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An Investigation on C.I. Engine Fuled with Di-Ethyl Ether, 2- Ethoxy Ethanol

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ABSTRACT: Diesel engines are widely used in almost all walks of life and cannot be dispensed with in the near future. As the fossil fuels now mainly used in diesel engines and continually depleting accompanied by increasing consumption and prices day by day, there is a need to find out an alternative fuel to fulfill the energy demand of the world. The emission norms becoming very stringent and the price of the fuel shooting its height, there is a need for reducing the emission and to improve the performances of the engine.

KEYWORDS: -The following oxygenated compounds are selected for this project work 1.Di-ethyl ether 2. Cello solve

I. INTRODUCTION

Diesel engines are widely used in many sectors due to its high thermal efficiency and fuel economy and much more efficient than petrol engines. However, the emissions from diesel engines lead to air pollutions. The pollutants emitted from diesel engines are confirmed to cause the ecological environmental problems such as the ozone layer destruction enhancement of the greenhouse effect and acid rain, etc. Diesel engine emissions such as particulate matter and black smoke carry carcinogenic compounds significantly impact the health of human being.

The major pollutants from diesel engines are NO_x and smoke. In addition to this there will be emissions of CO; CO₂ and HC. HC and CO emissions are formed when there is no sufficient oxygen available, especially in the case of rich mixtures. Both CO and HC emissions are poisonous and carcinogenic in nature. NO_x emissions are formed at high temperatures and at high oxygen concentrations. NO_x reacts with atmosphere to form ozone and is one of the major causes of photo chemical smog. It is also poisonous. Soot particles are clusters of solid carbon spheres which are seen as exhaust smoke and cause an undesirable odour. Soot arises when there is no sufficient oxygen to oxidize carbon. These particles are carcinogenic and they cause respiratory problems and even lung cancer.

II. RELATED WORK

ENGINE SPECIFICATIONS

TYPE:-

Vertical water cooled, totally enclosed, Compression ignition, 4-stroke cycle, and diesel engine

COMBUSTION:-

Hemispherical open type combustion chamber in an aluminium alloy piston and combination with long steam nozzle, resulting in low fuel consumption and easy starting

FUEL SYSTEM:-

Fuel is supplied to the fuel pump by gravity feed through the fuel tank an efficient paper element filter

FUEL TANK CAPACITY:-

11.5 liters

LUBRICATION:-

Moving parts are lubricated partly by force and partly by splash lubrication oil

**SUMP CAPACITY AND LUBRICATING OIL:-**

3.75 Liters, a high level mark on dipstick. Lubricating oil is SAE 40

COOLING:-

Engine is water cooled

GOVERNING:-

Class 'B1' for industrial application

Class 'A1' for genset application

STARTING:-

The engine is suitable for hand crank starting

ROTATION:-

Clockwise looking from flywheel end for hand start engines

DRIVE:-

Standard power take-off is from the flywheel end

STANDARD EQUIPMENT:-

Starting handle, Exhaust silencer, air filter, fuel tank and set of tools.

SAFETY DEVICES:-

Low lube oil pressure switch and high coolant temperature switch can be provided with stopsolenoid fitted on the engines. Engine safety unit for shut off with tachometer is also available.

III. METHODOLOGY**SPECIFICATIONS OF TEST ENGINE**

Table no 01: specifications of test engine

Type of engine	4-stroke diesel engine
No. of cylinder	One
Type of cooling	Water cooled
R.P.M	650
Bore	110mm
Stroke	150mm
B.H.P	6 H.P (4.41 KW) at 1500rpm
Rated power	1500 rpm

WORKING PROCEDURE OF THE ENGINE

A naturally aspirated, constant speed stationary single cylinder engine was selected for this experiment. The engine was operated manual. Fuel flow is measured on mass basis with a balance and a stop watch. Indus 5 gas analyzer was used for measuring oxides of nitrogen, HC, CO₂ and CO emissions. The sample was passed through the cold trap to prevent water vapour interference with functioning the analyzer. Indus tune smoke pump and meter were used for measurement of smoke.

