



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 9, Issue 12, December 2020

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

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Determination of Cloud Point and Pour Point of Biodiesel

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ABSTRACT: Alternative fuel and energy are the major research work in the world today. India and the world cannot be dependent on the fossil fuels for a long time. The shortage of fossil fuel has caused a rise in the prices of major commodities and it has become a burden on the world economy. India's oil demand rose from 4.51 million barrels per day in 2020 to 4.76 million bpd in 2021, recording a 5.61 per cent growth..Under these conditions the requirement of an alternative fuel is of utmost importance. The renewable sources of energy are pretty small as compared to the demand of the fuel. Base-catalyzed transesterification reacts lipids (fat and oils) with alcohol (typically methanol or ethanol) to produce biodiesel and an impure coproduct, glycerol. If the feedstock oil is used or has a high acid content, acid-catalyzed esterification can be used to react fatty acids with alcohol to produce biodiesel. Other methods, such as fixed-bed reactors, supercritical reactors, and ultrasonic reactors, forgo or decrease the use of chemical reaction that reduces the quality of substance in chemistry. We are here determining the cloud point and pour point of a given biodiesel samples.

KEYWORDS: biodiesel, transesterification, lipids, cloud point, pour point

I. INTRODUCTION

Biodiesel production is the process of producing the biofuel, biodiesel, through the chemical reactions of transesterification and esterification. This involves vegetable or animal fats and oils being reacted with short-chain alcohols (typically methanol or ethanol). The alcohols used should be of low molecular weight.

CLOUD POINT: The temperature expressed to the nearest degree centigrade, at which a cloud or haze appear when the oil is cooled under prescribed conditions.

POUR POINT: The lowest temp., expressed as a multiple of 3°C, at which the oil is observed to flow when cooled & examined under prescribed conditions.

Typical Oil Crops Useful for Biodiesel Production:

Rapeseed and Canola, Soybean, Oil Palm, Sunflower,

Peanut, Flax, Safflower, Castor Seed, Tung, Cotton

Jajoba, Jatropha, Avocado, Microalgae

The oil yield of the various crops is different and they may have protein and fiber content also.

II. PROCEDURE

Five samples of biodiesel have been given with different composition and additives. We will find their cloud point and pour point.



CLOUD POINT:

1. Heat the biodiesel sample to a temperature of at least 15 °C above the approximate cloud point and pour point and put it into the jar to a height of 60 mm.
2. Close the lead of the jar and make proper arrangements to fit the thermometer.
3. Fix the jar and casket making proper fittings for the positions.
4. The jar and jacket must be put in a proper position.
5. For each degree rise in temperature check the cloud point of biodiesel sample. Also check the condition of haziness of the biodiesel sample.
6. If there is no response for a long time then change the temperature of gasket by -10°C
7. Put the sample in another jar while reducing the temperature by 10°C
8. Record the reading of thermometer when a haziness or cloud begins to form.
9. Clean the apparatus and repeat the same procedure for the other four samples of biodiesel.

POUR POINT:

1. Freeze the sample to a low temperature so as to convert to solid form.
2. Reduces the temperature of bath to -5°C.
3. Bring the jar and jacket in a proper position.
4. Now reduce the temperature of given sample and check the flow. The pouring of the sample should stop. Note the readings for each degree change in temperature.
5. As soon as the required condition for pouring is found , note the readings and stop the apparatus for a small time.
6. Note that lowering the temperature to smaller values may lead to freezing. In that case reheat the sample and check for pour point.
7. Keeping the scope for error take exact reading of the given biodiesel sample.
8. Repeat the same procedure for the other four samples of biodiesel.

III. OBSERVATION AND GRAPHS

The following observations were noted for the five samples of Biodiesel.

S.No	Fuel	Quantity (ml)	Temperature (Cloud)	Temperature (Pour)
1	BioDiesel 1	50	-15	-20
2	BioDiesel 2	50	-14.1	-19
3	BioDiesel 3	50	-13.7	-18.5
4	BioDiesel 4	50	-12	-17
5	BioDiesel 5	50	-10	-16

TABLE 1: POUR POINT AND CLOUD POINT

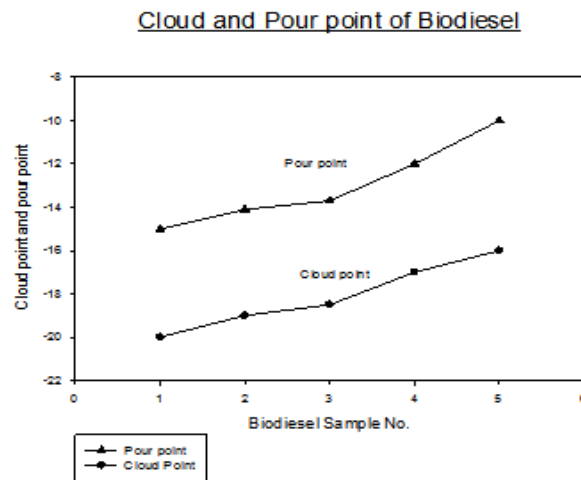


FIG1: PLOT OF POUR POINT AND CLOUD POINT

IV. CONCLUSION

From the graph we see that biodiesel sample 1 has the lowest pour point and cloud point. A four stroke diesel engine works by intake, compression, power and exhaust. Hence the Biodiesel sample 1 will be most useful for the present study. Various samples of Biodiesel were used with different additives.



Fig 2: Apparatus used

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**Impact Factor:
7.512**

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