Comparision of Combustion Characteristics of Different Bio Diesel in Diesel Engine

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***Abstract*— Considering production, availability, cost etc., for production of Bio Diesel we have conducted the experiments using Cotton seed Oil, Jatropha oil & Rubber seed Oil with Diesel in the proportion of 20%, 40% & 60% individually in a Two cylinder Four stroke Water Cooled Diesel Engine, the experimental curves are analysed and comparative results are presented below.**

***Keywords*— Bio diesel, Combustion, Cotton Seed Oil, Jatropha & Rubber Seed Oil**

I. INTRODUCTION

For developing countries transport play an important role to become a developed countries. In Major transports Diesel engines are used and the requirement of diesel is an increasing trend whereas the availability of diesel is decreasing trends. The exhaust emitted from the combustion of diesel engine contributes the major part for environmental pollution. To avoid the environmental pollution and to balance the demand of diesel we are going for alternative fuel for running the Diesel engine. So many research works already had been taken in the field of alternative fuel for diesel engine for testing the performance of Diesel Engine. Here, we have attempted to analyse and compare the combustion of Cotton seed Oil, Jatropha oil & Rubber seed Oil with Diesel in the proportion of 20%, 40% & 60% individually in a Two cylinder Four stroke Water Cooled Diesel Engine.

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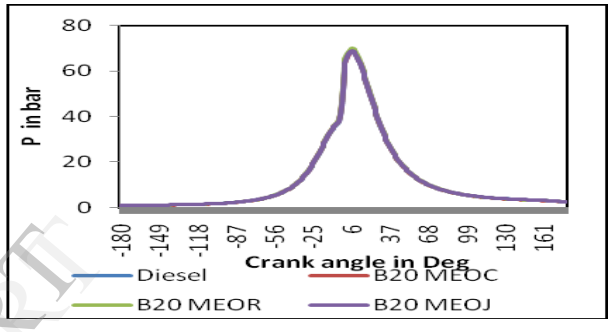
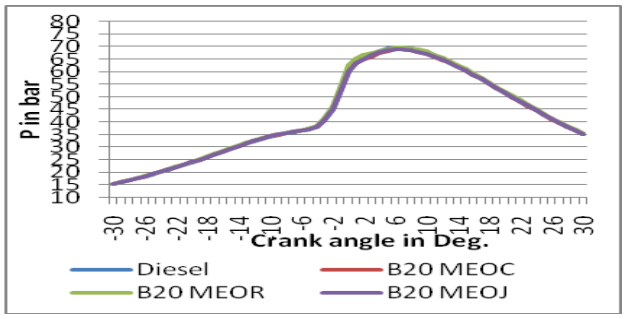
II. EXPERIMENTAL ANALYSIS

A series of test were carried out on constant speed four stoke water cooled two cylinder diesel engine at rated speed of 1500 rpm. All the blends were tested under varying load conditions (no load to max load) at rated speed.