Oxygenated fuel (fuel sample) is to be taken into the fuel tank and is allowed to flow towards test engine by opening the 3 way cock, the knob facing to left. In this position the fuel flows from the tank to the engine filling the burette. It is mandatory to remove air blocks in the hose by removing the hose from the engine and hold it vertically up. After confirmation it is reconnected (the hose back to the engine) and open the air bleed screw to allow the fuel to freely flow through the screw. Provide the decompression lever up. Remove load on the brake drum by loosening the screw rod Crank the engine to hear the fuel injection creek and the engine starts. After engine gets started weight for 10 minutes to stabilize the engine.

After engine gets stabilized speed, for no load condition apply 0 load on brake drum by using eddy current dynamometer and then adjust the speed of engine to 1500rpm by using the throttle valve.

Check the speed of the engine by using tachometer. Now take the readings of the water level in the two legs of U-tube manometer, note down the exhaust gas temperature and then measure the time taken for 10 CC of fuel consumption.

Repeat the above procedure by applying the loads on brake drum by using eddy current dynamometer for the loads of 2, 4, 6, 8 kgs for constant speed of 1500 rpm, and note down the corresponding readings.

Repeat the same experiment for all fuel samples including pure diesel, tabulate the corresponding readings, parameters and plot the corresponding graphs for each fuel sample.

Based on the above calculations and graphs we can analyse the performance characteristics of the engine for all fuel samples.

BLENDING PROPORTION

Blending of oxygenated compounds with pure diesel is done with care according to proportion and the proportions are:

- 1) 5% DEE with 94% diesel fuel by volume.
- 2) 10% DEE with 88% diesel fuel by volume.
- 3) 5% CE WITH 94% diesel fuel by volume.
- 4) 10% CE with 88% diesel fuel by volume.

The experiment is performed using the blended fuels as follows:

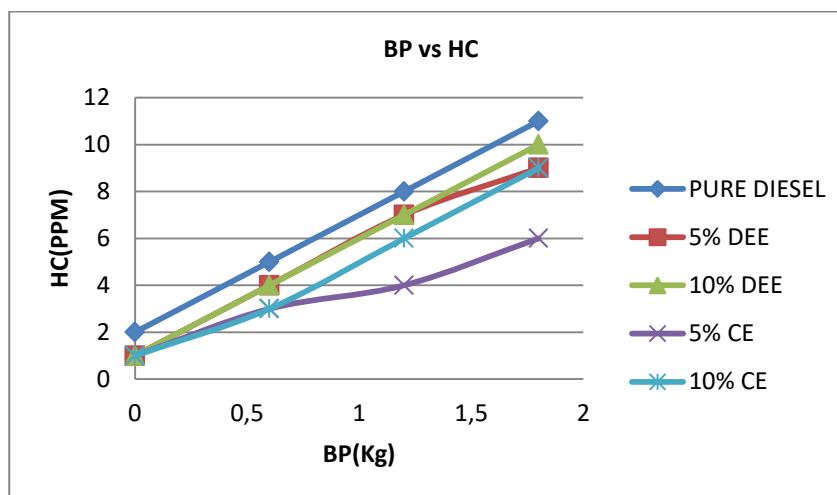
* The engine is made to run with pure diesel from zero loads to maximum loads and at constant speed of 1500 rpm.

* The engine is made to run with the above oxygenated blends of DEE and CE from zero to maximum load and at constant speed of 1500 rpm

The experimental study is conducted in 4.4 kw, air-cooled and direct injection Kirloskar engine. The performance and emission characteristics of the diesel engine using the two oxygenated compounds were measured.

