ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

PERFORMANCE OF DIESEL ENGINE USING A MIXTURE OF WASTE COCONUT OIL AND SESAME OIL BIODIESEL BLENDS AND DIESEL FUEL

Dr. P. RUKMANGADHA[1], CHETAN I S[2], KISHORE GOWDA A S[3], MANOHAR C N[4]

[1] Professor, Dept.of Mechanical Engineering, SJC Institute of Technology, Chickaballapur, KA, INDIA

[2, 3, 4] Final year BE, Dept.of Mechanical Engineering, SJC Institute of Technology, Chickaballapur, KA, INDIA

I. INTRODUCTION

In today's life the use of fossil fuels has increased and the availability of the fossil fuels is also depleting. In present situation all the development is taking place due to the usage of fossil fuels in all the field which indirectly responsible to the evolution in technology. But the world is facing the crisis for the fossil fuels, where the source of fossil is decreasing and the demand for that is increasing. Extensive use of these fuels has indirectly effected and has given rise to environmental issues. Petrol and diesel are the two fuels which are most largely in demand and all the machinery and the automobile industries are directly depending. Also the use of fossil fuels is creating an air pollution which emits pollutants like Carbon monoxide, Carbon dioxide and Oxides of Nitrogen along with particulate matters which are harmful for living kind and also to the environment. Hence to reduce the use of fossil fuels the researches for alternative fuels are going on some of the institution and also we got the result that bio degradable fuels can used as alternative fuel in automobile and industries which are less harmful and inexpensive.

II. OBJECTIVES

Keeping the observations in view based on the literature survey and the need of an alternate fuel in place of depleting of fossil fuels as projected by the statistician the project entitled "A Study on Performance Characteristics of a C.I. Engine using Alternate Fuels" was taken up. The raw materials such as sesame and waste coconut oils were selected in the present study for production of bio-diesel as an alternate fuel, since it matches well with the diesel properties.
The objectives of the present study are as follows.

- To review and study the literature related to oil bearing plants and by-products to produce non-edible oils in India as a feedback for production of biodiesel.
- Selection of oil bearing by-products and plants as an alternate fuel to produce biodiesel.
- Extraction of non-edible oil from the by-products and oil bearing plants selected for the study.
- Based on the study, extracting bio-diesels from the non-edible oil
- Characterization of biodiesel produced.
- Performance evaluation of DI, I.C. Engine which runs by different blends of biodiesel produced and to compare over the I.C. Engine which runs by pure diesel (B100).

III. REQUIRED CHARACTERISTICS OF BIO DIESEL AS FUEL

A. Ignition quality: Diesel combustion expects the fuels to be self-ignited since the mixture is sprayed near the TDC. If the ignition takes longer time to ignite then it leads to knocking. The expected cetane number should be in the range of 40 to 60.
B. Viscosity: Too low viscosity can lead to excessive internal pump leakage where as high viscosity can increase system

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

pressure to unacceptable levels.

C. Heating valve: Even though the heating value for any diesel engines has a wide range of acceptance, based on the calorific value of the fuel it is expected to be higher, it helps to minimize the quality of the fuel handled in turn increasing the range of operation of the setup.

D. Pour point, Cloud point and Flashpoint: First two properties are important for cold weather operation, whereas the freezing point of the fuel oil should be well below, and the flash point is very important for the safety. So this should be as high as possible.

E. Sulphur, Carbon slag and Ash: This is a main cause of corrosion and forms the slag on engine parts which eventually affects the engine life. Practically S-0.5 %, CS-0.27 % and A-0.01 % should be limited.

F. Miscibility with diesel: Vegetable oil should be mixed with diesel at various proportions and kept untouched for 24 hours.

G. Aniline point: This is the least temperature where the oil is completely visible along with equal amount of aniline. Usually it should be greater than 21 0C to be a good quality of diesel.

