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Study of Internal Combustion Engine performance using Biodiesel Blended Petro-Diesel

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Abstract

Alternate automotive fuels are currently an important issue all over the world due to the efforts on reducing global warming which is contributed by the combustion of petroleum or petrol diesel. Biodiesel is non-toxic, biodegradable, produced from renewable sources and contributes a minimal amount of net green house gases, such as CO2, SO2 and NO emissions to the atmosphere. With its suitability as a replacement fuel for existing compression ignition engines, it becomes interesting to know performance of a dedicated CI engine with biodiesel fuel. In this paper the performance of I C engine is studied.

Keywords:- Bio diesel, I C engine

Introduction

Particulate matter (PM) and oxide of nitrogen (NOX emission) are the two important harmful emissions in diesel engine. Among different alternative fuels. Oxygenated fuels is a kind of alternative fuels. Diethylen glocol dimenbthly ether (DGM), dimethoxy methane (DMM), dimethyl ether (DME), methyl territory buty ether (MTBE), dibuty ether (DBE), dimethly carbonate (DMC), methanol ethanol and diethyl ether (DEE-a Cetane improver) have played their role to reduce emission. Three fuels can either be used as a blend with conventional diesel fuel or as a neat fuel.

The most common blend is mix of 20% bio-diesel with 80%biesel. Bio-diesel is the only alternative fuel that runs in any conventional, unmodified diesel engine. It can be stored anywhere that diesel fuel is stored. The life cycle production and use of bio-diesel produce approximately 80%less carbon dioxide emission, and almost 100% less sulphur dioxide.

Biodiesel consists of mono alkyl esters produced from vegetable oils, animal or old cooking fats. Waste vegetable oil biodiesel is fuel alternative produced from soybean oil. Biodiesel contains no petroleum diesel, but it can be blended with petroleum diesel.

Biodiesel is a clean burning, Eco-Friendly natural fuel obtained from tree born oils by a chemical transformation process called TRANSESTERIFICATION carried out in a Chemical Processing Plant. Transesterfication is an age old chemical process and is a time tested method of Transforming Vegetable oils or fats into Biodiesel (Alkyl Esters of Fatty acids) and Glycerin plus some soaps etc.

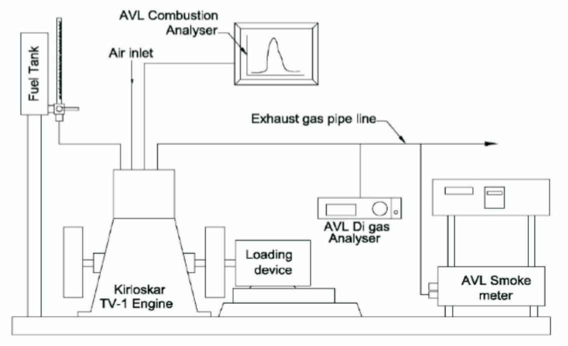
LITERATURE REVIEW

Particulate matter (PM) and oxides of nitrogen (NOx emission) are the two important harmful emissions in diesel engine. Fuel companies and the researchers around the world are devoted to reduce such emission with different ways. Fuel modification, modification of combustion chamber design and exhaust after treatment are the important mean to alleviate such emission. In this context, engine researcher are hunting suitable alternative fuels for diesel engine. Among different alternative fuels, oxygenated fuel is kind of alternative fuel. Diethylene glycol dimethyl ether (DGM), dimethoxy methane (DMM), dimethyl ether (DME), methyl tertiary butyl ether (MTBE), ibuty ether (DBE), dimethyl carbonate (DMC), methanol, ethanol and diethyl ether (DEE-a Cetane improver) have played theiri role to reduce diesel emission. These fuels can either be used as a blend with conventional diesel fuel or as a neat fuel. The presence of oxygen in the fuel molecular structure plays an important role to reduce PM and other harmful emission form diesel engine. The present work report on the effect of oxygenated fuel on diesel combustion and exhaust emission. It has been found that the exhaust emission including PM. Total unburnt hydrocarbon (THC), carbon monoxide (Co), smoke cased and were entirely depended on the engine operating conditions. The reductions of the emission were entirely depends on the oxygen content of the fuel. It has been reported that the combustion with oxygenated fuels were much faster than that of conventional diesel fuel. This was mainly due to the oxygen content in the fuel molecular structure and the low volatility of the oxygenated fuels.

