Synthesis of Biodiesel Manufactured by Waste Chicken Fat

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Abstract— Due to the fast growing need of replacing toxic oils with renewable sources of energy, waste chicken fat was used to produce a green fuel known as biodiesel.After suitable tests , it was found out that the Free Fatty acid(FFA) percentage in this oil was quite high . Therefore the high content of FFA present was pretreated with alcohol. Further trans-esterification process is followed by treating it with the a suitable alkali such as Potassium hydroxide (KOH) .Initially the chicken waste consisted of 14% of Free fatty acid(FFA) which after pretreatment was reduced to 1.5 % which then became viable for trans -esterfication process. Viscosity analysis was done on different blends such as B20, B30 and B100 .B20 was found out to have a lower viscosity of 2.9 mm^2/sec and is the most promising fuel in near future
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Keywords **:** Trans-esterification method; biodiesel; waste chicken fat; Free fatty acid percentage; Renewable source.

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1 INTRODUCTION

Biodiesel is an alternative fuel for diesel engines that is receiving great attention worldwide as it reduces the dependence on petroleum products, the energy crisis, global climate changes and environmental pollution and is also nontoxic. Biodiesel is currently produced from a number of products, including soy bean oil, cotton seed oil, and yellow grease, among other things. Turning animal fat into Biodiesel is not new, it's just not (yet) being done to any great extent. The low, uneven quality of chicken fat (a factor when being considered as a biofuel stock,) is normally shipped to a few vendors in other states to be used in soaps, as filler in pet foods and a few other consumer products. When compared to soybean oil, animal fats are more plentiful and easily exploited.

Demand for energy and its resources, is increasing every day due to the rapid outgrowth of population and urbanization. As the major conventional energy resources like coal, petroleum and natural gas are at the verge of getting extinct . Rendered animal fats and restaurant waste oils are appealing feedstock to produce biodiesel. They are sold commercially as animal feed. If the free fatty acid level is less than 15% it is called yellow grease and if it is above 15% it is called brown grease. But if FFA is more than 10% then this needs to be pretreated to bring the percentage down to as low as 1% in order to make it feasible for trans-esterification process.

For many decades the search for a perfect alternative for crude oil is being done.The way crude oil is being consumed , there will be times when the world will turn its attention to other sources of energy. Solar energy has widely been accepted and is being used in engines by in corporating a battery sytem in the car. But the overall cost of this battery system makes the car expensive and also the life of the battery keeps on degarding day by day making it a burdensome alternative source of energy.

The waste fat is animal byproduct which is not used in many countries such as India ,Pakistan , Bangladesh etc.Mainly all the asian countries prevent the consumption of chicken skin or feathers. Hence making use of this waste product saves us from using our conventional sources such as crude oil and also protects the enivronment from harmful gases which are emitted in using petrol based products.

The gases emitted from biodeisel doesnot contribute to global warning unlike other products. Hence on one hand it reduces the overall cost of the product and also saves the environment from harmful effects of dangerous gases.Therefore it's a win win situation in every scenario.

Biodeiesel is produced by obtaining fat from a paticular product and then treating it with a suitable alcohol and alkali such as KOH or NaOH. The foolowing equation describes the reaction which takes place in the production of biodiesel.

The by product obtained is glycerin which is later sold to soap manufacturers. Hence the cost of alkali and alcohol can be recoverd by selling this glycerin in the soap industry.

The use of biodiesel as a fuel has taken off over the last couple of years. Initially, biofuels were viewed as a fool -proof solution to the impending energy crisis. Biofuels are considered by many to be carbon neutral since the plants they are made from grow by taking in carbon dioxide from the air. Hence the carbon dioxide emitted by a vehicle running on a biofuel will then be reabsorbed by the plants in the next crop. It's a nice idea in theory, and consumers and governments alike have bought into the biofuel revolution.

In reality, there is an emerging debate about the true benefits of biofuels, and many people dispute that they really are carbon neutral. However, biofuels do have the potential to help bridge the gap as we wean ourselves off fossil fuels, and there is a lot of research into more sustainable methods of producing them (so-called 'second generation biofuels').

