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# STUDY OF VARIOUS METHODS OF BIODISEL PRODUCTION AND PROPERTIES OF BIODISEL PREPARED FROM WASTE COTTON SEED OIL AND WASTE MUSTARD OIL

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**Abstract- Biodiesel, an alternative fuel is obtained from the fats of animals and plants. Increase in energy demand has made it compulsory to given idea on biodiesel fuel. Besides exploring historical background of biodiesel production from vegetable oils, it also provides insight of different methodologies evolved for the conversion of vegetable oil in biodiesel. Cold starting, clogging and storage are some serious technological disadvantages associated with biodiesel. The most commonly used method is transesterifcation of vegetable oils and animal fats. The transesterifcation reaction is affected by molar ratio of glycerides to alcohol, catalysts, reaction temperature, reaction time and free fatty acids and water content of oils or fats. The second part includes the study of characteristics of biodiesel prepared from vegetable oils (waste cotton seed oil and waste mustard oil).The characteristics of biodiesel are to be checked at different blends(B10, B15, B20) and select the optimum blend based on these characteristics.**
**Keywords:- Biodegradable, Biodiesel, eco-friendly, renewable, rice bran.**

## 1. INTRODUCTION
Bio-diesel can be used instead of petroleum-based fuels which are derived from vegetable oils, animal fats, and used waste cooking oil as well as triglycerides. Vegetable oils are widely available from various sources, and the glycerides present in the oils can be considered as a viable alternative for diesel fuel. They exhibit good heating power and also provide exhaust gas with almost no any amount of sulphur and aromatic polycyclic compounds. Vegetable oils are produced from plants, their burning leads to a complete recyclable carbon dioxide (CO2). CO2 associated with solar energy falling on earth gets converted in to the feedstock through photosynthesis. Vegetable oils available through this feedstock can be used to produce biodiesel.

## 2. 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 amount of development leads the demand for oil to continue to rise at an 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.

## 3. DEVELOPMENT OF BIODIESEL IN INDIA
Biodiesel is a relatively new product in India. The use of certain types of vegetable oils for using as an engine fuels seems insignificant now a days. But such oil may in the course of time become as important as petroleum and the coal tar products of present time. Scientists discovered that the viscosity of vegetable oil could be reduced in a simple chemical process in 1970 and that it could work well as diesel fuel in modern engine. The fuel is called Biodiesel. It is alternative fuel that can be used in diesel engines and provides power similar to conventional diesel fuel. It reduces the countries dependence on foreign oil imports. As per its end use it is classified with petroleum products industry more particularly with diesel. Cost of petroleum products is directly proportional to the living cost of common man. Although biodiesel is new product but it is going to replace product of petroleum industry i.e. diesel in future. 4 The southern railway adopted a three pronged strategy of large scale processing of oil into biodiesel and making use of it for its large fleet of road vehicles and locomotives. Awareness in India is only now giving shape to projects. In Andhra Pradesh four companies viz. Southern Online Biotechnology (SBT), Tree Oils Ltrs (Zaheerabad) Natural Bio Energy and the GMR group have seriously entered into this

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project. Others include Vrideshwar SSK Ltd. (Ahmednagar, Maharashtra) the Simbhioly Sugar Mills (Ghaziabad, Uttar Pradesh), R.S. Petrochemicals (Punjab) and Progressive Petroleum (Mumbai). The Aditya Birla group proposed a project in Malaysia, which did not come off. All of them feel that government should offer incentives to offset risk of a Greenfield area

## 4. LITERATURE REVIEW

A large work has been done on different aspects of biodiesel. This chapter covers the
Literature on biodiesel production by different methods from waste vegetable oils and
Characteristics of biodiesel
Literature is divided into following two main categories:
1. Biodiesel production methods.
2. Characteristics of biodiesel
1 Biodiesel production methods:-biodiesel is becoming more attractive now a dyas because of itsenvironmental benefits and the fact that it is prepared from renewable resources. The usedcooking oils are basically used as raw products for the production of biodiesel and the adaption ofcontinuous transesterification process and recovery of a very high quality glycerol from biodieselby-product (glycerol) are used as primary options to be considered to lower the cost of biodiesel. Pre-treatment processes using of strong acid catalysts provide a very good conversion yields and high-quality final products. Conversion of the types of oils to their alkyl esters reduced the viscosity of oil to near diesel fuel levels and also produced a fuel with properties that were similar to petroleum based diesel fuel and which can be used in existing engines without any modifications.

## 5. PROCEDURE OF MAKING BIODIESEL:-

The vegetable oils and fats are basically made up of the mainly components of triglycerides. When, these triglyceridesreact chemically with alcohols in presence of a catalyst (base/acid) result in fatty acid esters.These esters show striking similarity to petroleum derived diesel and are called "Biodiesel".Biodiesel is produced by transesterification of oilobtains from the seeds. A short detail formaking biodiesel is given below:
1. Oil was taken in a flask. 2. Methanol (by weight) and a potassium hydroxide (by weight) were taken into a flaskaccording to the composition which we want to prepare. 3. The mixture was stirred until the KOH is fully dissolved in a methanol. 4. The mixture was heated on a heater up to $60^0$C. 5. The mixture was placed in a water bath shaker and stirred for one hour. 6. The mixture was allowed to sit until the waste glycerin settles to the bottom. 7. The mixture was pour into a separator (for 1 hour) for settle the glycerin in to the bottom. 8. Drain out the waste glycerin. 9. The liquid remaining was raw biodiesel Ester. 10. Wash the raw biodiesel using regular tap water to remove impurities. 11. The washing process was repeated as required 2 to 4 more times or until water was mostly clears. 12. Biodiesel was allowed to settle until remaining water drops to the bottom. 13. Polish the biodiesel using either heat or air drying. 14. Pump through a filter into a storage container. 15. Now we have clean dry biodiesel which were safely use to fill up in vehicle.

