Int. J. Chem. Sci.: 14(2), 2016, 1141-1147
ISSN 0972-768X
www.sadgurupublications.com

PRODUCTION AND PERFORMANCE TEST OF BIODIESEL ON SINGLE CYLINDER DIESEL ENGINE

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ABSTRACT

With increasing demand for petroleum with each passing day, it becomes utmost necessity to search for alternate fuels, which are renewable, and in that biodiesel emerges as a real solution. Biodiesel is cleaner burning fuel than diesel and a suitable replacement. Since the demand and cost of petroleum based fuel is growing rapidly, and if the present pattern of consumption continues, these resources will depleted in few years. Hence, efforts are being made to explore for alternative sources of energy. An alternative fuel must be technically feasible, economically competitive, environmentally acceptable and readily available. Biodiesel can be produced in many ways. The method used in the laboratory is Transesterification, which is actually replacement of alcohol group from an ester by another alcohol.

Key words: Component, Formatting, Style, Styling, Insert.

INTRODUCTION

Biodiesel refers to a vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters. Biodiesel can be produced from straight vegetable oil, animal oil/fats, tallow and waste cooking oil. The process used to convert these oils to Biodiesel is called transesterification. Biodiesel has many environmentally beneficial properties. The main benefit of biodiesel is that it can be described as 'carbon neutral'. This means that the fuel produces no net output of carbon in the form of carbon dioxide (CO_2). This effect occurs because when the oil crop grows it absorbs the same amount of CO_2 as is released when the fuel is combusted. In fact this is not completely accurate as CO_2 is released during the production of the fertilizer required to fertilize the fields in which the oil crops are grown. Fertilizer production is not the only source of

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pollution associated with the production of biodiesel, other sources include the esterification process, the solvent extraction of the oil, refining, drying and transporting.

Transesterification process

Transesterification or alcoholysis is the displacement of alcohol from an ester by another in a process similar to hydrolysis, except than alcohol is used instead of water (Srivatava and Prasad, 2000). This process has been widely used to reduce the high viscosity of triglycerides. The transesterification reaction is represented by the general equation as in the following equation. Transesterification is one of the reversible reactions and proceeds essentially by mixing the reactants. However, the presence of a catalyst (a strong acid or base) will accelerate the conversion.

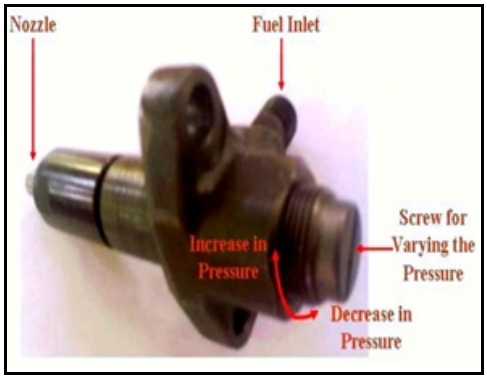
$$\text{Triglycerides} + \text{Methanol} \xrightleftharpoons{\text{Catalyst}} \text{Glycerol} + \text{Methyl ester}$$

Production of biodiesel

Biodiesel has many environmentally beneficial properties. The main benefit of biodiesel is that it can be described as ‘carbon neutral’. This means that the fuel produces no net output of carbon in the form of carbon dioxide (CO_2). This effect occurs because when the oil crop grows it absorbs the same amount of CO_2 as is released when the fuel is combusted. In fact this is not completely accurate as CO_2 is released during the production of the fertilizer required to fertilize the fields in which the oil crops are grown.

Changing the injector pressure

In fuel injector for B40 fuel the injection pressure should be above 140bar but in ordinary kirlosker diesel engine injector pressure is only 120 bar so we need to change the injection pressure in injector.



Measuring injection pressure

This is the measuring equipment for injection pressure. The pressure is measure by pressure gauge due to pumping the fuel into injector.

Emission control by using blended bio diesel

For b20 fuel

Average change	**PM**	**HC**	**CO**	**NO_2**	**SO_2**	**CO_2**
Percentage reductions	-27.32	-46.32	-32.67	2.89	-61.52	-60.36

For B40 fuel

Average change	**PM**	**HC**	**CO**	**NO_2**	**SO_2**	**CO_2**
Percentage reductions	-28.32	-48.33	-38.37	2.89	-61.52	-62.58

The emission is reduced by using pure biodiesel, 20% biodiesel blended with 80% diesel (B20 Fuel) and 40% biodiesel with 60% diesel (B40 Fuel). The B20 fuel table shows that the reduction percentage of emissions like particulate matter (PM), Hydro carbon (HC), carbon monoxide. Nitrogen dioxide, sulphurdioxide and carbon dioxide.

Experimental reading -for diesel

S. No.	**Speed (rpm)**	**Load (amps)**	**Time for filkering (sec)**	**Time taken (sec)**
1	1500	0	28	112
2	1500	5	23	90
3	1500	10	12	73
4	1500	15	6	62
For B20 fuel				
1	1500	0	26	114
2	1500	5	21	92
3	1500	10	12	77
4	1500	15	4	64

Cont…

S. No.	Speed	Load	Time for filkering (sec)	Time taken (sec)
For B40 fuel				
1	1500	0	25	140
2	1500	5	20	110
3	1500	10	11	90
4	1500	15	7	85

Result tabulation

S. No.	Performance characteristics	Diesel	B20	B40
1	BP (KW)	1.9025	1.9026	1.9028
	Torque (N-M)	803.7	8.442	8.440
3	TFC (Kg/hr)	0.3678	0.3611	0.3652
4	SFC (Kg/hr)	0.134	0.131	0.133
5	Heat supplied (KW)	4.4955	4.2787	4.2783
6	Indution power (KW)	3.0025	2.7021	2.4052
7	BTE (%)	37.19	39.08	50.38
8	IPE (%)	62.89	58.71	13.71
9	ME (%)	50.37	55.14	62.77

