

Comparison Study of Flash & Fire Point of Bio-diesel Produced by Mustard and Soya Bean Oil

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Abstract - Consumption of fossil fuel is increasing day by day that results decrease in amount of fossil fuels present on earth. After 30-40 years these sources are in danger of extinction so as to meet the requirement of human beings there is a need of using the alternative source of fuels. One of them which cause as alternative fuel that is derived from the vegetable oils and fatty acids. It is a key source as an alternative fuel. The process of biodiesel production is completed by the trans-etherification process and it is the chemical reaction between oil and alcohol in the presence of catalyst which results separating bio-diesel and glycerin. The process is completed in 2-4 hours and also depends upon the type of vegetable oil. Properties of Bio-diesel are also depends on the used oil. This paper illustrates the comparison between Soya bean and mustard oil Bio-diesel which is followed by different parameter such as Flash & Fire Point. Various ratios of blends of Bio-diesel (5%, 10%, 15% and 20%) are taken. Both edible and non-edible oil are used for producing the bio-diesel.

Keywords- Fossil fuels, Trans-etherification, Blends, Yield, Flash & Fire point etc.

I. INTRODUCTION

Fossil fuels are the fuels that generally derived from the dead and decay plants or animals who was buried inside the earth crust more than millions of years ago. Fossil fuels contain high percentage of carbon which includes petroleum, coal, natural gas and diesel[1]. They have low carbon-hydrogen ratio in compared to other fuels. Fossil fuels are non-renewable source of energy although, these sources of energy largely contributed today in world energy. Countries with maximum fuel producing according to a survey in 2014.

Saudi Arabia is the biggest oil producer in the world and that amount is about 400 millions of ton followed by Russia, USA, China, Canada and Iran. China consumed the maximum amount 25000 million tons of energy derived from fossil fuels followed by Us, Russia and India[2]. India ranks 4th in the consumption of fossil fuels that is about 300 million tons. Production of fossil fuel by the Gulf countries have an importance in the GDP of the countries after exporting the oil/fuels around the world.

The Fuel consumption details are US consume 1800 million tons, Russia consumes 700 million tons, India consumes 400 million tons. Countries like Japan, South Korea and France produced essentially number of fossil fuels and are 100% dependents on exports. India produces Fossil fuel 260 million tons and exports 140 million tons[3-6]. Bio-diesel started to be widely produced in the early 1990's the production has been increasing stably. Europe is the main producer of Bio-diesel that is about 95% of overall production. Countries like USA and Germany are working on Bio-diesel production[7]. The oil used here for producing bio-diesel are Mustard and Soya bean. Mustard and Soya bean oil are edible vegetable oil and they are easily available anywhere in India. They both are extracted from the seeds and widely used for cooking food. Cooking oil have three types refined, unrefined or in-

combustion. Refined oil are obtained by the process of oil refining where the impurities are removed. Soya bean is also considered as the best source of vitamin E.

It is pale yellow colored. The acid value and iodine value of soya bean oil are 1-2 & 132-136[8]. Mustard oil is the oil that is obtained from the mustard seed. It has higher viscosity and impurities in comparison of Soya bean oil. Input of Mustard oil in the financial year 2012-13 stood at 23 lakh tons and it is to touch 34 lakh tons in 2020. Major mustard producing states in the country are Rajasthan and Gujarat. Rajasthan is top producer of mustard oil.

Properties of this oil are different from other oils. It is dark yellow in color and viscosity and Boiling point are high [9]. Bio-diesel fuel produced by trans-etherification of edible, non- edible waste cooking oil it increasing the environment fresh and diminish the amount of harmful gases. Consistently every day we confront from such a situation and this bio-diesel is a new tactic to keep the balancing on the earth resources. The emissions produced from bio-diesel are cleaner as compared to petroleum diesel fuel. Particulate emission, soot and carbon monoxide are lower since biodiesel is an oxygenated fuel. The bio-diesel is formed and be used as a pure fuel alternative new and renewable fuel have the potential to solve many of the current social problems, concern, from air pollution and global warming to other environment improvement and sustainable issues. It is using to look forward for the future generation the paramount which we teach to all engineering student is we can't use more than we have the balance between renewable and non-renewable. 40% of the liquid transportation is depends now on bio-diesel this is now basic needs in the upcoming generation. Generally till date blends of Biodiesel up to 30% is acceptable in diesel engine [10-12].

1. Experimental setup

The setup used for complete the experiment is 500 ml Beaker and put on the magnetic stirrer with a Bit made up

by magnet. The Magnetic stirrer rotates the Magnet bit on constant RPM thus helps in the separation of Bio-diesel and glycerin. Flash and Fire point are measured by Pensky-martens Apparatus.



Fig.1 Magnetic stirrer.

Magnetic stirrer is a device used as for mixing of the chemicals during the reaction. Containing a magnetic bit which is used as a mixing the products who are in beaker. A magnetic device is a laboratory device that helps to employ a rotating magnetic field. It is immersed in a liquid solution to spin very quickly and break down the viscosity even, thus stirring it. Magnetic stirrer is dip in a liquid solution .beneath there is a magnetic which creates a rotating field and rotates the stirrer.