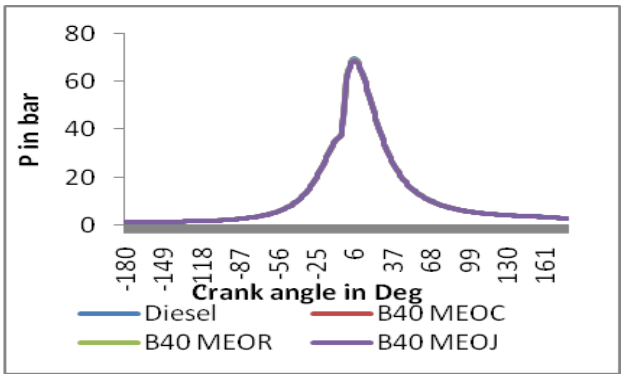
Pθ DIAGRAMS



Pθ diagram of 20% blends of Bio Diesel

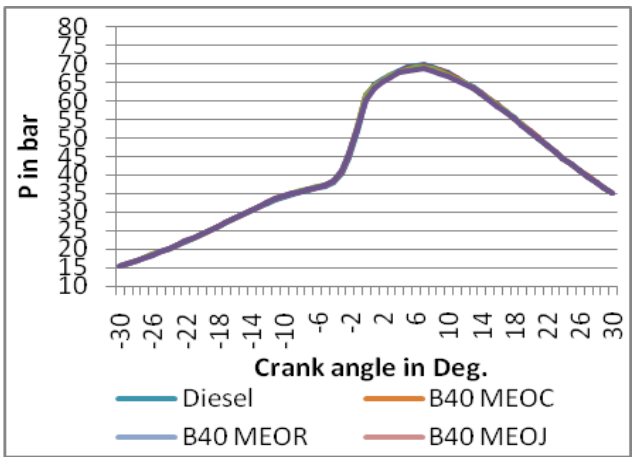


Pθ diagram of 20% blends of Bio Diesel from 30° BTDC to 30°ATDC

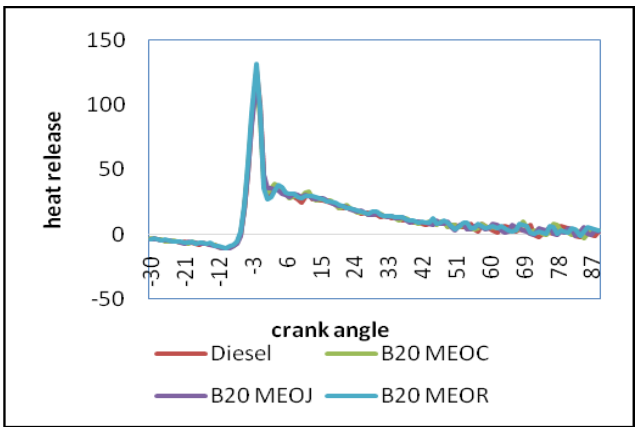


Pθ diagram of 40% blends of Bio Diesel

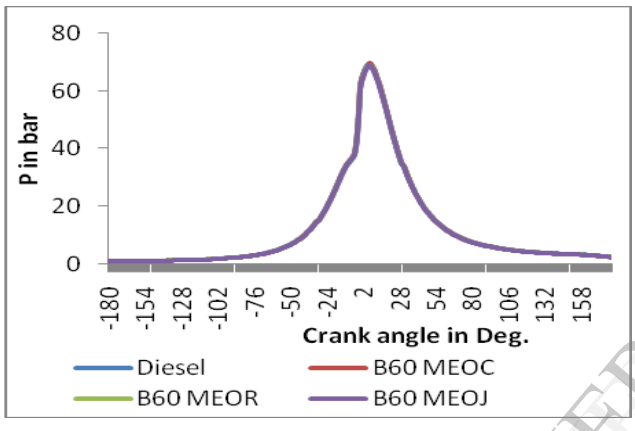
HEAT RELEASE RATE



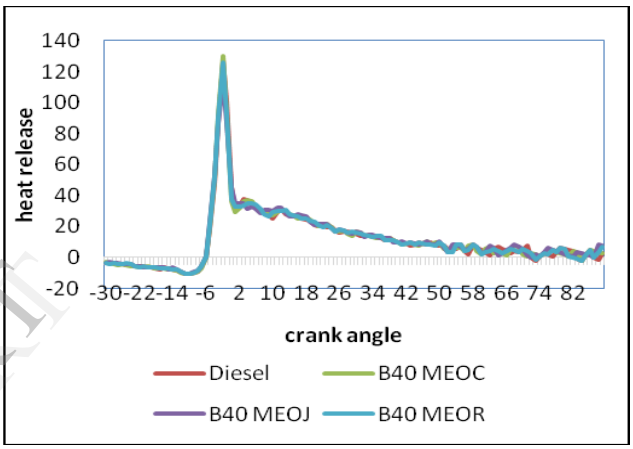
Pθ diagram of 40% blends of Bio Diesel from 30° BTDC to 30°ATDC