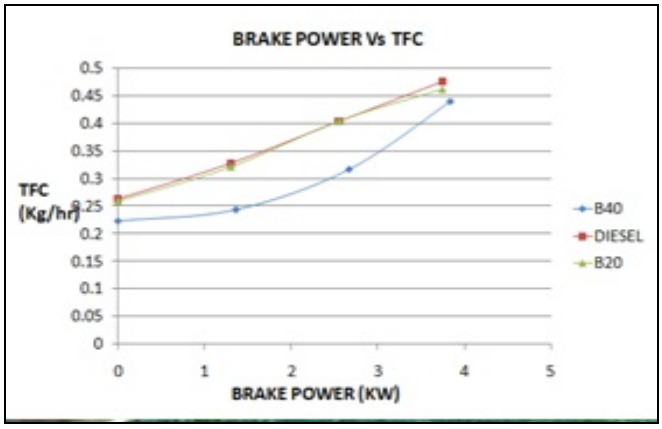


Fig. 1: Brake power Vs TFC

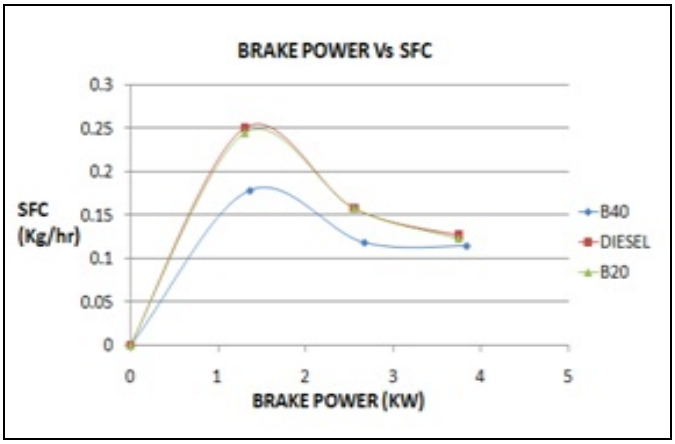


Fig. 2: Brake power Vs SFC

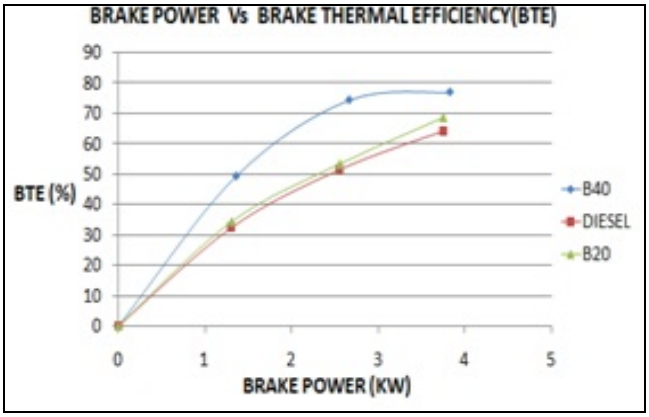


Fig. 3: Brake power Vs BET

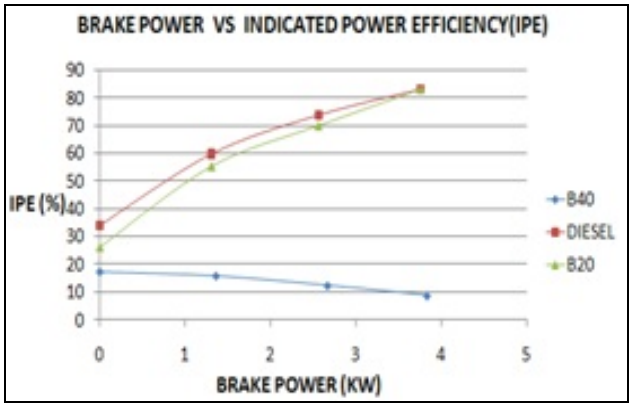


Fig. 4: Brake power Vs ITE

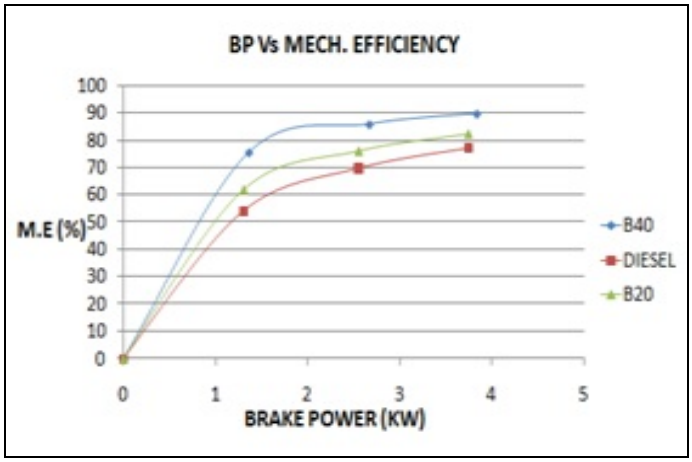


Fig. 5: Brake power Vs mechanical efficiency

CONCLUSION

An economical alternate fuel (Biodiesel) from waste vegetable oil is produced and Reducing the fuel consumption rate of Engine exhaust by increasing the fuel injector pressure. Obtaining the pollution free environment by using biodiesel as a fuel and reducing the emission rate of engine by using blended biodiesel with diesel. By using this Biodiesel blended with diesel on the single cylinder diesel engine so that the mechanical efficiency of engine is increased by using the blended biodiesel when compared to diesel.

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Accepted : 20.05.2016