EXPERIMENTAL SETUP

The following equipment are consists for experimental setup :

- DI diesel engine with rope dynamometer Single Cylinder
- Engine Date Logger
- Smoke Analyzer
- Exhaust Gas Analyzer



PROCEDURE PREPARATION OF BIO-DIESEL FROM COCONUT OIL:

- The production of biodiesel, or alkyl esters, is well known. There are three basic routes to ester production from oils and fats:
- Base catalyzed transesterification of the oil with alcohol.
- Direct acid catalyzed esterification of the oil with methanol
- Conversion of the oil to fatty acids, and then to alkyl esters with acid Catalysis.
- Making Biodiesel from the waste cooking oil & grease which contain higher value of FFA.

BIO-DIESEL PREPARATION:

The filtered oil was heated up to a temperature of 50°C in water bath to melt coagulated oil. It is important not to overheat the oil above 65°C, because at that temperature alcohol would boil away easily. The heated oil of 100 ml was measured and transferred into a conical flask containing catalyst-alcohol solution. The reaction was considered to start at this moment, since heated oil assisted the reaction to occur. The reaction mixture was then shaken by using shaker at a fixed speed for 2 h.

SEPARATION OF BIO-DIESEL FROM BY PRODUCTS.

The product of the reaction was exposed to open air to evaporate excess methanol for 30 min. The product was then allowed to settle down overnight. Two distinct liquid phases: crude ester phase at the top and glycerol phase at the bottom were produced in a successful transesterification reaction.

PURIFICATION OF BIODIESEL BY WASHING:

The top ester phase (biodiesel) was separated from the bottom glycerol phase by transferring to a clean 250 ml conical flask. The biodiesel was then purified by washing with distilled water to remove all the residual by-products like excess alcohol, excess catalysts, soap and glycerine. The volume of distilled water added was approximately 30% of the biodiesel volume. The flask was shaken gently for 1 min and placed on the table to allow separation of biodiesel and water layers. After separation, the biodiesel was transferred to a clean conical flask. The washing process was repeated for several times until the washed water became clear. The clean biodiesel was dried in an incubator for 48 h, followed by using sodium sulphate. The final product was analyzed to determine its ester content (that is, purity of product) and also other equipment were used to determine related properties.

SINGLE CYLINDER 4 STROKE DIESEL (CI) ENGINE EXPERIMENTAL SET-UP:

Single Cylinder 4 stroke (CI) Engine test kit was purchased and installed in the thermal Engineering Lab of University Institute of Technology, RGTU Bhopal. Details along with technical specifications of this kit being discussed as below.

PRECAUTIONS BEFORE STARTING ENGINE:

a) All nut bolts are tight. The universal joint is safely connected.
b) Safety guard is closed to avoid any damage or accident.
c) Sufficient oil in oil chamber of engine.
d) Fuel in Diesel Tank.
e) Water is flowing through engine, calorimeter & dynamometer f) Vibration to control panel should be minimized.
g) Adjust weighing machine at zero and put diesel pot on the weighing Machine.
h) All electrical connections and sensors are tight and protected and not in contact with water.
i) any rotating part, otherwise it will damage costly Electronic equipment's.

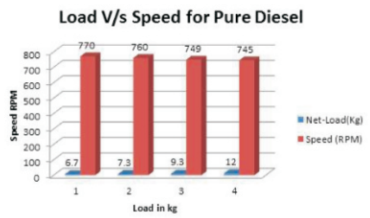
RESULT AND DISCUSSION

Repeated experimental work was done by using this single cylinder 4-stroke diesel engine and data were recorded at different loads for neat diesel, neat biodiesel and by mixing different ratio of diesel and biodiesel, using different blends all data was collected and represent in the graph which is shown below.