IV. EXPERIMENTAL RESULTS

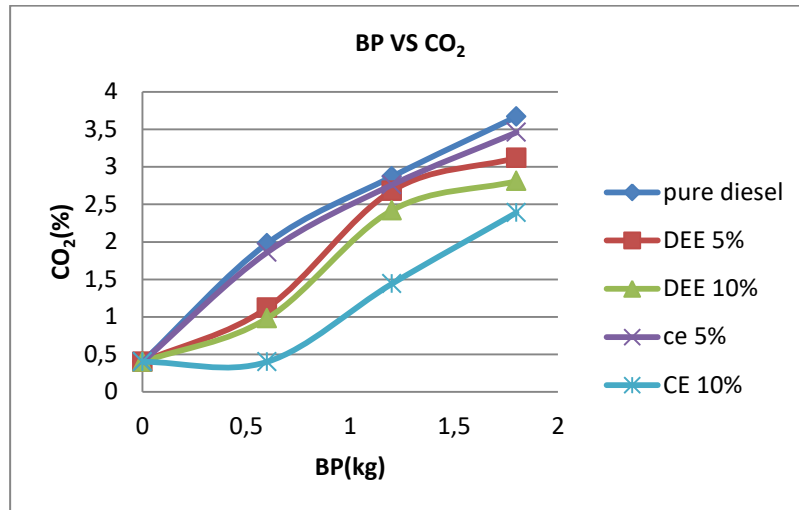
HC vs BRAKE POWER GRAPH



Graph no: -01hcvsbake power graph

Show the comparison of HC emissions of pure diesel, 5% DEE, 10% DEE, 5% CE, 10% CE with respect to brake power. As seen above, the emissions of HC reduce when using the oxygenated blends. As the load increases, there is appreciable increase in HC emission of diesel fuel. By comparing the oxygenated with diesel fuel, the oxygenated blend of 10% DEE is least. This is mainly due to higher oxygen content of the blend and lower density of the fuel blend as compared to CE fuel.

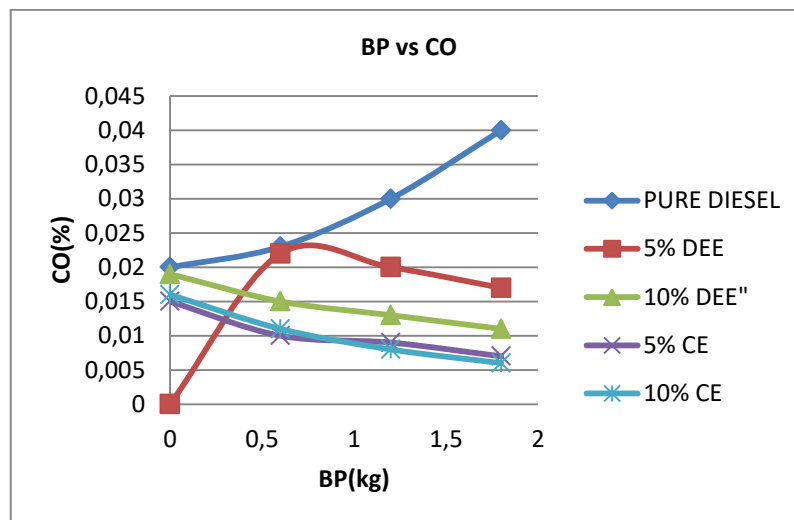
Co₂ vs Brake power



Graph no: -02 Co₂ vs Brake power

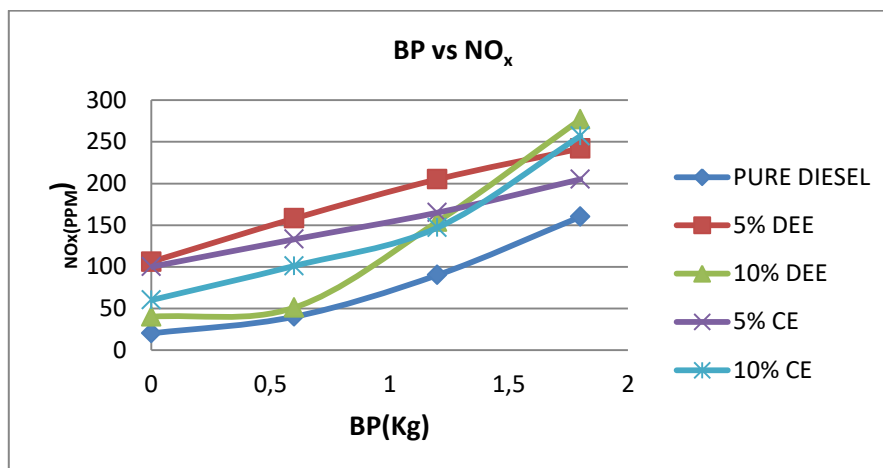
shows the comparison of co₂ emissions of pure diesel 5% DEE, 10% DEE, 5% CE, and 10% CE. With respect to brake power. At all engines loads, the emissions of carbon dioxide for oxygenated fuels were less than that of diesel fuels. It can be seen that the highest co₂ emissions was found at diesel fuel compare to oxygenated blends.

