International Journal of Mechanical Engineering and Robotics Research

ISSN 2278 – 0149 www.ijmerr.com
Vol. 4, No. 1, January 2015

Research Paper

EFFECT OF PONGAMIA AND JATROPHA BLEND ON THE PERFORMANCE OF DIESEL ENGINE

Sushma S[1], Faheem Akthar[1] and Abdul Razak R K[2]*

*Corresponding Author: Abdul Razak R K, ✉ abdulkaladgi@gmail.com

The objective of this work is to check the performance characteristics of four stroke single cylinder diesel engine by using different blends of biodiesel. The two different seeds used are Jatropha and Pongamia mixed with diesel under different proportions. The blend ratios used for present study are B5, B10, B25 and B100. The tests were done for different blends to verify the properties like, Flash point, Fire point, Viscosity, and calorific value. Experimental results obtained from the work shows that thermal efficiency increases with increase in load with increase in blending ratio. It is finally concluded that use of biodiesel as a future fuel will be environment friendly but not cost effective.

Keywords: Jatropha, Pongamia, Blending ratio, Thermal efficiency

INTRODUCTION

Fossil fuels can be considered as one of the major sources of energy in the world today. Their popularity can be accounted to easy usability, availability and most important the cost effectiveness. But these resources are limited & are fast depleting .This is one of the greatest concern today as there is an increase worldwide demand for these resource's. So efforts are being made to find alternative sources for this depleting energy source. Bio-diesel is replacement fuel that is manufactured from vegetable oils, recycled cooking oils and animal fats. Because plants produced oils from sunlight and air, these oils are renewable. Animal fats are produced when the animal consumes plant oils and other fats and they are also renewable.

As per ASTM, bio-diesel is chemical composed of mono alkyl ester as long chain fatty acids derived from vegetable oils and recycled cooking oils and animal fats. The bio-diesel thus obtained is designated at B100. Linseed oil, Jatropha, sunflower oil, neem-oil is commonly used oil for production of bio-diesel. Matani and Mukesh (2014) conducted

[1] Department of Mechanical Engineering,Channabasaveshwara Institute of Technology, Gubbi, Karnataka, India.
[2] Department of Mechanical Engineering, P.A College of Engineering, Mangalore 574153, Karnataka, India.

an experiment to evaluate the performance of different blends of biodiesel using karanji oil at 10B (10% neat Karanji oil and 90% diesel), etc. The experiment was conducted at different injection pressure. And they found that as the injection pressure increases the brake thermal efficiency, also increases and Brake Specific Fuel Consumption (BSFC) is decreases as the injection pressure increases. Edward Antwi (2008) took three locally available vegetable oils blends in CI engines. And determined Physical properties relevant for these three pure vegetable oils. Then they conducted Experiment on four stroke single cylinder, fixed throttle CI engine on blends these vegetable oils and diesel to measure their performance characteristics. And concluded that the cetane index, calorific value and density, of Jatropha oil came close to diesel than coconut and palm kernel oils. Sonune and Farkade (2012), reviewed research papers on various operating parameters for better understanding of operating conditions and constrains for preheated mahua oil and its blends. It was concluded that experimental study will not be sufficient to understand parameters improving the performance; hence analysis should be carried out using mathematical co-relations. Saswat Rath (2011) conducted an experimental to evaluate the performance, characteristics of diesel engine using different blends of methyl ester of karanji with mineral diesel. It was found that the brake thermal efficiency and mechanical efficiency were better as compared to mineral diesel for few specific blending ratios and only for certain loads. Nagarhalli and Nandedkar (2012) usedblends of Trans esterified Jatropha and karanji in various proportions and made testing for its performance parameters, brake thermal efficiency, brake specific energy consumption and also for emissions. They found that HC and CO emissions were lower at 200 bar and for K20-J80 blend. NOx emissions were higher at blends than for diesel.

From the above studies it is clear that biodiesel is one of the major sources of energy and further research has to be made to utilize it to the maximum possible extent. In this regard a further study by increasing the blend ratios of Jatropha and pongamia (a local seed) has been done. Also for comparison with the existing literature lower blend ratio is also studied.

EXPERIMENTAL SETUP

The experimental set up is as shown in the figure below. It consists of four stroke single cylinder diesel engine provided with temperature sensors and other equipment's to get the accurate readings.

