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PRODUCTION OF BIODIESEL WITH CHICKEN FAT

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ABSTRACT

Our conceptual attribute is extracting biofuel from chicken wastages. Waste chicken fat is harmful for human health due to fat contain in the chicken. So there is large amount of chicken fat is waste so we can use that chicken fat for production of chicken fat based biofuel. Mainly animal fats and vegetable oils are used for the production of biodiesel. Several types of fuels can be derived from triacylglycerol-containing feedstock .Biodiesel which is defined as the mono-alkyl esters of vegetable oils or animal fats. Biodiesel is produced by transesterifying the oil or fat with an alcohol (methanol/ethanol) under mild conditions in the presence of a base catalyst. This paper discuses fuel production, fuel properties, of biodiesel made from chicken fat. This also describes the use of glycerol which is the by-product in esterification process along with biodiesel.In this study, it could be determined that inedible animal fat could also prove a better source for production of biodiesel.

Keywords: *biodiesel, chicken fat, transesterification, biodiesel, diesel, blends*.

I. INTRODUCTION

Our society is highly dependent on petroleum for its activities. However, petroleum is a finite source and causes several environmental problems such as rising carbon dioxide, CO2 levels in the atmosphere. About 90% is used as an energy source for transportation, heat and electricity generation, being the remaining sources used as feedstock in the chemical industry (Carlsson, 2009). High petroleum prices and the scarcity of known petroleum reserves demand the study of other sources of energy.

Biodiesel is a non-petroleum based alternative diesel fuel that consists of alkyl esters derived from renewable feedstock 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 (Nivedita Das, 2013).

Biodiesel production with high quality feedstock such as vegetable oil is relatively expensive compare to fossil diesel cost. Edible vegetables oil is a feedstock that commonly used in producing biodiesel. Production of biodiesel could be less expensive if the feedstock is from inedible food or waste. Therefore, one of the most promising less-expensive feedstock is animal fat such as chicken fat, beef tallow, etc. Besides to reduce the environmental problems caused by incomplete combustion of diesel engines, at the same time, by using low-cost feedstock such as inedible animal fat could indirectly reduce the waste that comes from the slaughterhouse.

Oils and fats are composed primarily of triglycerides. Triglycerides consist of a glycerin backbone with fatty acid radicals attached in place of the hydroxyls.

Animal fats are readily available because slaughter industries are generally well managed for product control and handling procedure. In recent, alternatively lipid residues such as waste frying oil and inedible animal fats have also receiving considerable attention from biofuel sector. To take advantage of these low cost and low quality resources, a convenient action would be to reuse residues in order to integrate sustainable energy supply and waste management in food processing facilities emissions and co-products. This also an alternate fuel in future .If

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production of biodiesel is considered by our government the animal wastes which easily available in bulk can be used for producing biodiesel in a more cost effective method.

II. MATERIALS AND METHODS

The feedstock samples of Chicken Fats (CF) were provided by a local chicken supplier which has been wash thoroughly to remove foulness and bloodstain that can affect the hydrolysis process. Then, the CF is well fine-filtered to remove any unwanted part of the chicken mixed with the samples. Specific calculated amount of CF is needed to produce the desired amount of Biodiesel.

First step of the process is boiling up the CF along with distilled water - Hydrolysis process The specific calculated amount of chicken fats is measured and prepared (wash and filtered) while specific amount of volume of distilled water is poured into the tank and boiled up to 1000C. Then the chicken fats is placed in a filter and put into the hydrolysis tank. The extraction of oil occurred in duration of 30 minutes and the chicken fats will produce crude oil contains a triglyceride molecule chain attached to glycerin backbone molecule chain. Ginger is mixed into the tank for odour removal process. The extraction oil from the chicken fats is then introduced to the Transesterification Process.

