"PROCESSING SETUP TO PRODUCE BIODIESEL AND IT'S BLENDS"

Nikhil S. Bharsakhare [1], Sopan H. Chande [2], Shriram A. Jadhav [3], Krishna C. Nakade [4]
Deshodhan B. Dende[5],Sakharam A.Shimple[6]

U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg& Tech. Aurangabad, Maharashtra, India1
U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg& Tech., Aurangabad, Maharashtra, India2
U.G. Student, Department of Mechanical Engineering, Shreeyash College of Eng& Tech Aurangabad, Maharashtra, India3
U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg& Tech., Aurangabad, Maharashtra, India4
U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg.& Tech, Aurangabad, Maharashtra, India5
Assiistant professor, Department of Mechanical Engineering, Shreeyash College of Engg.& Tech, Aurangabad, Maharashtra, India6

ABSTRACT

The present paper gives the outline of the main aspect of production setup of biodiesel as a part of alternative energy. The biodiesel can be obtained from soya bin oil by the process of estarification.the obtained biodiesel can be used as a future fuel.. It contains no petroleum but it can be mix with petroleum diesel at any level to create a biodiesel mixes. It can be used in compressed ignition engine with no major modifications. Pure biodiesel will be biodegradable, non-toxic & essentially free of sulphur & aromatic compounds thus it is helpful to prevent the global warming so becomes eco-friendly. It is used to generate the electricity in low cost.

Keywords: Biodiesel, Methanoal, Potassium hydroxide.

1. INTRODUCTION

Use of energy has been the basic requirement for subsistence and development of mankind. Primitive man required energy primarily in the form of food and that time only renewable sources of energy were used to fulfill the energy needs of man mainly directly or indirectly use of solar energy. During industrial revolution in 18th& 19th centuries, the discoveries of steam engines, I.C. engines led to better quality of life. The 20th century saw new sources for it. In 21st century we are realizing now the effect of these sources on the environment.

The two types of energies are: -

Conventional type: - fossil fuels, coal, petroleum etc.

Non-conventional type (Alternate Energy):- solar energy, wind energy, biomass etc. which uses waste material as a fuel and don't cause environmental effect.

1.1 Introduction

The very earnest process of energy formation is from Biomass. The Biomass is of two types:-

a. Biomass grown for utilization: The biomass is obtained from pruned parts of the trees growing in forests.

b. Biomass available as waste: Animal waste, agricultural waste and domestic waste contains potential source of energy. The total biomass potential is around 1250MW for Maharashtra.

1.2 What Is Biodiesel?

Biodiesel is a diesel changes fuel that is manufactured from vegetable oils, recycled cooking greases or oils, or animal fats. Used cooking oils are more made from vegetable oils, but ay also contain animal facts. Used vegitable oils are both recycled and renewable. In the manufacture process of 100 kg of oils are reacted with 10 kg of a short chain alcohol (usually methanol) in the presence of a catalyst to form 100 kg of biodiesel and 10 kg of glycerine. Glycerine is a co-product of the biodiesel process.

Raw or refined vegetable oil, and recycled greases that have not been processed into biodiesel, are not biodiesel and should be avoided. Research shows that vegetable oil or greases used in CI engines at levels as low as 10% to 20%, can cause long term engine deposits, ring sticking, lube oil gelling, and other maintenance problems and can reduce engine life. These problems are caused mostly by greater viscosity of the raw oils compared to that of the diesel fuel for which the engines and injectors were designed. To avoid viscosity-related problems, vegetable oils and other feedstock's are converted into biodiesel. So this process of converting vegetable oils or greases to biodiesel, we reduce viscosity of the fuel to values similar to conventional diesel oil fuel.

2. BASIC INFORMATION

Biodiesel is clean burning fuel and can be produced from vegetable oil or recycled cooking grease.

Types of biodiesel are

- B5 (5% biodiesel + 95% diesel)
- B20 (20% biodiesel + 80% diesel)
- B100 (100% biodiesel)

But most commonly B20 is used. The cost of biodiesel is about 20 to 40 $ per gallon which is very economical. Biodiesel can be produced by

- Base catalyzed trans esterification
- Direct acid catalyzed esterification
- Conversion of oil to alkyl ester.

But most commonly base catalyzed reaction is used. It is simple to use and do not have any side effects on the environment as well as on the human body.

The goal of the biodiesel industry will be replace petroleum diesel but to extend its usefulness. Biodiesel is one of several alternative fuels that have to place in the development of a balanced energy policy. The role of biodiesel is to continue to the longitivity and cleanliness of diesel engines. The most likely use of biodiesel will be in certain marine markets that require a cleanly burning, biodegradable fuel. Biodiesel is the alternative fuel to have fully completed the health effects testing requirements of the clean air act. The use of biodiesel is an conventional diesel engine results in substantial reduction of carbon monoxide and particulate matter compared to emissions from diesel fuel. In addition, the exhaust emissions of sulfur oxides and sulfates from biodiesel are essentially compared to diesel. Thus it becomes environmental safety and becomes eco-friendly

2.1 Production of Biodiesel

Biodiesel fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, so meeting the requirements of ASTM (American Society for Testing and Materials) D6751.

