Production of Biofuel from Chicken Feathers

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Abstract - Increased urbanization and increase in population has led to an increased demand for fuels. The result is the prices of fuels are reaching new heights every day. The diesel engines led to emission of hazardous gases like sox, co etc. which can further led to problems like acid rains. This things can also affect human health and increase global warming. Today with the advances in the knowledge and developing technologies there is a way to control pollution, use of biofuel can be an alternative to current fuels. Biofuels like biodiesel is produced from variety of resources like Soyabean, rapseed, peanut etc. In the present text it can be found that chicken feathers can also prove a better source for production of biofuel.

Keywords - Biofuel, Chicken Feathers, methoxide.

I. INTRODUCTION

Energy demand in India is increasing 6% annually compared to 2% of other countries. Currently imported crude petroleum supplies about 70% of the energy requirement. Vegetable oils, fats, and their derivatives can be used as an alternate eco-friendly energy sources.

Biodiesel is a non petroleum-based alternative diesel fuel that consists of alkyl esters derived from renewable feedstocks such as plant oils or animal fats. The fuel is made by converting the oils and fats into what are known as fatty acid alkyl esters. The conventional processes require the oils or fats be heated and mixed with a combination of methanol and sodium hydroxide as a catalyst. The conversion process is called transesterification.

“Biodiesel provides an effective, sustainable-use fuel with many desirable properties,” Schulte said. “In addition to being a renewable, biodegradable and carbon-neutral fuel source, it can be formed in a matter of months from feedstocks produced locally, which promotes a more sustainable energy infrastructure.

It also decreases dependence on foreign oil and creates new labor and market opportunities for domestic crops.” Operating a plant in Cottonwood Falls, Kansas, R3 Energy began selling chicken fat biodiesels to rural consumers currently.

The plant has been operational for three months using local feed stock. At full production, the plant is expected to make 1.4 million gallons of biofuels a year [1].

II. ADVANTAGES OF BIOFUEL

1. Produced from sustainable / renewable biological sources.
2. Ecofriendly and oxygenated fuel.
3. Sulphur free, less CO, HC, particulate matter and aromatic compounds emissions.
4. Income to rural community.
5. Fuel properties similar to the conventional fuel.
6. Used in existing unmodified diesel engines.
7. Reduce expenditure on oil imports.
8. Non toxic, biodegradable and safety to handle [2].

III. CHEMISTRY OF BIODIESEL PRODUCTION

Biodiesel is produced by transesterification of large, branched triglycerides in to smaller, straight chain molecules of methyl esters, using an alkali or acid or enzyme as catalyst. There are three stepwise reactions with intermediate formation of diglycerides and monoglycerides resulting in the production of three moles of methyl esters and one mole of glycerol from triglycerides.

Alcohols such as methanol, ethanol, propanol, butanol and amyl alcohol are used in the transesterification process. Methanol and ethanol are used most frequently, especially methanol because of its low cost, and physical and chemical advantages.

They can quickly react with triglycerides and sodium hydroxide is easily dissolved in these alcohols. Stoichiometric molar ratio of alcohol to triglycerides required for transesterification reaction is 3:1. In practice, the ratio needs to be higher to drive the equilibrium to a maximum ester yield [2].

Chicken feather meal consists of processed chicken feathers, blood, and innards that have been steam processed at high temperatures, and because of its high protein and nitrogen content is currently used as animal feed and fertilizer. The meal also has a 12% fat content, which could be used as a nonfood feedstock to make biodiesel [3].
IV. MATERIALS AND METHODS

Materials: Chicken feathers; methanol [HPLC Grade]; potassium hydroxide [koh].

Feather sample: (100 g) was stirred in 300 ml of water at 100°C for ½ hr. The adsorbed fat on the protein content of feather meal was melted and floated on surface of water layer.

Titration: Burette contained lye (1 g lye-KOH in 1 l Distilled water). 10 ml of isopropyl alcohol added to 1 ml of d/w in conical flask. 2 drops of phenolphthalein indicator added in the flask. Lye added drop by drop and the readings noted when colour change appears.

Prepare potassium methoxide: Mix titrated value + 4.9 gm of KOH with 200 ml method.

Heat feathers mixed in sodium methoxide:
- While stirring
- Stir it at least 30 min
- Allow it to settle for 24 hrs

V. RESULTS

It was found that the solution formed two layers which were further separated using separating funnel. The layers were checked for pH. The sample was checked for its burning efficiency and was checked for Sp. Gravity and Optical Density respectively.

VI. CONCLUSION

In conclusion the said process can be implemented to produce a crude fuel from wasted chicken feathers. Feathers can prove a better alternatives for production of Biofuel as compared to other sources. Methoxide should be used as a catalyst. Methanol is a good solvent for the process.

Figure (2 - a): The separation of film was obtained using a separating funnel

Figure (2 - b): The separation of film was obtained using a separating funnel
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