2. Trans-etherification

It is the process used for the production of biodiesel by the conversion of edible or non-edible oils. The most common method of trans-etherification is the reaction of the ester with an alcohol in the presence of the catalyst. Basically, while doing trans-etherification we can used two catalyst KOH & NaOH. The function of sodium hydroxide increase the rate of reaction and used for the reduce the viscosity' by reaction in the presence of reactant that is methanol and the catalyst used is KOH and NaOH. the trans etherification process can also be done in the presence of ethanol, butane however, maximum yield get from the methanol>ethanol>1-butanol. Glycerol is by product of trans etherification process .after extraction of oil from the seed the detoxification occurs of seed cake and feed it to the cattle. Glycerin is a simple polyol compound. It is generally colorless, odorless and viscous liquid that is sweet testing and non-toxic in nature. It is used for skin and sometimes uses for moisturizer.

3.Processes

3.1 Experiment 1

Step-1 300 ml of Mustard oil taken in a Beaker
Step-2 Put the Beaker on Temperature plate and heat upto 500 c and start the Magnetic stirrer at same time.
Step-3 130 ml Methanol is mixed in the oil. This will change the color of Solution into yellowish and Methanol will come upward.

Step-4 After 4-5 minute of mixing add the cataylst KOH in quantity of 3 gm.

Step-5 Maintain the Temperature between 60-700 c and Constant the RPM of Magnetic stirrer.

Step-6 Keep checking the Temperature

Step-7 Separation of Bio-diesel and glycerin will occur in 3.5 hours.

Step-8 Leave the solution for 24 hours then this will be completely separated.

Bio-diesel will come on top and Glycerin will settle down.



Fig. 2 Quantity of KOH on Weigh M/c.

3.2 Experiment 2

Step-1 300 ml of Soya bean oil taken in a Beaker.

Step-2 Put the Beaker on Temperature plate and heat upto 500 c and start the Magnetic stirrer at same time.

Step-3 130 ml Methanol is mixed in the oil. This will change the color of Solution into yellowish and Methanol will come upward.

Step-4 After 4-5 minute of mixing add the cataylst KOH in quantity of 3 gm

Step-5 Maintain the Temperature between 60-700 c and Constant the RPM of Magnetic stirrer.

Step-6 Keep checking the Temperature

Step-7 Separation of Bio-diesel and glycerin will occur in 2 hours.

Step-8 Leave the solution for 24 hours then this will be completely separated.

Bio-diesel will come on top and Glycerin will settle down.



Fig.3 Mixing of Methanol into the Soya bean oil.



Fig.4 Separation of Bio-diesel and glycerine.

II. RESULT AND DISCUSSION

In the present experiment there is a comparison between physical and chemical composition of Mustard and Soya bean oil on the following parameter such as Yield amount, Flash and Fire point. The blends of both Mustard and Soya bean Bio-diesel is taken in ratio of 5%, 10%, 15% and 20% in the volume.

Table 1 Comparison of Mustard and soya bean oil bio-diesel.

S.No	Parameter	Bio-diesel from Mustard oil	Bio-diesel from Soya bean oil
1.	Yield (gm)	230.66	234
2.	Glycerine (gm)	47.67	61.20

Table2 Comparison of Flash & fire point of Mustard and Soya bean Bio-diesel on the basis of Blends.

S.No	Blends	Bio-diesel from Mustard oil		Bio-diesel from Soya bean oil	
		Flash Point 0c	Fire Point 0c	Flash Point 0c	Fire Point 0c
1.	5%	39	45	45	50
2.	10%	40	47	47	54
3.	15%	41	48	49	58
4.	20%	42	50	50	60

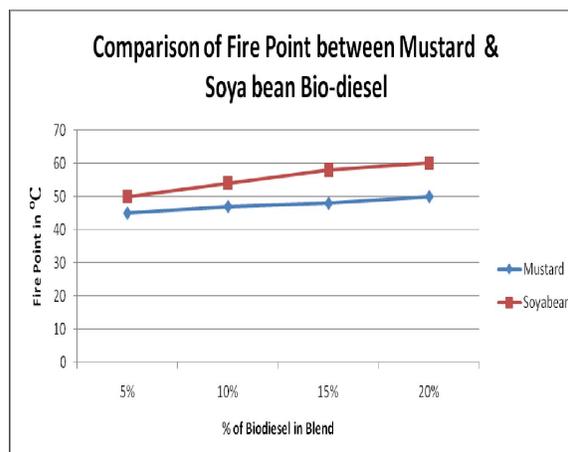


Fig.5 Comparison of Fire Point between Mustard & Soya bean Bio-diesel.

The graph is plot between the % of bio-diesel in blend and the flash point in 0c .This graph illustrate comparison between the mustard and soya- bean biodiesel on the basis of flash point value. The result shows that the value of.

III. CONCLUSION

This study suggests that the Mustard and Soya bean oil can be used to make Bio-diesel. And the comparison between them illustrate that the Yield percentage of Mustard is low as compared to Soya bean oil. These both oil are easily available in Market of India and India is a good Exporter of these oils. They both are edible oil so the costs are high. The Flash & Fire Point helps to know the Flammability of fuel. Thus required to safely stored at underground. Lower the Flash point temperature greater the risk of flame.

- The results show that when we increase the % of Bio-diesel in Blend then Temperature will be increase Constantly.
- Mustard oil Bio-diesel is more efficient in compared to Soya bean oil Bio-diesel. Mustard has high flammability then Soya bean.

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