Figure 1: Experimental Setup

RESULTS AND DISCUSSION

The following table gives the parameters noted during the test and the calculated results were

Table 1: Parameters Used for the Study

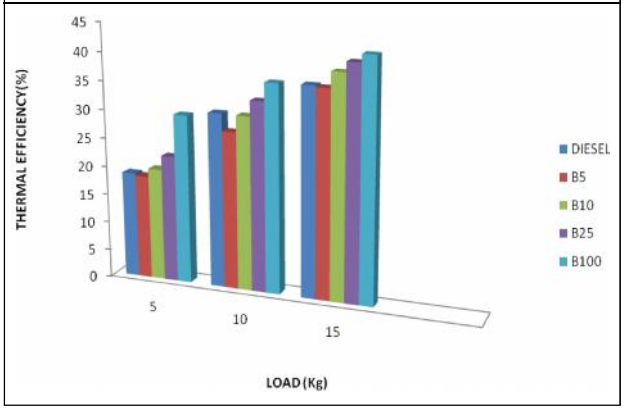
Parameters	Diesel	B100	B5	B10	B25
Flash Point (ºC)	51	165	80	93	115
Fire Point (ºC)	59	179	91	107	125
Density at 40 ºC (gm/cc)	0.81	0.839	0.824	0.8102	0.8102
Kinematic Viscosity at 40 ºC (Cst)	5.95	6.457	5.39	5.45	5.539
Absolute Viscosity at 40 ºC (poise)	0.0481	0.05412	0.044	0.0315	0.0437
Calorific Value KJ/Kg	46,533.23	34,567.25	44,317.31	41,657.068	38,114.72

plotted in the form of graphs to facilitate easy understanding of the parameters involved in the study.

Variation of Brake Thermal efficiency with load for different fuel blends

The variation of Brake Thermal efficiency with load for different fuel blends is as shown in Figure 2 below.

Figure 2: Variation of Brake Thermal Efficiency with Load

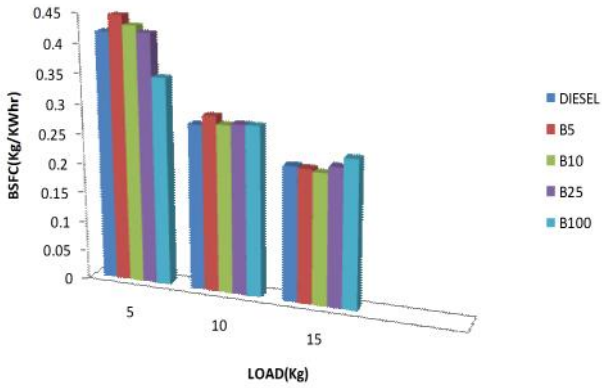


In all the cases brake thermal efficiency is increased due reduced heat loss with increased in load. The maximum efficiency obtained in this experiment was 40.60% (B25) and 41.98% (B100).

Variation of BSFC at Different Load

The variation of BSFC at different load is shown in Figure 3.

Figure 3: Variation of BSFC at Different Load



For all cases BSFC reduces with increase in load. The reverse trend in the BSFC may be due to increase in biodiesel percentage ensuring lower calorific value of fuel.

CONCLUSION

After conducting this project the following conclusion were drawn:

1. The pure biodiesel have lesser calorific value as compared to pure petroleum-diesel. Hence efficiency of biodiesels is usually low.
2. Due to increasing in blending, the flash and fire point increases.
3. In all the cases brake thermal efficiency is increased due reduced heat loss with increased in load.

4. BSFC reduces with increase in load for the entire bio diesel considered.

REFERENCES

1. Edward Antwi (2008), "Experimental Analysis of Vegetable Oil Blends in a Compression Ignition (ci) Engine", Master of Science in Mechanical Engineering, Kwame Nkrumah University of Science and Technology.
2. Matani A G and Mukesh A (2014), "Mane: Performance of Direct Injection C.I Engine Using Karanji Oil at Different Injection Pressures", *International Journal of Research in Engineering and Technology*, pp. 2321-7308.
3. Nagarhalli M V and Nandedkar V M (2012), "Performance of Diesel Engine Using Blends of Esters of Jatropha and Karanji—A Novel Approach", *International Journal of Advanced Engineering Technology*, Vol. 3, No. 3.
4. Saswat Rath (2011), "Performance & Emission Analysis of Blends of Karanji Methyl Ester in a Compression Ignition Engine", A Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Technology (Chemical Engineering), National Institute of Technology, Rourkela.
5. Sonune P P and Farkade H S (2012), "Performance and Emissions of CI Engine Fuelled with Preheated Vegetable Oil and Its Blends—A Review", *International Journal of Engineering and Innovative Technology (IJEIT)*, Vol. 2, No. 3.