REVIEW OF RESEARCH

BIODIESEL FROM COCONUT OIL

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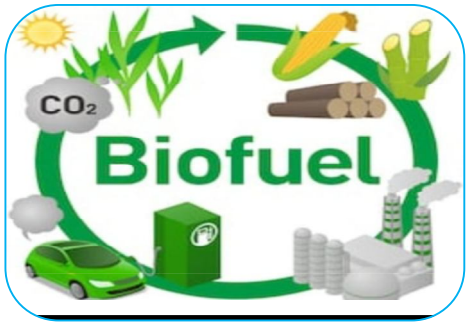

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ABSTRACT:

An attempt is made to review the article titled "Biodiesel from Coconut Oil -A Renewable Alternative Fuel for Diesel Engine" written by MD.A.Hossain, Shabab. M .Chowdhury, Yamin Rekhu, Khandhkar S.Faraz, Monzur ui Islam. The article has been taken from World Academy of science, engineering and technology. International Journal of Chemical and Molecular Engineering vol.6.8 no 2012.

The selected article discusses that there is a growth in modern civilization and in industrialization worldwide. It shows that the majority of the world uses fossil fuels and natural gas. It highlights that Fossil fuel is a non renewable one and which is being diminished year by year and to reduce the use of fossil fuels, use of renewable sources has now become popular. As examples, the authors consider the places where coconut trees are widely grown. In Bangladesh coconut is the most widely growing tree. In southern region the coconut tree is considered as an asset. The reason behind their consideration is that coconut oil can replace the Fossil fuels. So they have endeavored to use the coconut oil as a renewable and alternative fuel. In short they have performed the research in small diesel engines by using different blends of biodiesel like coconut oil and have shown how coconut oil can be used as an alternative fuel for diesel fuel. How coconut oil is being used as biodiesel becomes the main point of this article.

KEYWORDS : *Biodiesel, Bio fuel, Renewable energy and Transesterification.*

FUEL – AN INTRODUCTION

A fuel is any material that can be made to react with other substances so that it releases energy as heat energy or to be used for work. Most of the fuels used in the world are fossil fuels which are derived from coal, petroleum and natural gas. These fuels cannot be reused again and again so they are non renewable energy resources. These fuels are not eco friendly. In order to replace this fossil fuel an alternative renewable energy resource is being used. First they used the vegetable oil as a biodiesel. Later the attempt has been made using coconut , soybean , sunflower, palm oil etc. This vegetable oil is not used now since it cannot be used in some engines. To overcome these problems transesterification process was considered. Through this process the vegetable oils are converted to the alkyl esters of the fatty acids present in the vegetable oil. These esters are commonly referred as Biodiesel.

BIODIESEL

Biodiesel is the alternative fuel that is renewable in the sense that its primary feed stock has a sustainable source. By adopting and increasing the use of biodiesel, European countries have reduced their dependence on crude oil. The emissions from biodiesel are very clean since it is an oxygenated fuel. And the problem of using this fuel is its cold flow properties. Because in colder climates , crystallization can occur which leads to plugging of fuel filters and lines. In US case study biodiesel is blended with diesel fuel. So that

the work has been done to produce biodiesel from ethyl esters of coconut oil ."Biodiesel can be defined as mono alkyl esters of long chain fatty acids from renewable feed stock such as vegetable oil, or animal fats ,for use in compression ignition (I.C) engines.

BIODIESEL FROM VEGETABLE OIL

Biodiesel is produced from the vegetable oils .The main components of vegetable oil are triglycerides. Triglycerides are the esters of glycerol with long chain fatty acids, commonly fatty acids.

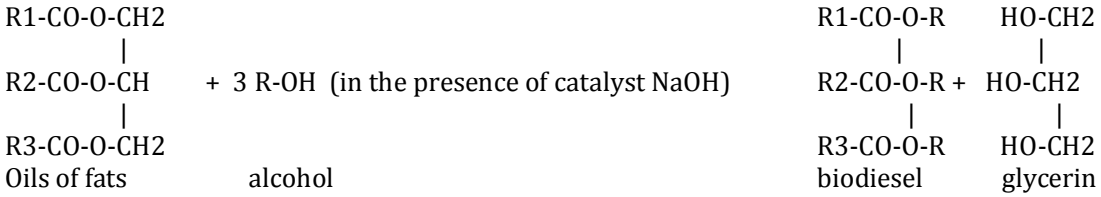
BLENDING PROCESS

Blends of biodiesel and hydro carbonated diesel are products most commonly circulated in diesel fuel market place. Most of the world uses a system known as the "B" factor to state the amount of biodiesel in fuel mix.