Three basic routes to ester production from oils and fats are

- Base catalyzed transesterification of oil with alcohol
- Direct acid catalyzed esterification of the oil with methanol
- Conversion of oil to fatty acid, and then to alkyl ester with acid catalysis.
- The majority of biodiesel today are done with the base catalyzed reaction. It has 4 steps
- The need to choose a feedstock. Commonly soybean oil or waste grease from fast food restaurants is chooses.
- In second step i.e. pretreatment, high free fatty acid feeds are stripped or esterifies to maintain high yield in transesterification.
- In third step i.e. transesterification, the glycerin will be separated from the fat or vegetable oil. This process leaves behind two products i.e. methyl ester and glycerin.
- The final step is purification. Highly effective washing coupled with full methanol. Recovery gives fuel grade

biodiesel and almost volatile organic compound (VOC) or wastewater discharge.
A fat or oil is reacted with an alcohol like methanol, in the presence of catalyst like sodium or potassium hydroxide (NaOH or KOH) to produce methyl ester or biodiesel as a main product and glycerin as a byproduct. The methanol will be charged in excess to assist in quick conversion and recovered for reuse.
The best-catalyzed reaction is commonly used for production because,

- Low temperature and pressure process.
- Conversion (98%) with minimal side reaction and reaction time.
- Direct conversion to methyl ester there is no intermediate steps
- Exotic materials of the construction are not necessary.

2.2 Setup Component

Following are the required component for design purpose

- Stand
- Heating tank 10 litre
- Esterification Tank 10 litre
- DC Motor- 2600RPM
- Thermometer 200° F
- Methanol 1000 ml
- KOH 500 gm
- Small Weight Scale
- Connecting Pipe
- Stop Cock
- Beaker 500 ml
- Beaker 1000 ml
- Steerer Fan
- Soybean Oil

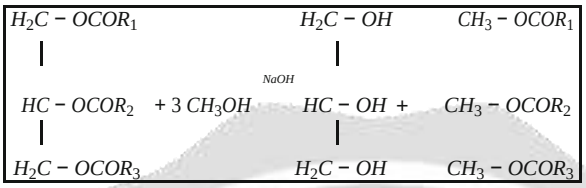
3. WORKING OF SETUP

The soyabin oil is poured in the reactor vessel, then the motor is ON, then the reactant (methanol) is added in to the tank. The oil and stirrer mixes the oil and the reactant and simultaneously catalyst is added in to the reactor vessel. In order to reduces the time consumption correct quantity of catalyst is added.

The catalyst we have taken NaOH, is more alkalyic and easy for handling and it is cheaply available. Hot water is supplied at 65^{o}C. After 30 min the motor is kept OFF. It is set ideal for the sedimentation of glycerin. Glycerin is a byproduct which formed during the reaction. After 30 min the biodiesel is extracted out from the vessel

Fig .Actual working setup

As the heat supply to the process is the hot water that can be heated by the electrical heater and this mechanism can avoid the temperature fluctuation especially in the radial direction. It keeps the temperature uniformity during the reaction. A thermostat is used to set the operating temperature of 65^{o}C keeping the methanol at liquid phase.



Basic Transestarification reaction

4. QUANTITY OF OIL OBTAINED

From the biodiesel plant Table show that production of biodiesel from soyabin oil, Coconut shell pyro oil, karanja seeds oil. Soyabin oil more amount of oil extracted from other two oils, because of soyabin oil is more viscosity and density when compare to that of other two fuels.

Oils	Quantity (mL)	methanol (mL)	KOH (gm)	Biodiesel (mL)	Glycerine (mL)	Wastage oil (mL)
Soyabin oil	1000	200	10	850	300	50
Coconut shell oil	1000	200	10	700	400	100
Karanja oil	1000	200	10	700	400	100

5. CONCLUSION

With the intensive study on Biodiesel the following conclusions can be drawn Biodiesel can be used as fuel and it has demonstrated significant environmental benefits with a minimum increase in cost for fleet operations and other consumers .Biodiesel is the only alternative fuel to have fully completed the health effects testing requirements of the Clean Air Act. Thus it becomes eco-friendly. Biodiesel is a cheaper than any other fossil fuels. Biodiesel plants being helpful in solving the problem of agricultural waste and partially the unemployment. can give the financial growth to the nation by reducing the importing of the crude oil. It is hoped that continuing research may provide more information about biodiesel in the future.

5.1. Advantages

Pure biodiesel is biodegradable, non-toxic and essentially free of sulphur and aromatic compounds.

• This biodiesel can be used in vehicles with no major modification in engine. This biodiesel delivers similar torque, horsepower and miles per gallon.

• Its emission have decreased the level of toxic air as follows

1. Particular matter – 31%
2. Carbon monoxide -21%
3. Total hydrocarbon-47%
4. Polycyclic aromatic hydrocarbons (PAH)-80%
5. Benzo (a) anthrancene -50%

• The absence of sulphur in 100% biodiesel should extend the life catalytic converters.

• The lubricating effect of biodiesel may extend the lifetime of engine.

5.2 APPLICATIONS

• Biodiesel operates in conventional combustion ignition engine from light to heavy duty. Biodiesel maintain the payload capacity and range of diesel since major engine modifications, change of spare parts, inventories, refilling stations or especially skilled mechanics is not required.

• Biodiesel can be used in the marine market with practical and is safe. In its pure form it is less harsh on marine .Environment and easier for Boaters to handle and to store. It does not cause water pollution and does not cause any bad effect on aquatic life.

• Biodiesel can be used to generate the electricity without any environmental harms and is ecofriendly and helpful to solve the problem of electricity.

▪ Biodiesel or vegetable oil can be used in the boiler of the thermal power stations for boiler's red hot condition.

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