## 6. RESULTS AND DISCUSSIONS

Worldwide, biodiesel is largely produced by methyl transesterification of edible and non edible oils. The concept of methyl transesterification is gaining attention as ethanol is derived from renewable biomass sources. The studies were, therefore, conducted on standardizing methyl transesterification process parameters for waste cotton seed oil and waste mustard oil, characteristic fuel properties of diesel, waste cotton seed oil and waste mustard oil, methyl esters of cotton seed biodiesel and mustard biodiesel and their 10%, 15% and 20% blends with diesel.The recovery of ester as well as its kinematic viscosity is affected by the transesterification process parameters such as catalyst concentration, reaction temperature and reaction time, molar ratio used. The above parameters were standardized to obtain methyl ester of waste cotton seed and mustard oil with lowest possible kinematic viscosity and highest level of recovery. The fuel properties such as kinematic viscosity, relative density, cloud and pour point, flash and fire point, ash content and carbon diesel, waste cotton seed oil, mustard oil and methyl ester of cotton seed and mustard oil as well as their blends with diesel were compared.

## 7. CALCULATIONS

First part includes the following work:  To optimize transesterification to produce biodiesel by varying the composition of catalyst. to determine fuel properties of biodiesel i.e. viscosity and FFA value. Second part includes the following work:  To determine the properties of different blends of biodieselwith diesel derived from waste cotton seed oil and waste mustard oil and optimum blend is to be selectedbased on these properties. The selected properties are: FFA value, Density, Viscosity, Flash point and fire point, Cloud point and pour point, Carbon residue content, Ash residue content, The properties were checked in MERADO (Mechanical Engineering Research andDevelopment Organization) Ludhiana (Punjab)

## 8. CONCLUSIONS

The overall studies based on the production of biodiesel from waste cotton seed oil and waste mustard oil, fuel characterization of cotton seed and mustard methyl esters were carried out.The relative density of B10 blends of cotton seed and mustard methyl ester were observed less as compared to blends B 15 and B 20 of both esters. The experimental results indicated that the relative density of B 10 blend of mustard methyl ester is slightly less to that of B 10 blend of cotton seed methyl ester. The relative density of cotton seed methyl ester and its B10 blend were observed 9.6 and 8.5 percent higher than that of diesel respectively. The relative density of mustard methyl ester and its B10 blend were observed 4.8 and 4.3 percent higher than that of diesel respectively. So B 10 blend was more suitable as compared to B 15 and B 20 blends of both the esters.The FFA content of B 10 blends of both esters were less as compared to B 15 and B 20 blends of both esters. So B 10 blend was more optimized as compared to B 15 and B 20 blends of both the esters. If the oil has a high water or free fatty acid (FFA) content the reaction will be unsuccessful due to saponification (saponification is defined as the reaction of an ester with a metallic base and water) commonly known as making soap, and make separation of the glycerol difficult at the end of the reaction. The FFA content of the raw oil will determine the quantity of biodiesel as the final product. A very low content of FFA (<0.2) can give a full 100% yield. 4The kinematic viscosity of of B10, B15, B20 blends of cotton seed methyl ester were found as 2.19, 2.38, 2.82 centistokes at 400C. Mustard methyl ester blends have higher kinematic viscosity as compared to cotton seed ester. Mustard methyl ester had the kinematic viscosity 5.12 percent less than that of diesel and cotton seed methyl ester had the kinematic viscosity 7.692 percent less than that of diesel. The results indicated that the B 10 blends of both the esters were observed the kinematic viscosity 40.05 and 43.8 percent less than that of diesel. So B 10 blend was more optimized as compared to B 15 and B 20 blends of both the esters. Viscosity plays an important role in the performance of an engine fuel system operating through a wide range of temperature. Kinematic viscosity affects the injection system. Low viscosity can result in an excessive wear in injection pumps and power loss due to pump leakage whereas high viscosity may results in excessive pump resistance, filter blockage, high pressure and coarse atomization and fuel delivery rates. The blends B10, B15, B20 of cotton seed and mustard methyl esters have higher cloud and pour point as compare to diesel. The cloud and pour point of cotton seed methyl ester and mustard methyl ester was also higher as compared of diesel respectively. The results indicated that the blend B 10 of both the ester was observed the cloud point nearly to that of diesel. The B10 blend of both esters has lower cloud and pour point as compare to B 15 and B 20 blends of both the esters. At low operating temperature fuel may thicken and not flow properly affecting the performance of fuel lines, fuel pumps and injectors. Therefore B 10 blend was reliable to use in cold weather.

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