V. METHODOLOGY AND EXPERIMENTATION

Selection of Alternate Fuels

In the present study, mixture of Sesame and waste coconut oil are selected as the properties of these oils are closely related to pure diesel and are available plenty in the study area. The brief history of the production and the present status of the oils are presented.

SESAME OIL

Sesame (Sesamumindicum L. syn. Sesamumorientale L.) has been cultivated as a commercial crop, even though it is cultivated in many countries China and India are the main cultivating countries. Sesame seeds have more oil and proteins, roughly around 50% of seeds contains oil. [3] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV. The speed of rotation of DC motor i.e., velocity of AGV is controlled by the microprocessor controller.This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

WASTE COCONUT OIL

Coconut oil is the newest, high valued product and very much used by human for its nutraceutical benefits and as a function food. World demand for the coconut oil is rapidly increasing day by day, which eventually leads to increase in the production of this oil which can be done with minimal setup.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

VI. BIODIESEL PREPARATION USING A MIXTURE OF SESAME OIL AND WASTE COCONUT OIL

STAGES OF TREATMENT

- **First stage treatment**

To expel the moisture present in the sesame oil and coconut oil, initially 1 litre of mixture oil is boiled up to 1000C.A composition of 250 ml methanol + 1.5ml of sulphuric acid is poured in the flask containing the oil and heated at a constant temperature of 65°C for about 1 hour. It is allowed to settle for at least 8 hrs. The acid waste settles down which is removed.

- **Second stage treatment**

Based on the fat content present, suitable amount of sodium hydroxide flakes is rendered in methanol and flown into the tumbler having the oil and heated for about 1 hour. It is allowed to settle for at least 8 hours. The setup is not to be disturbed during settling. Glycerol settles down in the bottom of the flask.

This is referred to as separation of the top layer which is the biodiesel. Upper layer will have traces of NaOH, glycerol, and methanol after transesterification. The components of the engine may be damaged by the presence of the residual catalyst NaOH, and the presence of glycerol reduces the fuel lubricity and causes coking. They are being soluble in water and can be removed by washing process

- **Water washing and heating**

The glycerol formed is removed by using washing apparatus or Biodiesel reactor, and the settled impurities with water is removed by repeating the process 3 to 4 times for ensuring the pure biodiesel and then heated to 1100C to remove the water. The product obtained after heating is biodiesel

VII. BLENDING

Mixing the biodiesel and diesel in a proper ratio is known as blending, which can be done with the help of a flask and volume measurements. The exact quantity of oil and the diesel are mixed in a flask and in turn by constant stirring process, this secure proper mixing of biodiesel with diesel.

- **Viscosity of a mixture of sesame oil and waste coconut oil**

As mentioned earlier viscosity of the mixture (sesame oil and waste coconut oil) is measured by using Redwood Viscometer apparatus.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

Flash point and Fire point of a mixture of sesame oil and waste coconut oil and its Blends

Flash point and the Fire point of a mixture of sesame oil and waste coconut oil and its Blends are obtained by using Pensky marten's apparatus.

Calorific value of a mixture of sesame oil and waste coconut oil and its Blends

The Calorific value of a mixture of sesame oil and waste coconut oil and its blends and obtained by using bomb calorimeter. Value obtained using bomb calorimeter shows the heat during combustion per unit mass referring to fuel sample.

PROPERTIES OF A MIXTURE OF SESAME OIL AND WASTE COCONUT OIL AND ITS DIESEL MIXTURE.

