Performance Characteristics of Jatropha Bio Fuel Blends with Kerosene using Domestic Kerosene Stove

Akshay R Kage[1] Nayana G[2] Avinasha P.S[3] Madhusudana H.C[4] Muniraju M[5]
[1,2,3,4,5]Department of Mechanical Engineering
[1,2]Student [3,4,5]Assistant Professor
[1,2,3,4,5]Adarsha Institute of Technology/VTU. Bangalore, Karnataka

Abstract— Now a day's Biodiesel is one of the most popular field and it reached good height in automobile sector [1]. Biodiesel made huge changes in domestic applications. It has huge changes in fuel economy. One of the best option is replacement of kerosene to biodiesel. In India, in cooking stove kerosene is used as fuel. Kerosene causes environmental degradation. Because it contains impurities like sulphur, aromatics and hydro carbons. This paper contain burning pressure stove using jatropha bio diesel without changes in design of kerosene cooking stove [2]. This paper contains comparison of blends of bio fuel with kerosene. B20, B40, B60, B80, B100 and kerosene. This experiment is done on stove without any modification in design.

Key words: Cooking Stove, Kerosene, Biodiesel

I. INTRODUCTION

Biodiesel is one of the spreading revolutions in case of fuel replacement in automobile sector. Many researchers are going on for using biodiesel [3]. The biodiesel is also playing most important role in rural thermal applications.

In India most of the peoples are die as a result of emission from cooking fuels, like kerosene, LPG etc. [4]. Therefore this Paper is mainly concentrating on replacing kerosene to bio fuel blends in rural areas for thermal application. By comparing jatropha biodiesel and kerosene properties [3].The performance test on kerosene stove by using biodiesel was conducted using without any modification in the kerosene stove.

A. Biodiesel:

Biodiesel is a renewable fuel, bio degradable, non-toxic. This fuel is made from vegetable oil. It has high lubricity; it is clean burning fuel and can be fuel component for existing and unmodified diesel engine [4]. Bio diesel is methyl ester or ethyl ester of fatty acid derived from range of organic source of oil.

Biodiesel is one of renewable resources. It can be used in the internal combustion engines without any modifications and this bio diesel not contains any petroleum products but its petroleum products can be blended with bio diesel in any form [5]. Bio diesel is one of several alternative fuels designed to get usefulness of petroleum products and longevity and cleanliness of diesel engine.

B. Jatropha Curcas:

Fig. 1:

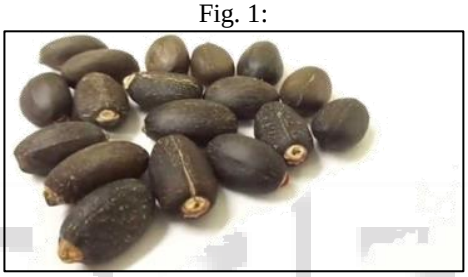


Fig. 2: jatropha seeds

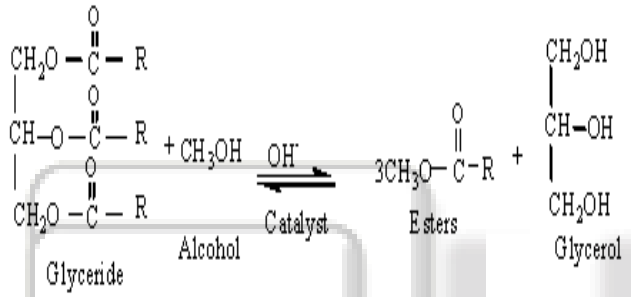
Jatropha is a small, perennial shrub and the jatropha plant belongs to the spurge family; Bio diesel from the jatropha seed is important and it is found abundantly in deserts and in tropical regions. Jatropha seed contains 27-40% fatty oil.

Jatropha seeds will grow in waste land and dry land, the tree as a height of 3-5m long and it is suitable for all the weather conditions and it is resistant to a high degree of aridity and the tree as small spreading root system [7]. The seed is in form of egg shaped. Jatropha seed is poisonous and seed is obtained during June to July.

C. Transesterification:

Where R1, R2, R3 are the palmitic acid, oleic acid, stearic acid, linoleic acid. And measure 1 litre of jatropha oil. Transfer this oil into the 3-neck flask and place the 3-neck flask on the magnetic stirrer. And insert the magnet pellet into the flask and then fix the reflex condenser into the central neck to the 3-neck flask. Connect the water pipe line to the condenser and check the water circulation from the tap to the condenser and outlet. Then connect the magnetic stirrer to the electrical connection. And ensure that the magnetic stirrer switch is one or not. Set the heat control to 60 degree Celsius. Adjust the speed controller to 500-700rpm to get homogenous heating of oil. And insert the thermo well into the side neck of the flask. Place the thermometer into thermo well and see the temperature. Take 300 ml of methanol in 1000ml capacity beaker. Then weigh the required amount of NAOH Based on the FFA level in the previous test for the jatropha oil added to methanol. When the temperature

reaches 45 degree Celsius, add the mixed mixture slowly to into hot oil through the loading opening neck and maintain the speed at 500 rpm. And then close the opening with the stopper. Maintain temp at 55-60 degree Celsius and leave the process to run 45 minutes and observe the colour of the mixture turns from turbid brown to transparent yellowish colour in the reaction vessel. After allowing settling for 30 minutes and keeping the sample to settle. The two distinct layers are formed and the chemical reaction is formed. The top layer is glycerine. And keep the process to settle for another 1 hour drains one more sample and observe the glycerine separation. Then switch off the magnetic stirrer. And transfer the mixture into the separating funnel and allow it to cool for about 2-3 hours after glycerine well settle at bottom and the biodiesel is obtained on the top layer and then separate the biodiesel from this unit and observe for other ½ hr. If there is no formation of the glycerine then take pure bio diesel and it on the magnetic stirrer to remove moisture. If there is any glycerine content is observed, then drain the same [6].



