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Production of Bio Diesel from Rice Bran Oil

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ABSTRACT: The main aim of this work is to find an alternative fuel for diesel engine & to analyse the performance emission combustion characteristic. The increase in growth of population made to find the new fuel for the existing fuel. Because the existing fuel is depleting. The alternate fuel can be used without any modification in the existing engine & it should be available in affordable cost. Engine emission should be compared because it should not create pollution problem. Properties of RBO bio diesel were studied and compared to ASTM standards. The consequent engine test showed a similar power output compared with regular diesel but consumption rate was slightly higher.

KEYWORDS: Transesterification, biodiesel

I. INTRODUCTION

Increase in population has made increase in utilization of fossil fuel. But the amount of fossil fuel is decreasing. An Alternative fuel is needed for the use. This fuel should not affect the environment. Transesterification is a simple method for fuel production.

The process of converting Triglycerides into mono esters & glycerol is called transesterification. Many alcohols (methanol, ethanol, propanal & butanol) are available in the market. Among other Alcohols methanol is used commercially. Because of its low cost. In the year 1975 vegetable oil was used directly in engine. If vegetable oil is used directly used in engines it would create several problems. The process transesterification converts the vegetable oil to BD & it is in usable form to compression Ignition Engines. BD has higher oxygen & it reduces emission (CO, HC, PM). Bio Diesel from edible oils create food crisis for the increasing population. Rice bran oil is not much used for cooking.

II. MATERIALS

2.1 Materials: Crude Rice bran oil (refined), homogeneous alkaline base catalyst (NaOH), Methanol.

2.2 Apparatus:

Transesterification consists of conical flask, magnetic stirrer with hot plate.
Separating funnel, Iron Stand, Thermometer.

2.3 Transesterification:

RBO was heated to (50-55°C). Then 25ml of methanol & NaOH 1% of weight is mixed with that. The mixture is heated for a hour. Then it is poured in the separating funnel. After 3hrs the mixture separates into two layers. Top layer is methyl ester & bottom layer is glycerol. The top layer is separated, & then washed twice with (hot distilled water at 100°C). The washed esters were filtered using sodium sulphate (powder) for removing water droplets).

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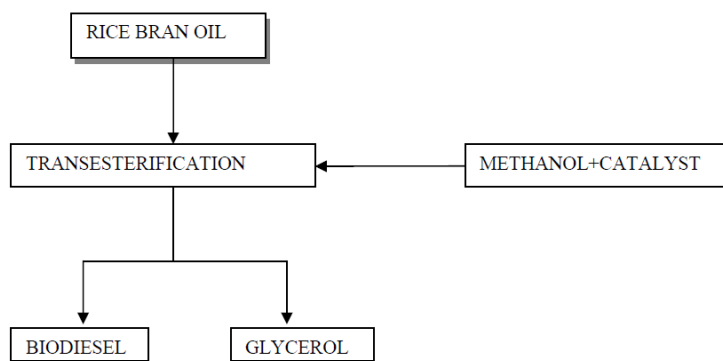


Fig 1 Transesterification



Fig 2. Heating of Rice Bran Oil



Fig 3. Separation of biodiesel from glycerol

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III. RESULTS & DISCUSSION

3.2 Alkali - Catalyzed Transesterification:

Tests were carried out at varying conditions of molar ratio, catalyst amount, reaction temperature & reaction time. The optional reaction condition based on a series of experiments was observed.

3.2.1 Influence of molar ratio on conversion efficiency:

When the molar ratio was high, the separation of glycerin because there is an increase in solubility if glycerin remains in the solution, it gives lower esters.

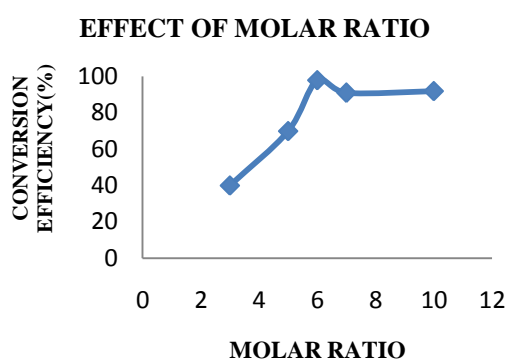


Fig .4.Molar ratio vs conversion efficiency

3.2.2 Influence of catalyst amount on conversion efficiency:

The amount of catalyst that should be added to the reaction varies from 0.5 to 1% w/w. The NaOH amount in the range of 0.5-1% w/w was used in this experiment. Esterification of RBO with the catalyst 1% w/w NaOH gave the best yields of the esters. With further increase in catalyst quantity, there was little decrease in the conversion efficiency. Excess amount of catalyst lead to the formation of gels. The formation of emulsion with therefore blocks the reaction.

