"EFFECTS OF MODIFIED PISTON ON DIESEL ENGINE USING FUELLED WITH BLENDS OF DUAL BIO-DIESEL (ETHANOL & N-BUTANOL)"

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ABSTRACT

Now a day's direct injection diesel engines are used in both heavy duty vehicles & light duty vehicles for agriculture and transport purpose. these are consuming maximum amount of petroleum based fuels and also generate high amount of pollutants such as CO_2, CO, NOx, Smoke etc., which are harmful to environment, and these are leads to increasing the earth temperature which leads to Global warming. In the process of increasing the performance & decreasing the emissions of I.C Engines, The present experimental attempt is made to know the effect of modified grooves (on piston crown) on performance and emissions characteristics of engine. And also due to the consumption of high amount fuels there is a chance to decreasing the fuel contents, Based on this reason & also for reducing the emissions we are using some alternative fuels which are gained by the processing of vegetable waste. Finally, the effects of grooves on piston crown on the performance and emission characteristics are studied. Thermal efficiency and mechanical efficiency of engine slightly increased when operating on blended fuel of 20% and 80% of diesel (B20)From the experimental investigation it is found thatmodified piston with B20 P250 CR16 will gives better results in both performance and emission conditions.

Keywords:Bio- Diesel, Ethanol,n-butanol,Grooved Piston, B10,B20,B30, P250, CR16.

1. INTRODUCTION

Energy is the most important aspect to economic and social development to improve quality of life. Majority of the current energy sources in the world are based on fossil fuels, which will someday deplete if we do not develop technologies that could utilize alternative fuels for energy supply [1]. The consumption of energy demand around the world is growing faster than population growth. In this century it is believed that crude oil and petroleum products will come very scare and costly. Day to day fuel economy of engines is getting improved and that will be continued for years [2]. But because of the substantial increase of the number of vehicle the demand of fuel increases rapidly. This increment projection is estimated to increase up to 1.5% in 2030, due to great energy consumption in developing countries, especially in the Asian region.

The increasing demand for energy forces the major exporters of fuel energy around the world to find the alternative fuels to replace products based on fossil fuel, and not to be dependent on it. Sustainability is the main issue that causes the energy sector not being fully developed, thus various agencies are required to utilize new and renewable energy sources [3]. Biodiesel is one of the most promising alternative fuels to solve this problem. Biodiesel is renewable, biodegradable, and non-toxic and has almost very close property to that of diesel fuel. It can be produced from vegetable oils, as well as animal fats. These oils, however, have high viscosity and is therefore cannot be directly used as fuel. In order to reduce viscosity, the raw oils must undergo transesterification process to remove glycerin as by product and esters, thus creating biodiesel [9]. Biodiesel can operate in compression ignition engines with little or no modification, similar to petroleum diesel. Moreover, biodiesel has more advantages regarding the engine wear, cost, and availability. When burned, biodiesel produces pollutants that are less detrimental to human health. In addition, it provides better lubricant as compared to diesel fuel. However, performance and emission characteristics of biodiesel-fuelled engine are important to consider. In general, combustion of biodiesel fuel in compression-ignition (C.I) engines produces less smoke, particulate matter, carbon monoxide and hydrocarbon emission [8].

Objective of the Study:

The present study is to investigate the suitable grooved piston configuration to increase swirl motion in the combustion chamber and ethanol oil and n-butonol oil blended fuel at 250 bar injection pressure for which the diesel engine delivers better efficiency with minimum pollutants and there by the suitable replacement for diesel oil. To achieve the better efficiency and low emission, the following experiments are carried out as explained below

Need of Alternative Fuels

Alternative fuels are derived from the sources other than Petroleum. Many of them are produced domestically, and some are derived from renewable sources. The vehicles are increasing day by day, there by the use of fossil fuels is also increasing exponentially. Till now we are depending on hydrocarbon fossil fuels which are non-renewable and also they are producing huge amount of harmful emissions. As the hydrocarbon fuel reserves are depleting in a faster way due to the population explosion and improved technology which uses higher fuel energy consumption, it is much required an alternative renewable fuel. The governments and organizations like pollution control board etc., are imposing extra taxes or fines on the vehicle manufacturers as well as on the customers those who violate the emission norms for their vehicles. To avoid all these problems, we need such an alternative fuels which decreases harmful emissions and the fuels are renewable in nature.