D. Comparison of fuel properties:

Properties	jatropha biodiesel	Kerosene
Density(Kg/m^3)	709	810
Flash point (℃)	120	45
Fire point(℃)	135	55
Calorific value(KJ/KG)	40232	41500
Viscosity	4.679	1.46
Specific gravity	0.709	0.81
HC	20	32
CO	0.07	0.86
CO2	5.6	6.3
NOx	832	651

Table 1: fuel properties

II. EXPERIMENTAL SETUP

The experimental work is shown in figure below

The domestic stove consists of burner, hand pump, fuel tank, oil knob, air screw

The burner is the part of stove that burns kerosene and produces flame. Pump is a device used to increase the pressure on the fuel. Air release screw is used to increase the pressure by tighten it during the pumping,as it the fuel enters the burner and the fuel sprinkles on the burner then the air release screw is released and the fire is ignited. The stove starts to burn and the air release screw is tightened for continuous burning.

Fig. 3: Experimental setup

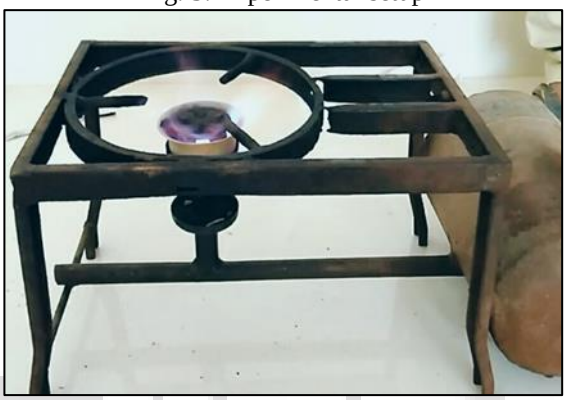


Fig. 4: burning of Biodiesel in stove

Technical Specification of stove

Manufacture	MVS enterprises
Stove type	Capillary feed
Weight of stove	2 kg
Fuel tank capacity	One litre
Thermal efficiency	60%
Design of fuel	Kerosene

Table 2: Technical Specification of stove

III. EXPERIMENTS AND METHDOLOGY

Firstly, from the Kerosene it is made to boil the water from 0℃ to 100℃ and the time taken for the boiling of water from 0℃ to 100℃ is noted down. The same procedure is continued for all other biodiesel blends like B20, B40, B60, B80 and B100 [9]. The time taken for boiling of water for all fuel samples is recorded.

Fuel Sample used	Time taken to boil 1 litre of water from (0 ℃ to 100℃)
Kerosene	5min
B20	5.5min
B40	6min
B60	6.5min
B80	7min
B100	7.5min

Table 3: Comparison of performance analysis of kerosene and biodiesel blends

IV. RESULTS AND DISCUSSION

From the performance analysis on the kerosene pressure stove of kerosene, B20, B40, B60, B80 and B100. The B20 time values is nearer to the kerosene value. Hence the biodiesel can be used for the burning of kerosene pressure stove with the blends of kerosene.

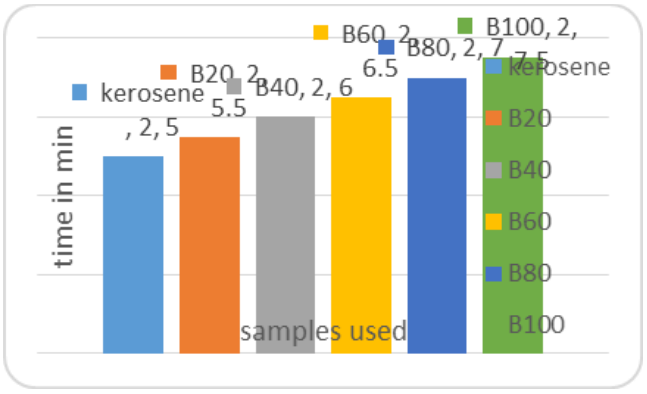


Fig. 5: Representation of variation of time for samples used

V. CONCLUSION

The main aim of this 0!0000+ values of thermal efficiency and fuel qq1q rate p0 Bio-fuel blended fuel where found to be comparable with reference fuel

1) jatropha oil can be successfully converted into methyl ester by using transesterification process.
2) Transesterification process reduces the viscosity of the jatropha oil and it improves the properties like viscosity, flash point, fire point of the jatropha methyl ester.
3) The properties of B20 sample are closer to the kerosene properties and hence it gives better performance.
4) Smooth burning of stove is observed with esterifies jatropha oil compared with that of kerosene.
5) The B20 Bio fuel blends with kerosene is nearer to the kerosene value.
6) The jatropa bio fuel blends is used in the automobiles, but it also can be used domestic purpose.

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