Contents	Pure sesame oil	Waste coconut oil
Specific gravity	0.85	0.85
Flash point (°C)	270	273
Fire point (°C)	278	280

COMPARISON OF THE PROPERTIES OF A MIXTURE OF SESAME OIL AND WASTE COCONUT OIL AND ITS BLENDS WITH DIESEL

Fuel	Specific gravity	Kinematic viscosity at 40°C (m2/s)	Flash point (°C)	Fire point (°C)	Calorific value (kJ/kg)
Diesel	.82	5.0×10^{-6}	48	50	42933
B10	.83	5.1×10^{-6}	53	55	42016
B20	.84	5.2×10^{-6}	55	57	41249
B30	.85	$5.3x\ 10^{-6}$	58	62	40386
B40	.86	5.4×10^{-6}	62	66	39522
B50	.87	5.5×10^{-6}	68	69	37668

VIII. PERFORMANCE ANALYSIS OF DIESEL ENGINE USING A MIXTURE OF WASTE COCONUT OIL AND SESAME OIL BIODIESEL BLENDS AND DIESEL FUEL

Brake specific fuel consumption

Table: The variation of brake power with brake specific fuel consumption for diesel and different ratios of biodiesel blends of waste coconut oil and sesame oil.

	BP(kW)	Diesel	B10	B20	B30	B40	B50
BSFC (kg/kW-hr)	0	-	-	-	-	-	-
	0.7853	.632	.502	.6569	.667	.6679	.675
	1.5707	.464	.433	.4387	.4250	.4474	.4338
	2.3567	.374	.357	.3709	.3592	.388	.3743
	3.1417	.329	.3317	.3377	.3346	.3570	.3535

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

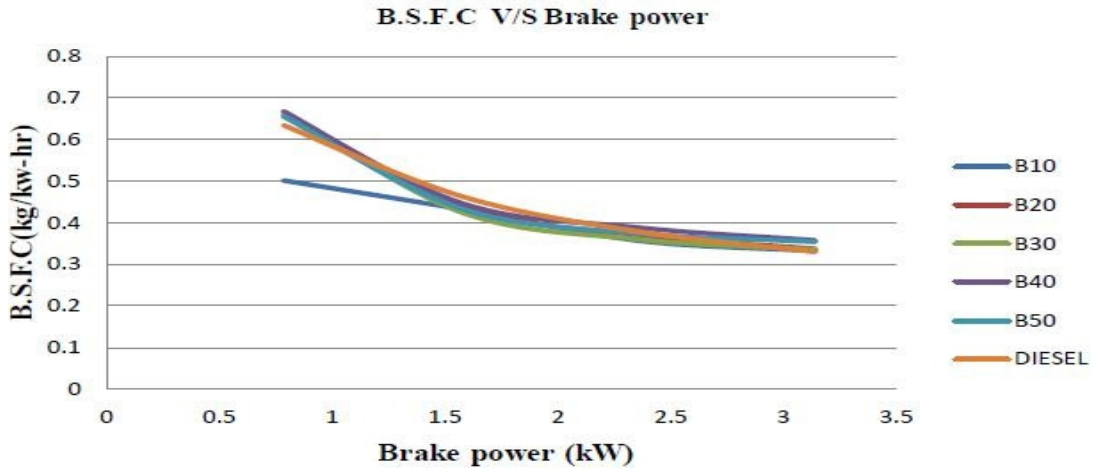

Fig: Comparison of Brake specific fuel consumption with Brake Power for diesel, a mixture of waste coconut oil and sesame oil and its blends

It could be observed from the fig that for all the ratios of waste coconut oil and sesame oil biodiesel blends. The specific fuel consumption was at the higher range as compared to the engine run by using diesel. The higher range of specific fuel consumption using waste coconut oil and sesame oil biodiesel blends could be due to lower calorific value of waste coconut oil and sesame oil. The specific fuel consumption of diesel is lower than all the ratios of waste coconut oil and sesame oil biodiesel blends, Hence, the fuel efficiency of diesel is better.