ENGINE SPECIFICATIONS:

ENGINE	FOUR STROKE SINGLE CYLINDER
BHP	5 HP
SPEED	1500 RPM
FUEL	DIESEL
BORE DIA	87.5 MM
STROKE LENGTH	110 MM
METHOD OF COOLING	WATER COOLED
METHOD OF IGNITION	COMPRESSION IGNITION

2. EXPERIMENTAL SETUP

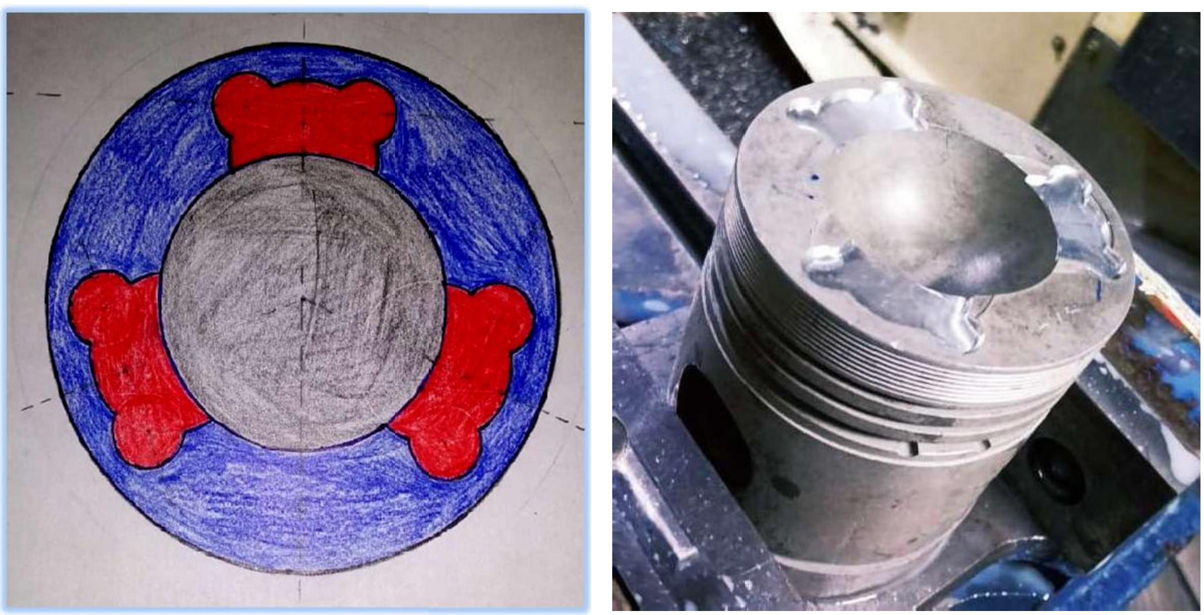

Figure 2.1Sketch view of 2D& Grooved piston diagram

Figure 2.2 Experimental setup

Figure 2.3 Modified Grooved Piston After Combustion

The piston crown of 87.5 mm diameter of base line engine is modified by producing three grooves. In the present experiment , grooves of length 28mm at the crown and 39mm at the outer diameter with a width of 15 mm is produced on piston of 87.5 mm diameter and maintaining a depth of 1.5 mm at outer and 2mm at inner in each groove. The experiments are conducted with this pistonby blends of B10, B20, B30 and waste lube oil and their performance and emissions are compared with each other.

3. RESULTS AND DISCUSSIONS

Test were carried out by the modified piston with a blends of B-10,B-20 & B-30 and injection pressure 250 bar and varying the compression ratios CR16 & CR18, with a loads of 0.2kg,3kg,6kg, 9kg and 12kg. In this test both performance and emission characteristics are compared with each other. After comparing all the readings with each modified piston with B-20, 250 bar & CR16 will gives better results in both performance and emission parameters.