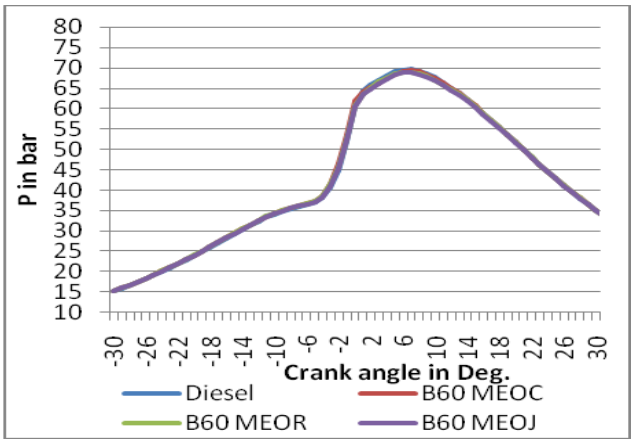
Heat release and crank angle diagram of 20% blends of Bio Diesel



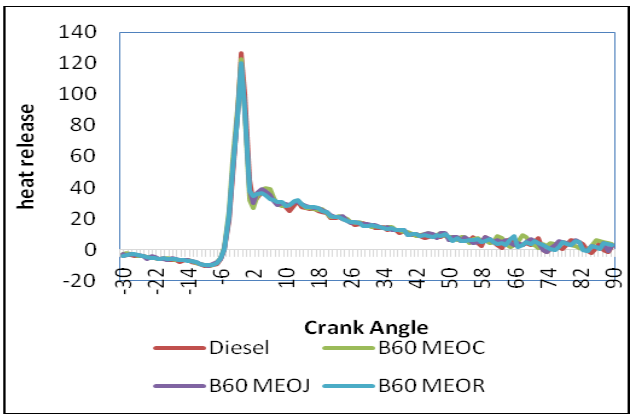
Pθ diagram of 60% blends of Bio Diesel



Heat release and crank angle diagram of 40% blends of Bio Diesel

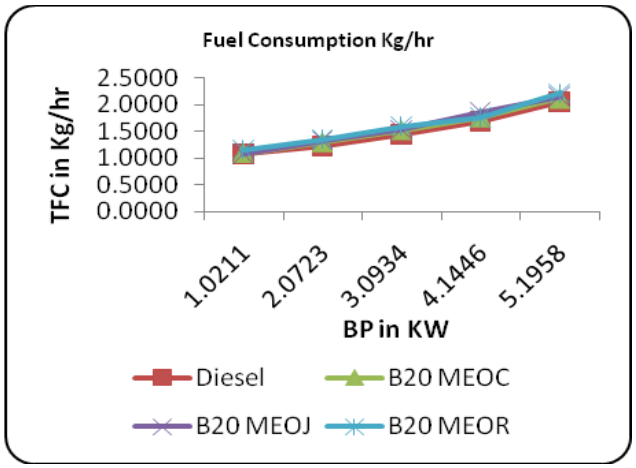


Pθ diagram of 40% blends of Bio Diesel from 30° BTDC to 30°ATDC



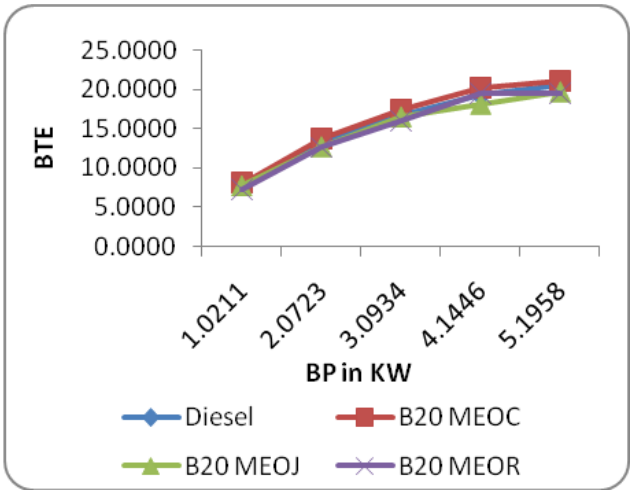
Heat release and crank angle diagram of 60% blends of Bio Diesel