CO VS BRAKE POWER GRAPH

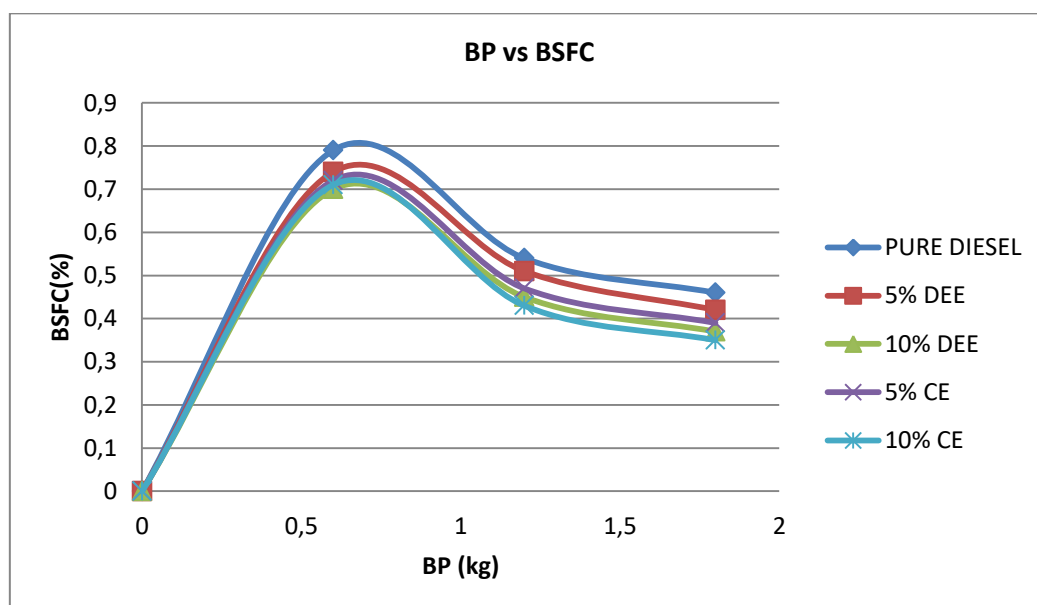


Graph no: -03 co vsbrake power graph

Shows the comparison of co emissions of pure diesel 5%DEE, 10% DEEE, 5%CE, and 10% CE with respect to brake power at all engines loads, then emissions of carbon monoxide for oxigenatedfuelsnwere less than that of diesel fuel. It can be see that the highest co emission was found at diesel fuel compare to onygenated blends. Compare to ce the blend DEE have more reduction of co emission. This is mainly due to more oxygen content of the DEE fuel compare to CE fuel

