An Analytical Evaluation of Emission Parameters for 4 Stroke Diesel Engine by Using Biodiesel and Its Blends

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***Abstract*-Fast changing scenario of automobile industry worldwide increases the fuel demand. Fossil fuels available are exhaustive type of resource and having an adverse effect on environment. So there is need of alternate fuel option which should be environment friendly. Biofuel is the suitable option, biofuel obtain from vegetable seeds like jatropha, karanja etc. which can be easily cultivated. This fuel used in different proportion (Blends) with diesel without any modification in engine. It also reduces the Smoke Emission of Exhaust Gaseous. The aim of the research work is to find out the performance and emission characteristics of biodiesel blends. Biofuel used is extracted from Jatropha seeds. Blends taken in proportion JB15, JB50, JB75, JB100 and Diesel and the results critically examines the performance standards i.e. Brake Power, Smoke emission and Exhaust gas Temp.. The results are calculated for optimum blend and other blends to check the effect on performance and emission standards.**

***Index Terms*- JB (Jatropha Biofuel), Brake Power, Smoke emission and Exhaust gas Temp.**

I. INTRODUCTION

Many energy fuels are being investigated as potential substitutes for the current high-pollutant diesel fuel derived from diminishing commercial sources. Vegetable oils may provide one such alternative and their potential has been examined in the past years by several researchers.. Our current research effort has been directed towards the use of vegetable oil as a diesel fuel substitute with minimal fuel processing and no engine modification. To take advantage of emulsification as a way of improving the combustion of vegetable oil in a diesel engine, some amount of water was introduced in the vegetable oil during the extraction process. The research paper evaluated the performance emission Parameters for Jatropha fuel blends in a diesel engine with and without using fuel additive Three blends were obtained by mixing diesel and Jatropha oil in the following proportions by volume 85% diesel & 15% Jatropha oil, 50% diesel&50% Jatropha oil and 25% diesel &75% Jatropha oil.

II. BIODIESEL

The Biodiesel being used in the experiment is derived from Jatropha curcas by transesterification method. Biodiesel blends are denoted as, "Bxx" with "xx" representing the percentage of Biodiesel contained in the blend (i.e.: B20 is 20% Biodiesel, 80% petroleum diesel).

III. EXPERIMENTAL SETUP

IV. ENGINE SPECIFICATIONS

Cylinders	01
Strokes	04
Fuel	Diesel
Power	@ 1500rpm
Cylinder bore & Stroke	87.5 & 110 mm
Compression Ratio	17.5:1
Dynamometer	Rope brake
Cooling	Water cooled

V. TESTING PROCEDURE

Experiment was conducted with Jatropha oil Blends having proportion of 0%, 15%, 50%, 75%, 100% Jatropha oil at various load levels. Using pure diesel engine performance tests was also conducted for comparison purpose. Engine performance will be measure in term of brake specific fuel consumption, air flow rate, and exhaust gas temperature and

emissions. Engine should be run for few minutes to attain steady state before the measurements get started. The experiment was repeated thrice and average values of performance and emission get measured. In this experimental setup dynamometer was used to load the engine at varying load of 2-10 kg. Spring balance attached to the dynamometer to measure the torque by means of a 100 x 0.5 N arrangement. Three way, hand operated, two-positional directional control valve added in fuel supply system used to switch from diesel fuel and the test plant fuels. Tachometer is used to measure speed of the shaft at each loading. Under gravity and the volumetric flow rate fuel supplied to injector pump and measured the time taken for 10 ml of fuel to flow through a graduated measuring device. A smoke emission of exhaust gas was monitored by portable combustion analyser fitted near the exhaust valve. Exhaust gas temperature was measured by thermocouples. Test runs carried for pure Jatropha oil, diesel fuel and their blends in order to make comparative assessments. Engine warm up to some extent is required to run on all fuels. The outcome of preheating of the pure Jatropha oil and a blend of equal proportion of the Jatropha oil and the diesel fuel on engine performance was also studied.

VI. CALCULATIONS

Table No.1: Experimental Data Table for JB15

Sr.no	W (Kg)	Time required for 10 ml fuel consumption in (sec)	B P (kw)	Exhaust gas Temp. (˚C)	Smoke (%)
1	0	91	0	81	59
2	2	83	0.539	87	56
3	5	74	1.348	96	55
4	7	67	1.887	106	60
5	10	56	2.695	117	63

Table No.2: Experimental Data Table for JB50

Sr. no	W (Kg)	Time required for 10 ml fuel consumption in (sec)	B P (kw)	Exhaust gas Temp. (˚C)	Smoke (%)
1	0	88	0.000	77	58
2	2	83	0.539	85	54
3	5	65	1.347	97	53
4	7	58	1.886	109	59
5	10	50	2.695	122	61

Table No.3: Experimental Data Table for JB75

Sr. no	W (Kg)	Time required for 10 ml fuel consumption in (sec)	B P (kw)	Exhaust gas Temp. (˚C)	Smoke (%)
1	0	94	0.000	91	56
2	2	79	0.539	94	54
3	5	65	1.348	98	53
4	7	62	1.887	112	57
5	10	54	2.695	124	59

Table No.4: Experimental Data Table for JB100

Srno	W (Kg)	Time required for 10 ml fuel consumption in (sec)	B P (kw)	Exhaust gas Temp. (˚C)	Smoke (%)
1	0	90	0.000	75	55
2	2	75	0.539	86	54
3	5	67	1.348	98	52
4	7	63	1.887	115	56
5	10	53	2.695	129	58

VII. CONCLUSION

Smoke emission level is low for all blends. For JB15 smoke emission is 62% and for diesel it is 65% for higher loading conditions. The exhaust gas temperature is lower down for all compositions Exhaust gas temp. is lower for JB15 blend .The percentage rise by volume of the Jatropha oil in the fuel blends leads to amplify the exhaust gas temperature. The decrease in the exhaust gas temperature is due to the effect of water present in the Jatropha oil. For JB15 exhaust gas temp. is 117°C higher loading conditions.

On the above whole, it is concluded that JB15 is the optimum blend ratio which gives the higher performance The biodiesel blends will be a good

substitute fuel for diesel engine for different applications.

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