PERFORMANCE
Total Fuel Consumption

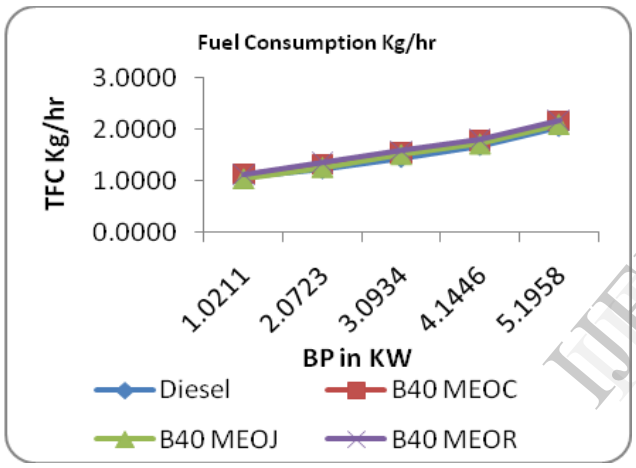


Graph between BP Vs TFC for 20% blends of biodiesel

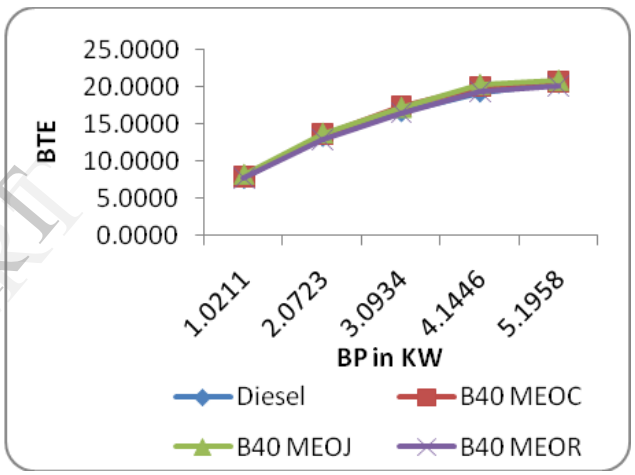
Brake Thermal Efficiency



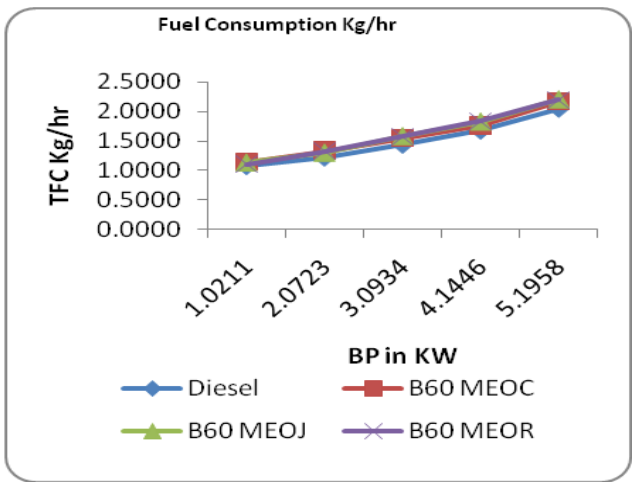
Graph between BP Vs BTE for 20% blends of biodiesel



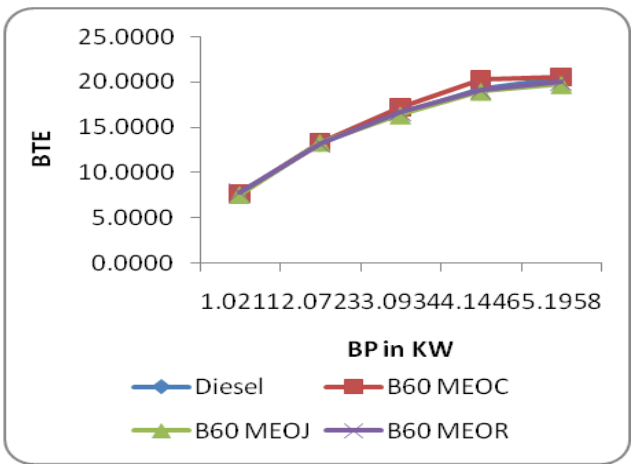
Graph between BP Vs TFC for 40% blends of biodiesel



