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Characteristics on Performance and Emission Characteristics of Papaya Seed Oil with VCR Engines for Different Nozzles

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Abstract*: *The conventional fuels are necessity for all the automobile machineries, due to deficiency of conventional energy sources need to search for alternative sources like biodiesels should give more impact to the automobile sectors. Biodiesel are clean energy, eco friendly, easily possible to produce from biomass. Alternative energy sources having more capable for solving environment aspects like reduce the pollution to the environment. This paper deals papaya seed oil used as feedstock, in this biodiesel produced by transesterification method using potassium hydroxide (KOH) as catalyst. This biofuel is used in four stoke, single cylinder, variable compression engine (VCR). The rated speed of the engine is 1500 rpm. This emission performance is analyzing for different nozzles with blends. Carbon mono oxide (CO) slightly increasing with load, Hydro carbon (HC) slightly decreasing with load, Carbon di-oxide(CO2) increasing with load. Oxygen (O2) is decreasing with load. Nitrogen oxide (NOX) and particulate matter is also increasing slightly with load.

Keywords* : *Biodiesel, Transesterification, Methyl ester, Papaya seed oil

I. INTRODUCTION

The energy demand is increasing day by day. Now we are utilizing the energy demands by conventional energy sources (like Petrol, Natural gas, Coal) but it is draining fast[1]. So we need to focus the other alternative sources for automobiles, probably biodiesel is the alternative sources of diesels because the properties are very similar to biodiesels[2]. It is the renewable and non toxic moreover we are utilizing the feed stocks are non edible seeds like (Algae, animal fats, vegetable seeds) etc[3].

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Biodiesels emitting minimum emissions compare to the fossil fuels, good lubrication, highcetane number[4]. We can mix the biodiesels with diesels at any percentage, normally 5 to 20percent or else we can run the engine directly by using the biodiesels[5]. Biodiesels controlled the CO_2 emissions and CO emissions[6]-[8].Fig.1 shows the papaya seeds.

Fig. 1.Papaya Seed.

II. MATERIALS AND METHODS

A 3.5 kW, 1500 rpm, Kirloskar diesel engine is used for this investigation. Two different fuel tanks and fuel switching system were used, one fuel tank for diesel (D100) and the other for alternate fuel (B100). Optical sensor is used for Fuel consumption.Fig.2 shows schematic view of Experimental setup.

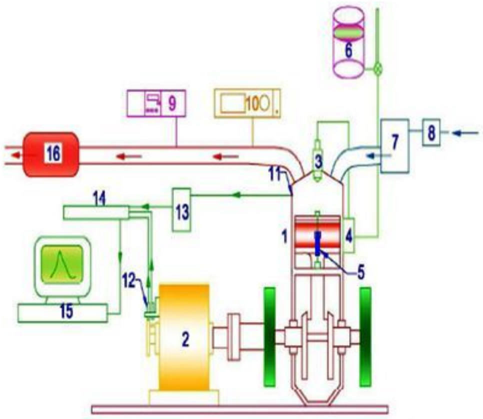

Fig. 2.Schematic view of Experimental Set-up.

Airflow measuring by Differential pressure transducer.Power train is coupled with an eddy current dynamometer for measuring the sense the torque through system.

The dynamometer controller is controlled to load and engine speed, for measuring the inside pressure of cylinder using Piezoelectric transducer is placed in the engine head. The received Signals are transferred to the resonator. The précised crank positions, is applying for actions from TDC and crank angle. The data acquisition system received the signals from the amplifier and crank angle encoders. The intensity is measured by the AVL exhaust gas analyzer and smoke intensity is measured by AVL smoke meter. Exhaust temperature, coolant heat, atmospheric temperature everything measured by Thermocouples.