Brake power:

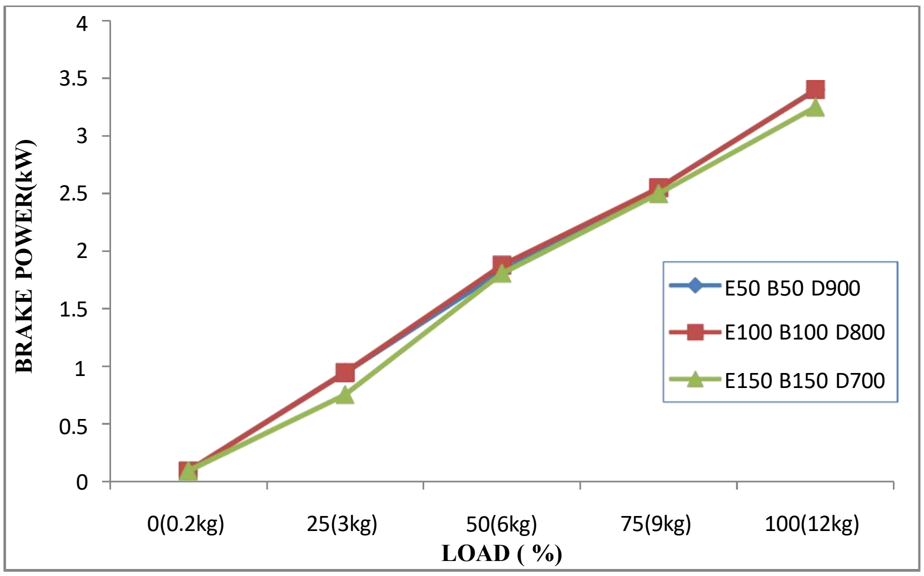

Figure 3.1 Variation of Brake power with respect to load

The Brake power for the modified piston with B20 at full load is 3.46 KW.The Brake power of B20 is maximum compare with remaining.

Brake thermal efficiency:

The Brake ThermalEfficiency with load will conduct a performance test on modified piston with blends. The Brake ThermalEfficiency for the modified piston with B20 at full load is 28.9%.The Brake ThermalEfficiency of B20 is maximum compare with remaining.

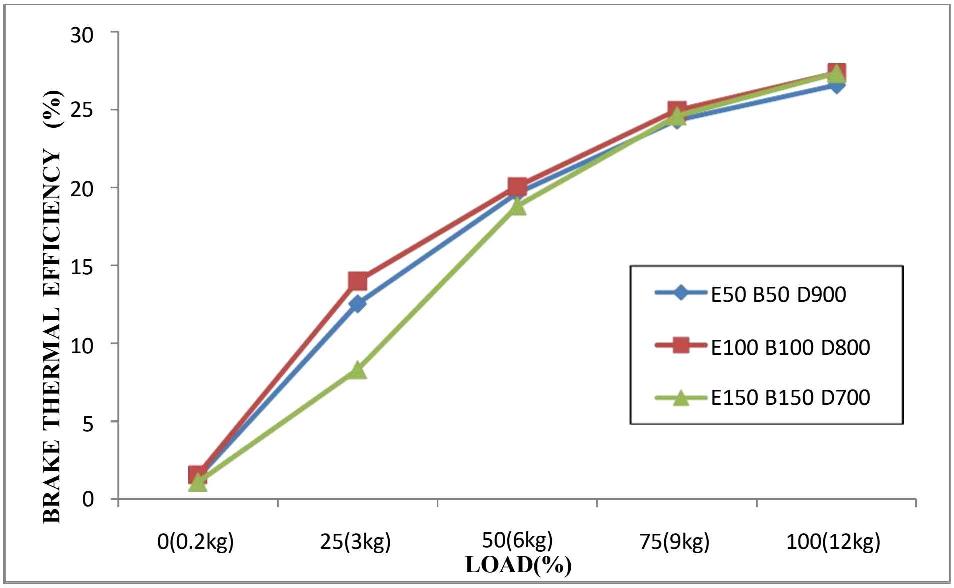

Figure 3.2Variation of Brake thermal efficiency with respect to load

Specific Fuel Consumption:

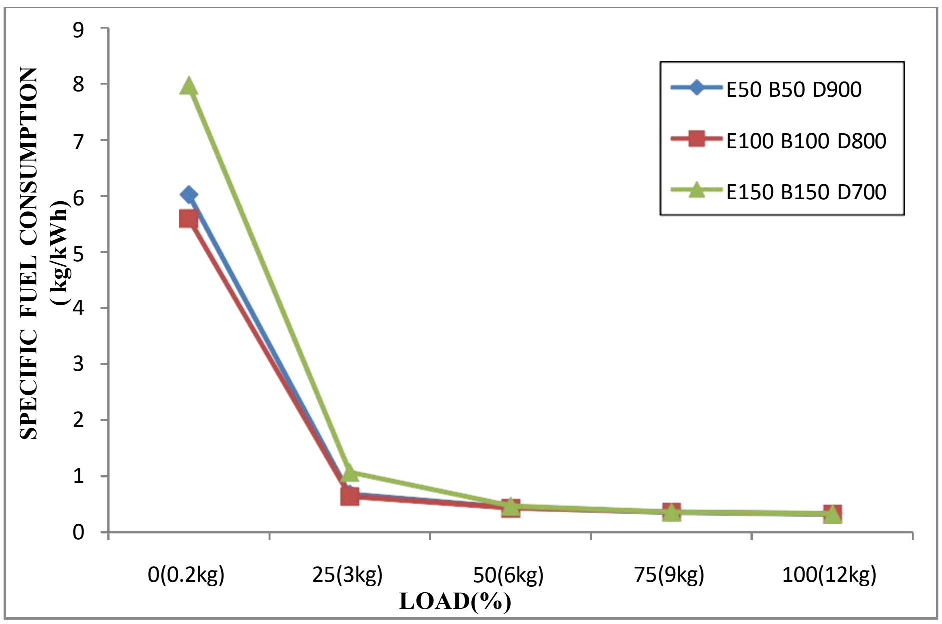

Figure 3.3Variation of specific fuel consumption with respect to load

The specific fuel consumption with load will conduct a performance test on modified piston with blends.The specific fuel consumption for the modified piston with B20 at full load is 0.33 kg/kWh, the specific fuel consumption at B20 is minimum compare with remaining.

Volumetric efficiency:

The volumetric efficiency for the modified piston with B20 at full load is 75.08% and with B30 at full load is 76.09%.The volumetric efficiency is more for B30 compare with others.