NO_x VS BRAKE POWER GRAPHGraph no: -04 no_x vs brake power graph

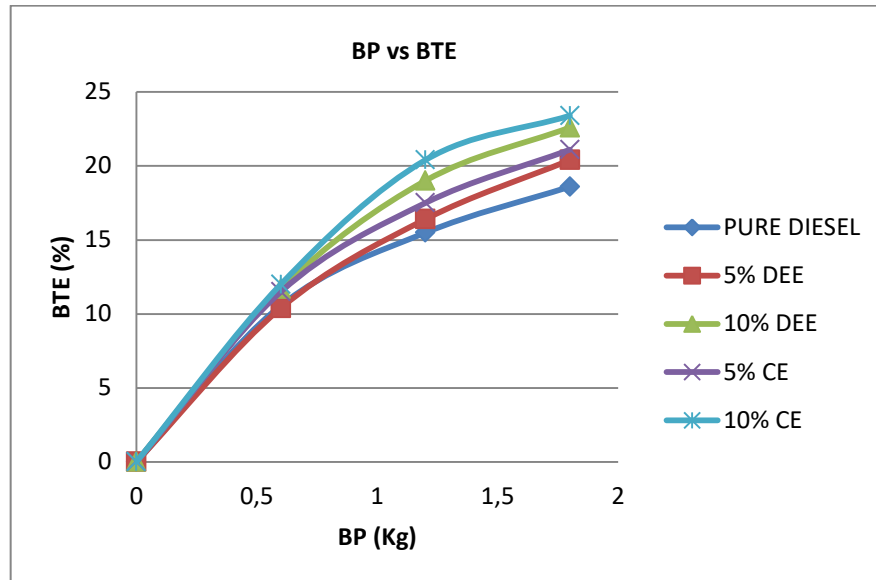
show the comparison of nox emissions of pure diesel, 5% DEE, 10%DEE, 5% CE, 10%CE with respect to brake power. All of the oxygenated blends increase Nox emissions compare to diesel fuel. Nox emissions is mainly due to oxidation atmospheric nitrogen at high temperature. As the load is increased, the emissions for the oxygenated blends increase. This is mainly due to increase in combustion temperature of the fuels. The Nox emissions for oxygenated fuels were higher than the diesel fuel. The addition of oxygenates to diesel fuel makes the charge lean inside the combustion chamber. This oxygenated fuels provides the addition oxygen needed to oxidize the nitrogen. Therefore the Nox emissions of oxygenated fuel increases comparing with DEE the Nox emissions of CE is less. This is due to more oxygen content of the DEE as compared CE.

BSFC VS BRAKEPOWER GRAPH

Graph no: -05bsfcvsbrakepower graph

Shows the comparison of BSFC for pure diesel, 5% DEE, 10% DEE, 5% CE and 10% CE with respect to brake power. As seen BSFC of diesel is the least, the 10% CE blend has the highest BSFC as compared to the other oxygenated blends. The 10% DEE have BSFC values closer to that of diesel fuel. This mainly due to higher calorific value, low density and compare to CE, the DEE blend has oxygen content is high. So less fuel was consumed in case of DEE. This is show that the BSFC increase when using oxygented blends.

BRAKE THERMAL EFFICIENCY Vs BRAKE POWER GRAPH



Graph no: -06 brake thermal efficiency vs brake power graph

shows the comparisons of BSFC for pure diesel, 5% DEE, 10% DEE, 5% CE and 10% CE with respect to brake power. As seen brake thermal efficiency of diesel is high compare to oxygenated blends. Comparing the oxygenated blends the DEE blend has higher thermal efficiency then CE. This is main due to the combined effect of higher oxygen content and higher calorific value of the DEE blend as compared to CE.

V. CONCLUSION

We The DEE and cellosolve blends were tested in single cylinder naturally aspirated diesel engine. The significant point of this investigation are

- The oxygenated fuels blends provide lower brake thermal efficiency has those of the diesel fuels over entire
- The BSFC of oxygenated blended fuels were higher than diesel fuels due to their higher fuels densities and lower calorific value.
- All the oxygenated blends have the tendency to reduce co, co2 emissions. Among all the fuel blend the 10% DEE reduced co, co2 more than other fuel blends
- All the blends produce lower emissions of unburnt hydrocarbons at all engine loads compared with diesel. It is observed that the DEE blends reduce HC emissions more than the cellosolve blends.
- By using oxygenated fuels in diesel engines Noxemissions was increased. The oxygen content and higher cetane number of oxygenated fuel is the reason for increase of the NOx engine.

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