BRAKE THERMAL EFFICIENCY

Table: BTHE of diesel engine using different blends of fuel at different brake power

	BP(kW)	Diesel	B-10	B-20	B-30	B-40	B-50
BTHE (%)	0	0	0	0	0	0	0
	0.7853	13.26	12.73	12.97	12.99	12.96	13.25
	1.5707	18.06	18.67	19.44	20.19	19.33	20.10
	2.3567	22.42	23.61	22.95	23.90	22.53	23.32
	3.1417	25.42	25.47	25.23	25.64	24.23	24.66

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 3, January 2018

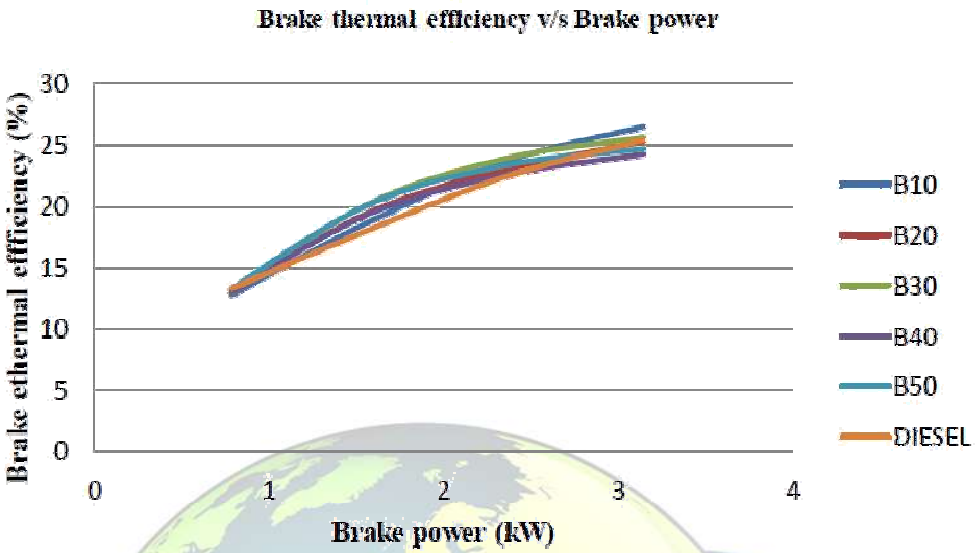

Fig: Comparison of Brake Thermal Efficiency with Brake power for diesel, a mixture of waste coconut oil and sesame oil and its blends.

IX. CONCLUSION

The maximum thermal efficiency was found to be 26.8% for B10 & 26.2 % for B20 & diesel. The BSFC for all the blends was higher than that of diesel and the EGT increased as the quantity of mixture of waste coconut oil and sesame oil in the blend increased.

From the study of performance characteristics of diesel, biodiesel and biodiesel-alcohol (ethanol and methanol) blends, we can conclude that the addition of lower percentage of ethanol and methanol in sesame oil and waste coconut oil biodiesel as in BE5 (Biodiesel Ethanol 5%) and BM5 (Biodiesel Methanol 5%) is appreciable and can be successfully used as alternate to the fossil diesel.

X. REFERNCE

[1] Parisara, (2005), Envis Newsletter State Environment Related Issue Dept. of Forests Ecology &Environment, Govt. of Karnataka.1 (3).2-6.

[2] Naveen Kumar, Sharma, P.B. (2005). "A sustainable source for production of biodiesel." International Journal of scientific & research, Vol. 64, November 2005,pp. 64,883-889.

[3] Christo Ananth, M.A.Fathima, M.Gnana Soundarya, M.L.Jothi Alphonsa Sundari, B.Gayathri, Praghash.K, "Fully Automatic Vehicle for Multipurpose Applications", International Journal Of Advanced Research in Biology, Engineering, Science and Technology (IJARBEST), Volume 1,Special Issue 2 - November 2015, pp.8-12.

[4] Ganeshan V. "Heavy-Duty Diesel Engine/Fuels Combustion Performance and Emissions-A Cooperative Research Program," Internal Combustion Engine Fundamentals, McGraw-Hill International Editions, and Automotive Technology Series. SAE paper 852078,1985. 2009