TABLE

DIESEL WITHOUT BIO DIESEL (PURE DIESEL)

Net-Load(Kg)	Speed (RPM)	Fc(Kg/hour)	BSFC (kg.Kwhr.)	B.P. (W)	BMEP Bar	μ_{bth}(%)	μ_{vol}(%)	A/F
6.7	770	0.415	0.460	1019	2.45	20.1	89	37.4
7.3	760	0.561	0.476	1160	2.78	19.0	91	33.7
9.3	749	0.695	0.511	1375	3.36	17.8	92	22.8
12	745	0.890	0.494	1745	4.30	17.8	93	18.9



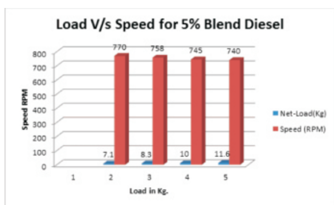
Variation of speed with load for pure diesel

Fuel consumption V/s load is plotted for Pure diesel and fuel consumption increase as load increases. In the figure fuel consumption is nearly same for neat diesel.

TABLE

5% BLEND OF BIO DIESEL

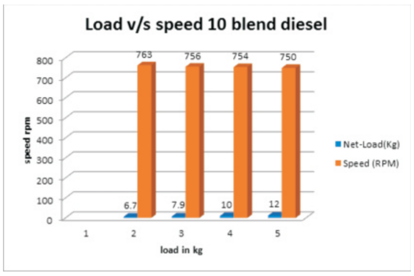
Net-Load(Kg)	Speed (RPM)	Fc(Kg/hour)	BSFC (kg.Kwhr.)	B.P. (W)	BMEP Bar	μ_{bth}(%)	μ_{vol}(%)	A/F
7.1	770	0.503	0.497	1013	2.40	16.5	90	31.4
8.3	758	0.555	0.469	1143	2.75	17.5	93	29.6
10.0	745	0.690	0.449	1358	3.33	16.4	95	27.5
11.6	740	0.880	0.505	1724	4.23	16.2	97	16.5



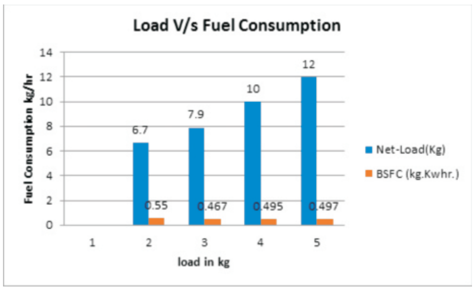
Variation of fuel consumption with load for 5% blend diesel

Volumetric efficiency is plotted against the load for blend of of bio diesel and volumetric efficiency as load increases.

Net-Load(Kg)	Speed (RPM)	Fc(Kg/	BSFC (kg.Kwhr.)	B.P.	BMEP	μ_{bth}(%)	μ_{vol}(%)	A/F
		hour)		(W)	Bar			
6.7	763	0.504	0.55	1011	2.4	16.9	90.5	28.7
7.9	756	0.56	0.467	1155	2.8	18.1	91.1	27.5
10	754	0.687	0.495	1357	3.36	16.9	92.7	23



Variation of fuel consumption with load for 10% blend diesel



Variation of fuel consumption with load for 10% blend diesel

Conclusion :

Conclusions can be drawn: In the beginning for smaller values of Brake Power and Load blend biodiesel consumption is higher than the neat diesel consumption which narrows down with higher values of brake power and load.

- BSFC values for smaller load is higher for blend bio-diesel and this gap reduces later for higher value of load.
- Brake power for neat diesel have higher values than blend bio-diesel at all load and difference decreases as load increases and brake power is minimum for 20% blend.
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- Brake thermal efficiency is higher for neat diesel at all load and lower for 20% blend and difference decreases as load increases.

REFERENCES

- M. A Kalam, M. Hunsawan, H. H. Masjuki. 2003. Exhaust emission and combustion evaluation of coconut oil powered indirect injection diesel engine. Renewable Energy. 28(15): 2405-2415.
- Raffiq H. M. and Ahmed K. M. B. 2005. Emission control for a direct injection CI engine using preheated coconut oil blended diesel. IE (I) journal-MC. 86: 149-152.
- Fosseen, D., "DDC 6V-71N Emission Testing on Diesel and Biodiesel Blend," FosseenManufactuering and Development, Ltd., report no. NSDB4F15, July 14, 1994
- Fosseen, D., "DDC 6V-92TA MU1 Coach Upgrade Emission Optimization on 20%/80% Soy/Diesel Blend," FosseenManufactuering& Development, Ltd., report no. 260-2 and 24 11,September 30, 1994.

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