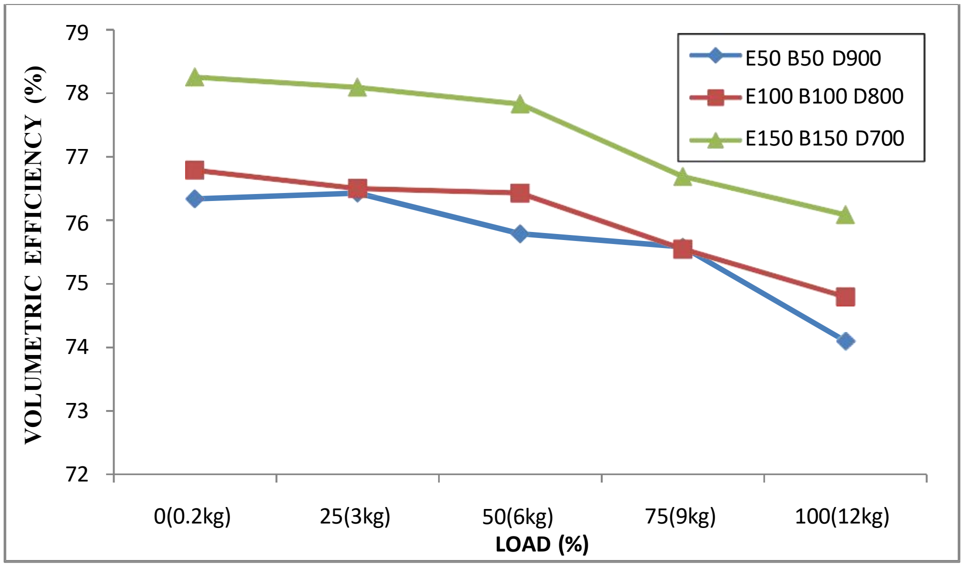

Figure 3.4Variation of volumetric efficiency with respect to load

Nitrogenoxides (NOx):

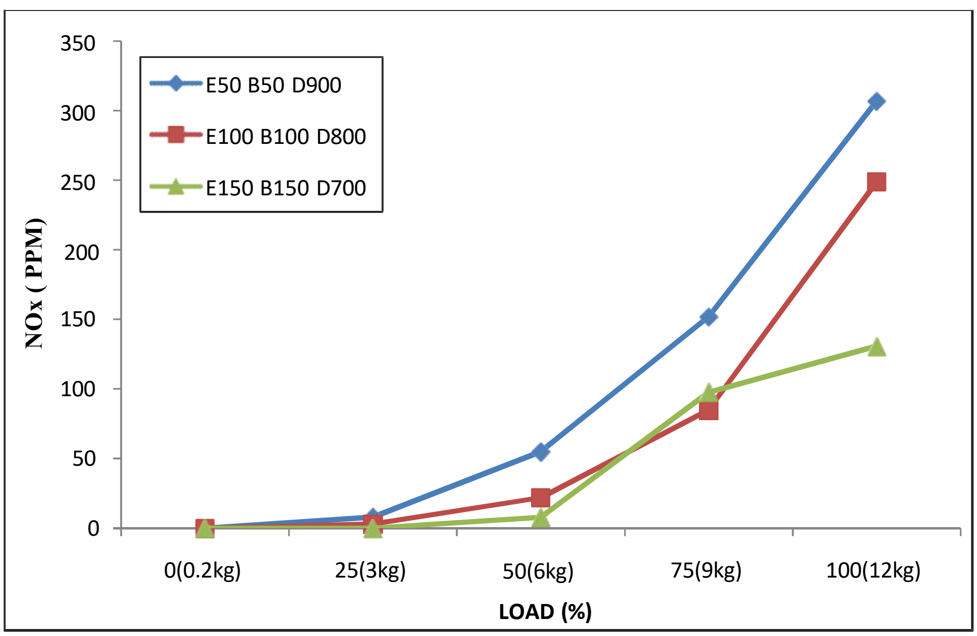

Figure 3.5 Variation of NOx with respect to load

The NOx for the modified piston with B20 at full load is increasesdue to complete combustion fuel.

Carbon dioxide:

The CO_2 for the modified piston with B20 at full load is 3.2%. The Co_2 for the modified piston with B30 at full load is 2.7.The Co_2 of B20 is in good condition compare with remaining.