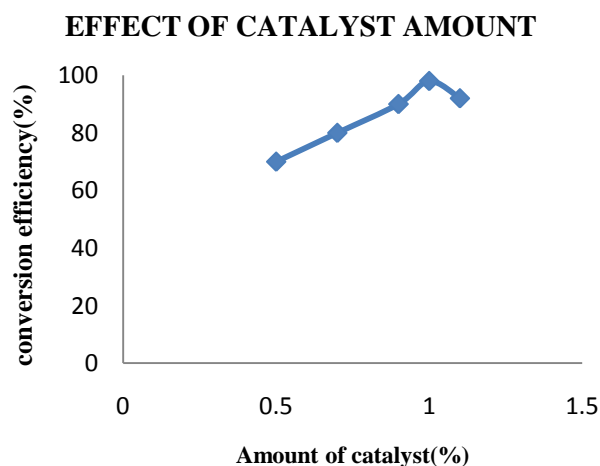


Fig.5. Amount of catalyst vs conversion efficiency

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3.2.3 Influence of Reaction Temperature on Conversion Efficiency

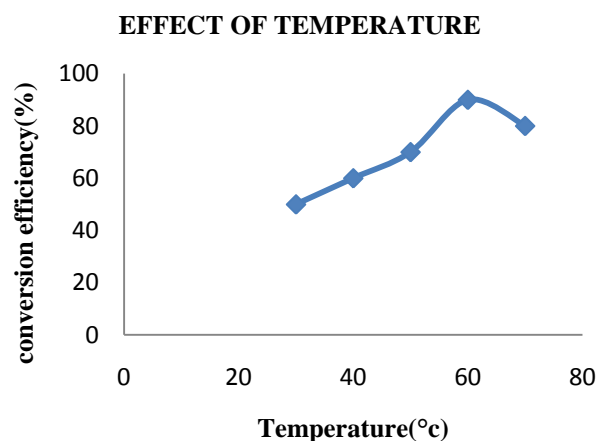


Fig.6. Temperature vs conversion efficiency

The maximum yield of ester was obtained at 60°C, a further temperature increment decreased the conversion efficiency. If the reaction temp is above 60°C, it tends to loss of methanol & accelerates saponification of the glycosides.

3.2.4 Influence of Reaction Time on Conversion Efficiency

The influence of reaction time on conversion efficiency. The conversion efficiency increased with reaction time but the ester yields were almost same after 45mins. For economical reasons the best process is the one that reaches the highest conversion in the shortest period of time.

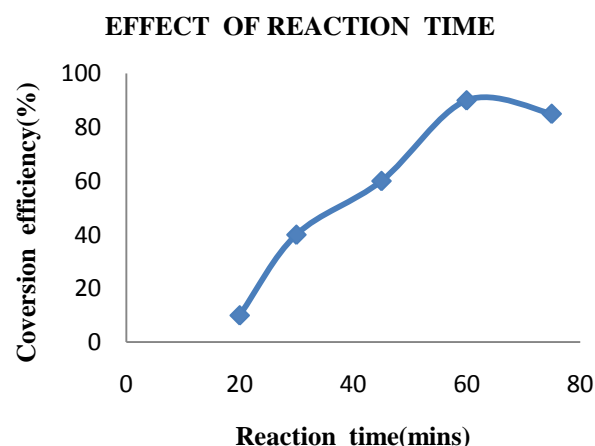


Fig.7. Effect of reaction time vs conversion efficiency

Results obtained from the present experiments reveal that 45mins is sufficient for the completion of the reaction.

3.3 Optional Parameters of Conversion Efficiency

The optional parameters of conversion efficiency obtained by range analysis methanol / oil molar ratio 6:1, catalyst amount 1% w/w reaction temp 60°C, reaction time 60mins. The conversion efficiency was 98.7%.

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3.4 Fuel Properties of RBO Diesel

Property	Unit	RBO Diesel	ASTM STD
Density (at 15°C)	kg/m ³	884	875-900
Viscosity (at 40°C)	m ² /s	4.8	1.9-6.0
Flash Point	°C	75	>130
Fire Point	°C	86	-
Calorific value	k cal / kgm	11084	-

Table.1. Fuel properties

IV CONCLUSION

1. Bio diesel Reduces emission in the environment
2. It can be used in the existing engine without any modification
3. It is available in the affordable cost

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