Biodiesel is commonly made using a process called transesterification. Vegetable oil is composed of triglycerides, which are triesters of glycerol. To make biodiesel, the triglycerides are reacted with methanol. The reaction is extremely slow, so a potassium methoxidecatalyst is used to speed the reaction up.

Expensive

2 Procedure for Paper Submission

2. Review Stage

Waste animal fat (WAF) is an appealing raw material, as it serves as a cheap source and its utilization serves as an environmental cleaner .Waste chicken fats were collected from city Slaughter House of Okhla, New Delhi . Fats were eventually melted by preheating to a void any degradation. Melted fats were then filtered to remove suspended elements and solid waste products(feathers ,dirt).Methanol and Potassium hydroxide (98%) were acquired from Chemistry lab of Al-Falah university.

A chemical treatment called transesterification was performed on this raw material in which linear monohydroxy alcohol reacts with the WAFs, which are triglycerides (glycerin esters) of fatty acids, in the presence of a catalyst
While basic catalysts are used with many straight vegetable oils, basic catalysts cannot be utilized with used WAFs, which contain 12–15% of free fatty acids(FFA). These basic catalysts therefore loose their effectiveness eventually reacting with free acids to form glycerine and makes a grievous job to separate it with the final products.

3. Experimental procedures and test results

3.1. Materials

A sample of the WAF, weighing 100 g, was filtered and heated to remove wastes because their presence reduces the production of alcohol ester. After preheating , alcohol (methanol) and 10 g of catalyst (0.1 KOH) were measured . Then, the acid was dissolved in the alcohol with quiet agitation. This mixture was then poured into the filtered WAFA funnel will be rquired to filter out the glycerin from the mixture.For indication of oil phenopthelaic indicator is uesd to determine the amount fatty acid present in the waste.

3.2. Schematic Mixing

By heating the mixture to the defined temperature of 100 C, the reaction is embarked.
The ultimate mixture was eventually left to cool and settle for 60 min. Finally, a reparatory funnel was used to part the final product into two layers. The top layer was alcohol ester (biodiesel) that was separated and weighed using a digital balance with accuracy of ±0.002 g.

3.3. Measuring apparatus

The weight of each sample were measured by the quality digital scale .(model: AND Weighing FX-5000i lab scale).

3.4 Experimental parameters and design

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To further determine the potential of this produced biodiesel, thus produced, as a substitute of the crude oil based Di esel fuel, samples of the biodiesel were sent to the laboratory of the mechanical engineering department of Al Falah university to examine their physical and thermal properties compared to those of Diesel fuel

3. Results and discussion

The following sections describe the results of the present study and also present a discussion on the results in light of the available literature.
Two blends were produced B20 and B30 whose viscosity was measured with a viscous meter. Blends were produce d by mixing petroleum derived diesel oil with Bio diesel oil. For the preparation of B20 ,80 % of diesel oil was mixed with 20 % of WAF bio diesel. The viscosity of this mixture was found out to be 2.8 mm2/sec. The viscosity of this B30 mixture was found out to be 3.2 mm2/sec . Whereas the viscosity of diesel oil is about 2.6 mm2/sec . Hence the value of B20 is comparatively close to diesel fuels viscosity . the viscosity of B30 being hiher makes it difficult to be used. Hence further viscosity has to be rduced in order it to make it
It was found that B30 is more viscous as compared to B20
On the other hand B100 was highly viscous and could not be used for any purpose special purpose engines would be required to use it
Hence in near future B20 can be much further enhanced and used for replacing it with crude oils

4. Conclusion

Although Waste Fat of animals is a exceptional raw material for biodiesel production, but 20 –24% of this fat is glycerine, which makes them thick and gluey .
Different blends of biodiesel were prepared by adding suitable mixtures of petroleum oil derived diesel oil with produced biodiesel using WAF. Viscosity was measured for each and every sample to determine which blend would be suitable to be used for an engine
Although B30 makes a cheaper oil but B20 works m uch more effectively due to its cold-weather performance, m aterials compatibility, and ability to act as a solvent.
Also the viscosity measured in case of B20 was found to be which makes it a better fuel as compared to B30.

5. References

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