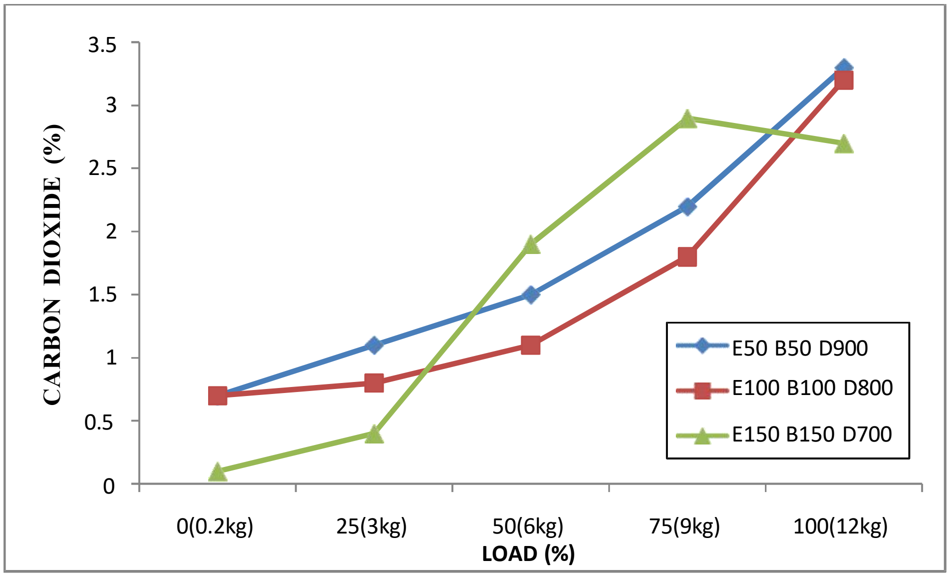

Figure 3.6Variation of CO_2 withrespect to load

Carbon monoxide:

The Carbon monoxide for the modified piston with B20 at full load is 0.1. The Co for the modified piston with B30 at full load is 0.08.The CO of B20 is in good condition compare with remaining

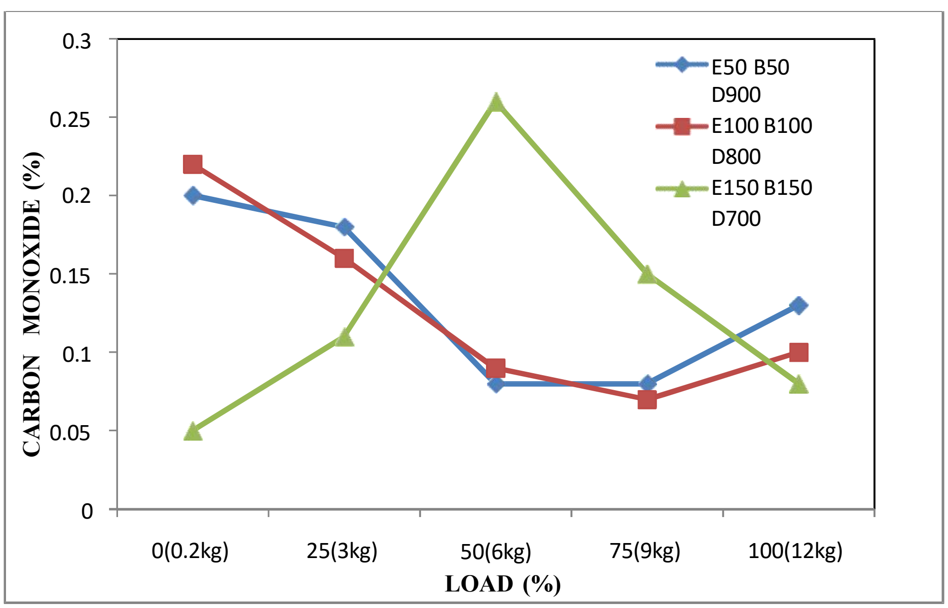

Figure 3.9Variation of CO with respect to load

CONCLUSION

Based on the above experiments the following conclusions can be drawn

- The maximum brake power with modified piston and using Bio- Diesel blends (B-20) is 3.4 kW.
- The Brake thermal efficiencyis increased by 2.3 % compare with other.
- The specific fuel consumption is lowat (B-10) is 0.32 kg/kw hr compare with remaining.
- The volumetric efficiency for the modified piston with B30 is maximum at full load is 76.09%.
- The NOx for modified piston with blends of B20 is good 0.34 condition comparing with remaining.
- The CO_2 with load will conduct a performance test on modified piston with blends. The CO_2 of B20 is in good [3.2] condition comparing with remaining.
- The CO with load will conduct a performance test on modified piston with blends. The Co of B20 is in good [0.1] condition compare with remaining

After comparing all the readings with modified piston and using Bio-Diesel B20 P250 CR16 will gives better results in both performance and emission conditions.

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