. Initial cost may be higher but feedstock diversity and multi-feedstock production technologies will play a critical role in reductions in production cost and making the fuel economically viable. The process of making biodiesel from mixture of two or more vegetable oils is required to be studied, energy and energy analysis for mixture of biodiesels may be conducted and software programming for energy and energy analysis, chemical composition of fuel is to be developed.

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