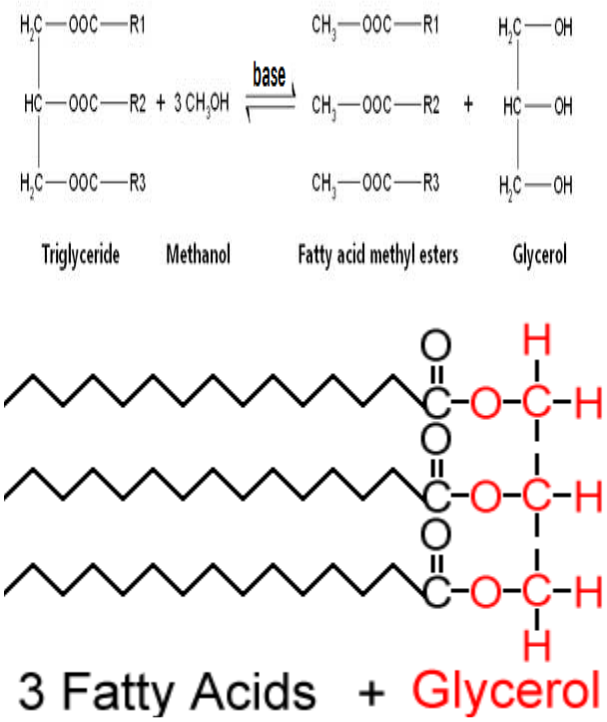

Figure: Transesterification reaction

Catalyzed process Transesterification

The chemical reaction that converts an animal fat oil, specifically chicken fats to biodiesel is call "transesterification". In this reaction, an ester and a alcohol (i.e. methanol) react to form a different ester. The three fatty acid chains - triglyceride (R1COO") connected to the glycerol backbone are broken at their ester bond and react with the alcohol to form an alkyl esters and a glycerol molecule. Figure 4 shows the transesterification reaction Biodiesel is produced from the triacylglycerol containing material by means of a transesterification reaction. In this process, alcohol (methanol/ethanol) and animal fats are mixed in the molar ratio of 6:1, heated at 60-650C for 1hr and the ambient pressure in the presence of catalyst such as NaOH/KOH. Before that, animal fat gets heated up to

105-1100C so that it will be converted into fat oil then in the separate flat bottom flask, alcohol and NaOH/KOH (2% of fat)are mixed exothermic reaction take place. This mixer is then added to heated fat and keep it at 60-650C for 1hr. After this, it is poured into a bottle so that biodiesel and glycerol get separated as shown.

This biodiesel is used in diesel engine as a solvent in ethanol-diesel mixer for avoiding a phase separation. The increasing % of biodiesel in ethanol-diesel blends results in the increase of emissions NOx but it reduces the emissions of CO, HC, sulphur and particulate matter (PM) considerably

Biodiesel is being produced from many of vegetable oils and animal fats. If it is produced from high quality edible oil and fats, it will resulted in high prices of raw material and biodiesel is more expensive than petroleum diesel fuel also shortage of edible oil for food purpose. Biodiesel may also be produced from less expensive animal fats including inedible tallow, pork lard and yellow grease. Animal fats are highly viscous and mostly in solid form at ambient temperature because of their high content of saturated fatty acids. The high viscous fuel leads to poor atomization of the fuel and result in incomplete combustion. Transesterification and emulsification are two main solutions that have appeared as effective methods for using animal fats in diesel engine. Animal tallow generated biodiesel offers a wide range of energy, environmental and economic advantage as stated by Nelon and Schrock (10). Glycerol, which is a co-product in the biodiesel production, refining and unrefined, can be used in the manufacture of a variety of products as shown in figure given below. Glycerol obtain from biodiesel production does not require any further processing except purification.

III. PREPERATION OF BIODIESEL BLENDS WITH DIESEL

The commercial diesel oil used in the tests was obtained from a local automotive supply network and had the following features:

- Calorific value: 44.816 (KJ/kg)
- Density: 857 (kg/m3) at 25 ºC
- Viscosity: 3.32 (mm2 /s) at 40 ºC
- Flash Point: 69 ºC
- Sulphur: 0.121 (% m/ m)

Mixtures were processed with different percentages of commercial diesel and biodiesel placed in PET containers and properly identified. The fuels were classified as 100% commercial diesel, 100% biodiesel (B100), addition of 5% biodiesel to diesel (B5), addition of 20% biodiesel to diesel (B20), and addition of 50% biodiesel to diesel (B50

IV. CONCLUSION

The use of the Chicken fat as a raw material for biodiesel production has proved to be of substantial value as compared with other choices of raw materials of various origins, such as the planting of oleaginous and the use of oils of plant seeds origin since chicken fat is available in large quantities in the community and would otherwise be dumped. Gains related to the reduction of toxic gas emissions resulting from combustion processes were remarkable considering the large reduction of CO and CO2 emissions. The studies point to a possible NOx emission reduction via improvements in the density, additives, and stoichiometric balance of biodiesel.

The technical feasibility of using biodiesel, considering the physical-chemical aspects, was presented positively and interpreted by the torque and power tests conducted, with little variability regarding the percentage of biodiesel in the mixture with diesel. Considering the specific consumption of biodiesel compared to diesel, despite having a small increase, it is passive in terms of improvement in reducing energy consumption through the use of additives, the improvement of density, and in the transesterification process. The use of Chicken fat as the base for the production of biodiesel has proven to be viable and can be seen as an alternative solution to the problem of the improper disposal of Chicken fat.

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