Graph between BP Vs BTE for 40% blends of biodiesel

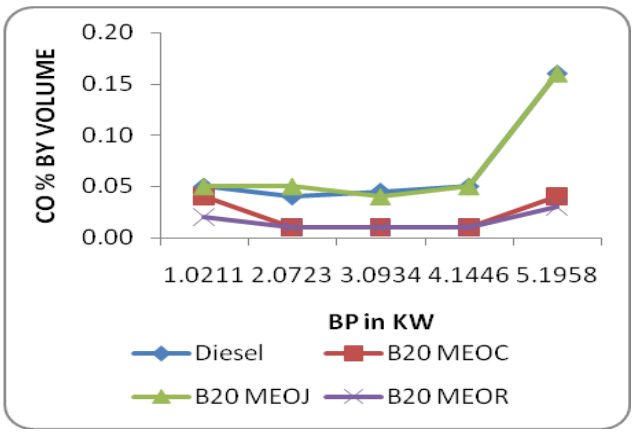


Graph between BP Vs TFC for 60% blends of biodiesel

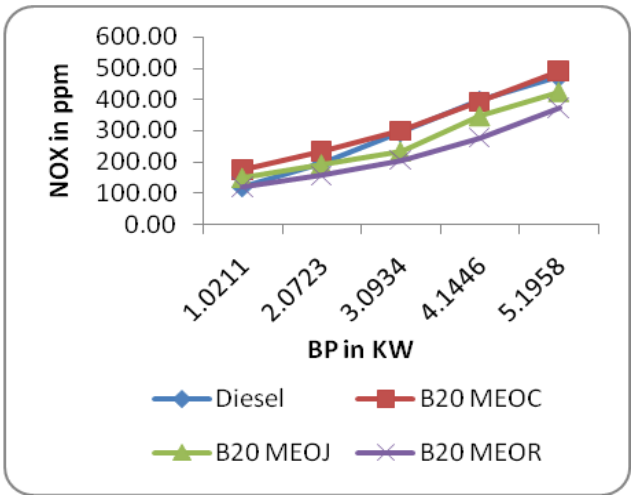


Graph between BP Vs BTE for 60% blends of biodiesel

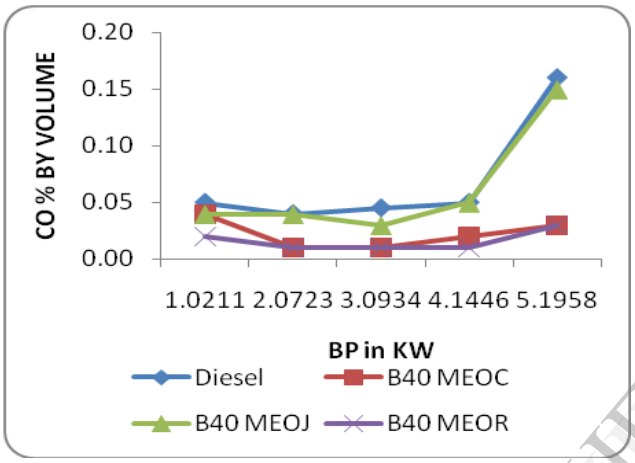
EMISSIONS



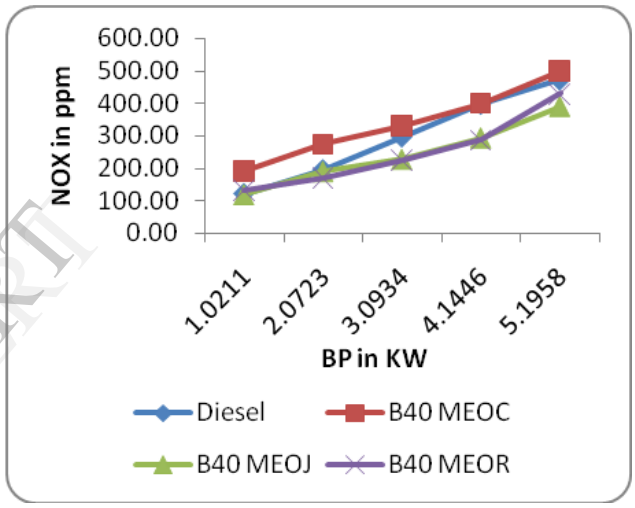
Graph between BP Vs CO% for 20% blends of biodiesel