A. Emission Analyzer

Exhaust Emission Gas Analyzer (AVL 444 Di-gas Analyzer) is used to measure Hydrocarbon, Carbon monoxide, Carbon dioxide and Nitrogen oxide emissions. The investigation of the exhaust gas emissions is done through non-scattering infrared technique. The exhaust gas is passed through the exhaust pipe to the screen in order to reduce the precipitate.

Then the gas is passed to the fiber constituent. It filters all the unwanted things from the emission gas.

The cold trap is used to control the moisture content in the emission gas. The filtered gas passes through the sensor to measure the reading. The readings are displayed on the system screen. The analyzer specification is shown in the tables below.

III. RESULT AND DISCUSSION

A. Carbonmonoxide Vs Load

From the Table I and fig. 3we can analyses the Carbon monoxide variation with load. When compared to 20 hole,15.52 hole,15.53 hole, less carbon monoxide emission.

Table- I: Carbonmonoxide VS Load

	0	3	6	9
20 2hole	0.02	0.04	0.03	0.02
15.5 2hole	0.02	0.05	0.05	0.05
15.5 3hole	0.04	0.04	0.03	0.03

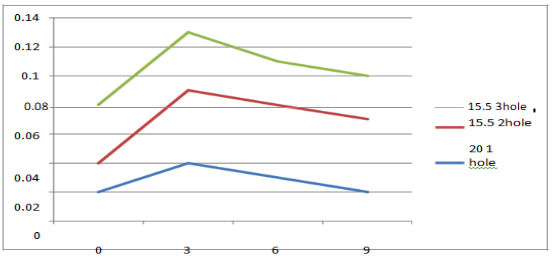

Fig. 3.Performance chart for Carbonmonoxide VS Load.

B. Hydro Carbon Vs Load

From Table II and Fig.4 we can analyses the hydrocarbon variation with load. For maximum load for diesel 320 ppm, B20 - 280 ppm. When compared to 20 hole,15.52 hole,15.53 hole, less carbon monoxide emission.

Table- II: Hydrocarbon VS Load

	0	3	6	9
20 2hole	2	4	3	2
15.5 2hole	6	8	6	4
15.5 3hole	5	4	5	4

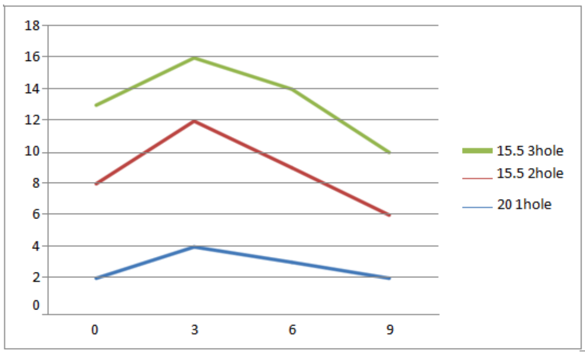

Fig. 4.Performance chart for Hydrocarbon VS Load.

C. Carbon Dioxide Vs Load

From the table III and Fig.5 gives that variation of the CO2 emission of different load. When the load has increased CO2 emission also increased. For maximum load for 15.5 3hole,15.5 2hole, and 20 1 hole, when compared to other and produce less CO2 emission.

Table- III: Carbon Dioxide Vs load

	0	3	6	9
20 2hole	0.6	1.7	1.5	1.7
15.5 2hole	0.5	1.1	1.5	1.8
15.5 3hole	0.7	1.1	1.2	1.9

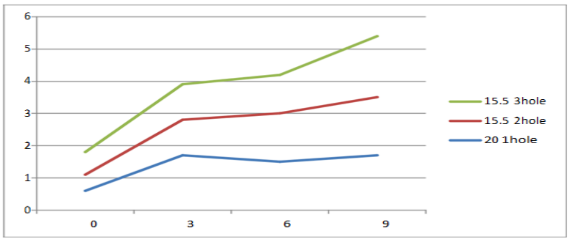

Fig. 5.Perfromance chart of carbon dioxide VS Load.

