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Performance and Emission Test on Corn Oil Blended Diesel with Hydrogen Fuel

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***Abstract*: In the present situation, oil-based fuels and coal lead to a few environmental issues for the past few decades, solution for the above issue is utilizing bio fuel for Internal Combustion engines. Bio fuel has been developed for the betterment of fuel efficiency and emission controls. This study is a about preparing a blended alternate fuel (corn oil blended diesel + hydrogen) and evaluate the performance of an engine. The study revealed that the blended oil produces less emission than Diesel**

***Keywords:* Corn oil, corn oil blended with diesel, coal, hydrogen, electrolysis.**

I. INTRODUCTION

Innovation in the diesel engine has been arrives day by day for the past few decades. Even though that is not improves the performance of the engine. Reduction of high pollutant (Carbon Monoxides, Unburned Hydrocarbons, and Nitrogen Oxides) is still a major problem [1-3]. Many researchers are looking to eliminate these problems by altering Engine design. However, use of an alternate fuel is another way to reduce these pollutants. As experimentation, corn oil is blend with diesel and hydrogen is prepared in different ratios and tested in diesel engines for its performance and efficiency [4-6].

Corn oil was blend with diesel in the ration of 10% for that volume. The viscosity of the corn oil is higher than diesel. Hence Transesterification process is done to blend Diesel with corn oil. This process brings down the viscosity of the corn oil closer to Diesel. The duel fuel cannot be injected through the fuel injector. As a result of this, the blended fuel is converted to mono-fuel

II. EXPERIMENTAL SETUP AND PROCEDURE

Experiment was conducted on a four stroke single cylinder direct injection vertical air cooled diesel engine, which is primarily used for energy generation in agriculture and house hold. Single cylinder Engine was chosen for experiment for its light weight and easy maintenance. The objective of this experiment is to adding diesel fuel with corn oil without loss of performance and better emission control. The following figure 1 shown experimental setup.

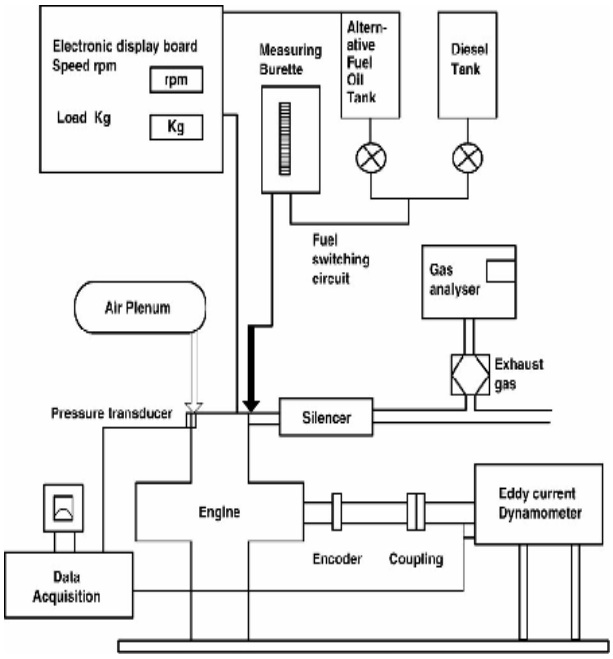

Fig 1 Experimental setup

The compression ratio of 17.5:1 and was normally aspirated and air cooled. The shaft of the diesel engine was coupled with generator set of 4.4 kW capacities. Emission analyzer noted emission data. AVL DI GAS 444 (five gas analyzer). The smoke level was analyzed by AVL 415 Smoke meter. The following table 1 given the engine specifications.

Table 1- Engine Specification.

Manufacturer	Kirloskar
Engine type	Single cylinder Vertical diesel engine
Bore / Stroke	87.5mm / 110mm
Rated Speed	1500rpm
Rated Power	4.4 kW
Compression Ratio	17.5:1

The emission analyzer was calibrated with minimum error for diesel engine and set to zero before the each experiments. The blending was done on volume percentage basis with 10 % of corn oil added in 90 % of diesel with some hydrogen. The commercial diesel fuel and corn oil were used for base fuel for corn oil-diesel blends in this study. The experiments were conducted under the five different loads (0%, 25%, 50%, 75%, and 100%) conditions.

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All data were collected from the engine during the running conditions. All the gaseous emissions were measured by the AVL DI GAS 444 & AVL 415 Smoke meter. The average results could be evaluated.

III. RESULT AND DISCUSSION

Engine performance parameters such as thermal efficiency specific fuel consumption and emissions were observed from the experimentation.

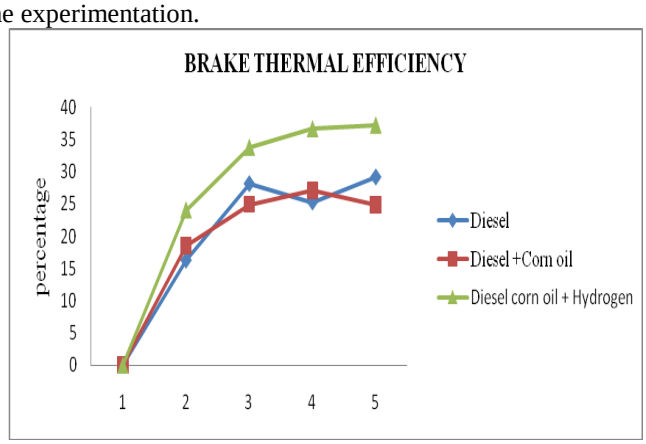

Fig 2. Brake thermal efficiency for different fuel condition

Efficiency of this proportion of blend was found to be less than pure diesel. At full load condition the efficiency of the corn blend was decreased by 15 % and the hydrogen blend was increased by 28 %.