(1) 100% biodiesel is known as B100
(2) 20% biodiesel ,80% petro diesel B 20.
These are some examples of blending process.

TRANSESTERIFICATION PROCESS

Coconut and any vegetable oils are triglycerides mainly containing glycerin. The biodiesel process turns the oil into esters, separating out the glycerin from main product. The glycerin sinks to the bottom and the biodiesel floats on top and can be decanted off. The process is called transesterification, which substitutes alcohol for the glycerin in the chemical reaction, using a catalyst.



MATERIALS USED IN BIODIESEL PRODUCTION

1. 1 Liter of coconut oil
2. 200ml of methanol 99+% pure
3. Sodium hydroxide 0.1 grams.

BIODIESEL FROM COCONUT OIL

The main source used here is coconut oil . In the reviewed article it is shown that based on stoichiometric equation of the process , 1 mol of coconut oil is to react with 3 moles of methanol to produce 3 moles of biodiesel and 1 mole of glycerol. Nearly 100 gram of coconut oil was taken. Temperature taken was 65 degree Celsius below the boiling point of alcohol. Different researchers have taken different time and temperature for transesterification process. Reaction time ranges from 15 to 30 minutes.0.1 to 1.2% (by weight of oil), 0.8% NaOH,20% methanol was used in the biodiesel production.

The steps involved in the synthesis of biodiesel from coconut oil are

1. 200ml methanol was mixed with 150ml of NaOH and this is an exothermic reaction ,so the mixture gets hot . This solution is known as sodium methoxide , which is harmful to human skin.
2. Sodium Methoxide was added with 1L of coconut oil, which was preheated at 65 degree Celsius. Then it was shaken for 5 min in a glass container and it was left for 24 hours for the separation of glycerol and ester into two layers.

3. The upper layer is 100% biodiesel and the lower layer is glycerol and heavier layer is removed by centrifugation .
4. If the coconut oil contains impurities there will be a thin white layer between these two layers.
5. Then biodiesel will be washed with distilled water in order to remove waste and dry wash will be done .

Biodiesel produced in the above process contains moisture and usually some soap and methanol .So heating the biodiesel above 100 degree Celsius would remove the moisture and methanol. By washing method the biodiesel was obtained by 2 steps. First step is hot water was poured in biodiesel and kept for 4 hours in stable position , then the biodiesel was collected in a pipe using siphoning method and it was repeated and PH was noted and it is known as wet wash process. Second step is using air stone which produces bubbles in solution for dry wash and a heater was used to remove water from biodiesel.

BIODIESEL PROPERTIES

Heating Value	Viscosity	Flash point
It indicates the energy density of the fuel.	Viscosity of the fuel exerts a strong influence on shape of fuel spray.	It is an important property of CI engine fuel.
ASTM 2382 method was used to measure the heating value of biodiesel. Heating value of fuel decreases if it has higher blending of biodiesel.	High viscous oil will make the difficulty in starting and a smoky exhaust will appear. Low viscous fuel would pass through leakage of the piston.	The flash point of the bio fuel is higher with higher blending of bio diesel. Biodiesel has lower energy density than diesel fuel, so compression ratio is required.

PERFORMANCE TEST OF BIODIESEL

The final product of biodiesel from coconut oil was used as a fuel to operate diesel engine. In a experimental setup an engine test bed with fuel supply system and measuring and metering devices were used. Preheating system is made in engine test bed with the help of heater and thermocouple. A single tank is used here to mix coconut oil with diesel. After proper blending performance test of engine was carried out. All engine parameters were noted down properly before and during operation for comparion of diesel and biodiesel.

CONCLUSION

In short in this reviewed article we can know about the biodiesel and diesel performance in engines. Biodiesel is an important fuel in our society because it transforms the by- products into biofuel. Vehicles are the major source of atmospheric CO2, the main green house gas that causes global warming. Biodiesel is the way to reduce the human caused global warming. It poses no risk to our nation's water supply.

Apart from coconut oil , algae, ethanol are also used as bio fuels. Its cost is high. Research has shown that use of biodiesel reduce the GHG emissions by over 76% compared to petroleum diesel. Hence this biodiesel has a larger scope in the future.