D. OXYGEN VS LOAD

From this graph gives that variation of the oxygen emission of different load. When the load has increased oxygen emission also increased. For maximum load for 20 2hole,15.5 2hole,3hole 15.5, when compared to other and produce less CO emission.

Table- IV: Oxygen Vs Load

	0	3	6	9
20 2hole	20.22	18.84	18.95	18.7
15.5 2hole	20.05	19.68	19.14	18.75
15.5 3hole	20.09	19.48	19.43	18.49

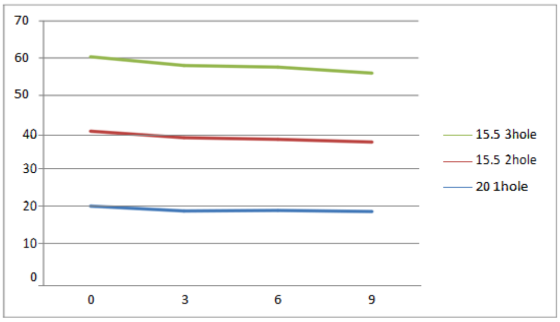

Fig. 6.Performance Chart of Oxygen Vs Load.

E. Nitric Oxide Vs Load

From this graph we can analyses the Nitric oxide emission variation with load. For maximum load for20 2 hole,15.5 2 hole, 15. 3hole..

Table- V: Nitric oxide VS load

	0	3	6	9
20 2hole	27	154	162	198
15.5 2hole	9	72	127	142
15.5 3hole	18	58	123	236

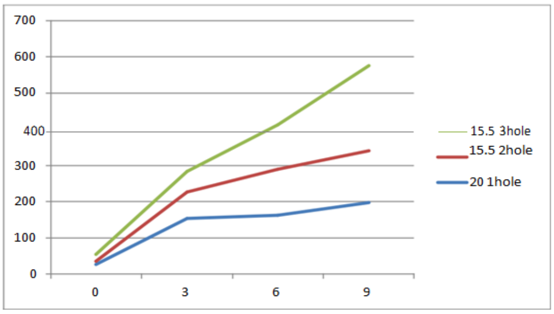

Fig. 7.Example Perfromance chart of Nitric oxide VS load.

F. SMOKE DENSITY VS LOAD

The deviation of smoke density with load is shown in below graph. The load increase when smoke density will be increased. For maximum load for 20 2 hole,15.5 2 hole, 15.5 3 hole when compared to diesel produce less smoke density.

Table- VI: Smoke Density Vs Load

	0	3	6	9
20 2hole	18.54	26.8	36.1	47.6
15.5 2hole	7.1	6.2	27.2	56.2
15.5 3hole	4.2	8.6	19.4	36.02

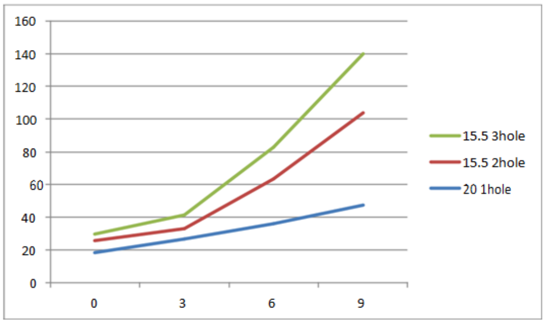

Fig. 8.Performance Chart of smoke density Vs Load.

IV. CONCLUSION

The main objective of the present investigation is analyzing the emission characteristics of papaya seed oil for various loads and three types of nozzles at constant speed (1500 rpm). From the investigation results shows papaya seed oil is showing the alternative fuel for CI engines. It can be utilized directly or in combination of small percentages of biodiesel with diesel in CI engine without any modification. Based on the emission characteristics CO is reduced with load, hydrocarbon is decreasing, CO_2 is increasing, oxygen is decreasing, and NOx is increasing with loads

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