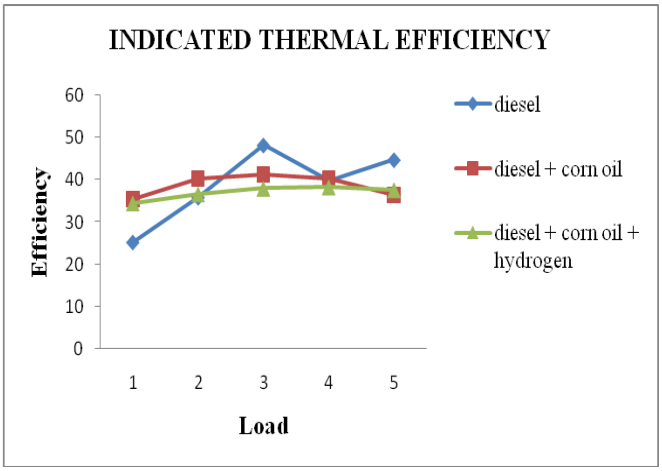

Fig 3. Thermal efficiency for different fuel condition

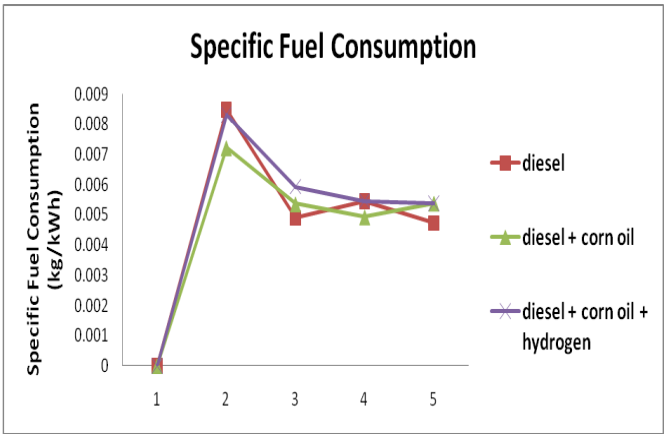

Fig 4. Specific fuel consumption for different fuel condition.

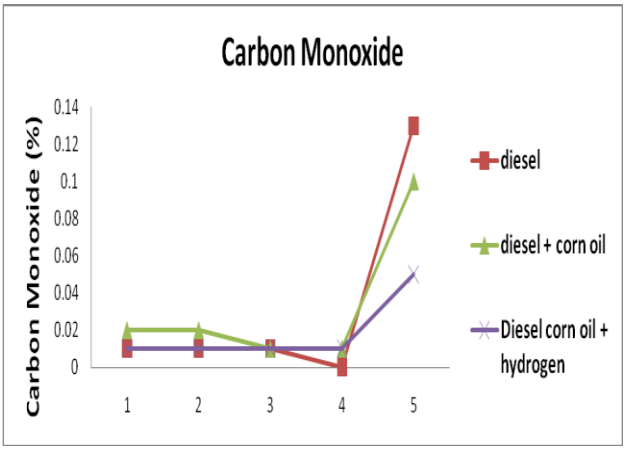

Fig 5 Range of carbon mono-oxide

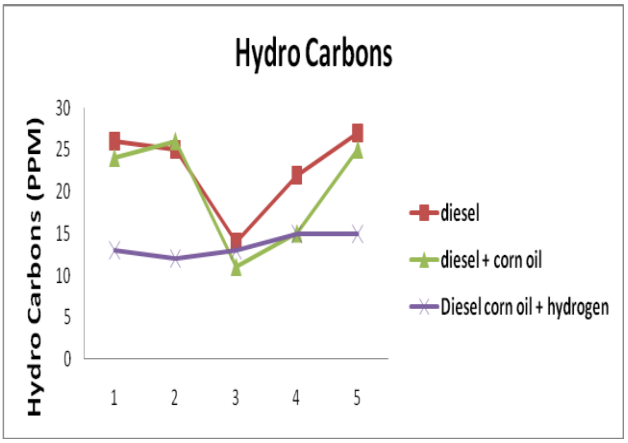

Fig 6 Variation of unburned hydrocarbon with the engine loads.

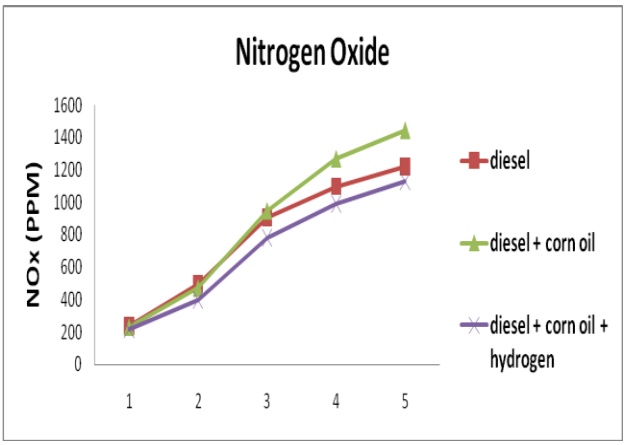

Fig 7. Variation of NOx emission.

IV. CONCLUSION

Corn oil diesel blends are in early stage of development, these blends can reduce greenhouse gas emissions. As for energy concern, corn oil has lower calorific value than diesel hence it will consume more amount of fuel.

Experimental results revels the following conclusions,

(i) Brake Thermal Efficiency of Hydrogen enriched Bio-Diesel is 15% more than Diesel and Bio-Diesel at high load condition.

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(ii) NO_X emission has dropped by 400 PPM at high loads over Diesel and Bio-Diesel.
(iii) Specific fuel consumption is on par with Diesel.
(iv) UBHC is lowered by three PPM.

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