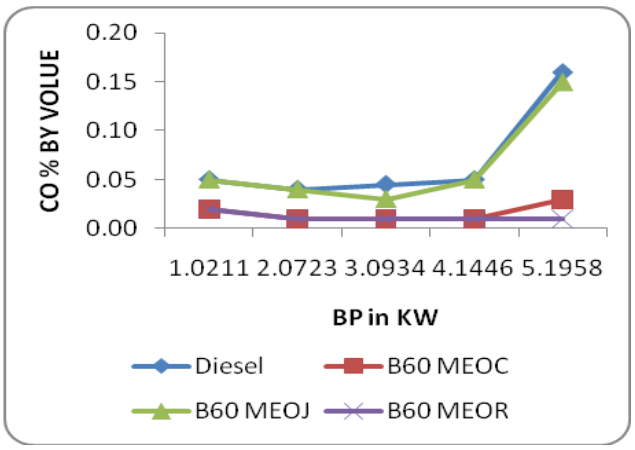
Graph between BP Vs NOx for 20% blends of biodiesel



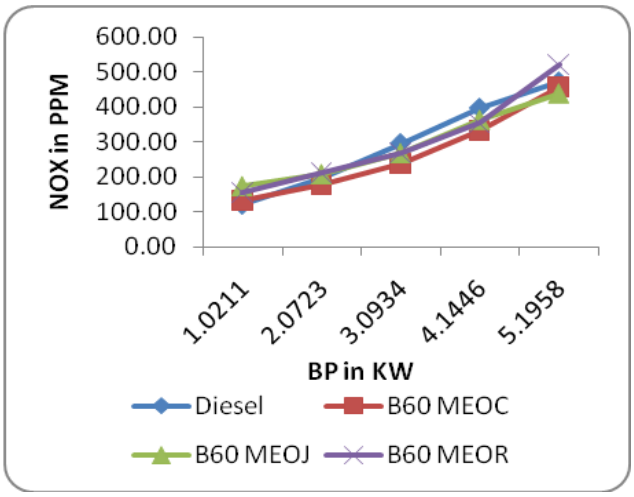
Graph between BP Vs CO% for 40% blends of biodiesel



Graph between BP Vs NOx for 40% blends of biodiesel



Graph between BP Vs CO% for 60% blends of biodiesel



Graph between BP Vs NOx for 60% blends of biodiesel

III. DISCUSSIONS

- In Pθ diagram there is no major deviation between the diesel and bio diesel blends of MEOC, MEOJ & MEOR in 20%, 40% & 60%. We maintain the rated speed of 1500 rpm is constant in each and every load change. Hence, the engine taking more fuel than the diesel to maintain the rated speed at different load.

- The Pressure, crank angle diagram shows with minor deviations by burning of more fuel to obtain the maximum pressure to maintain the speed.

- We have obtain maximum pressure at full load 69.719 bar for diesel , 69.004 bar for 20% blends of MEOC at 7° ATDC and 69.788 bar & 68.765 bar for 20% blends of MEOR & MEOJ with diesel respectively at 6° ATDC.

- The max pressure 69.415bar, 69.203bar & 68.634 Bar for 40% blends of MEOC, MEOR & MEOJ with diesel respectively at 7° ATDC.

- The max pressure 69.456bar, 68.785& 68.843 Bar for 60% blends of MEOC, MEOR & MEOJ with diesel respectively at 7° ATDC.

- The max Heat Release takes place at 1° BTDC is 126.948 KJ / m^3deg. and 119.675 KJ / m^3deg, 118.865KJ / m^3deg & 131.532 KJ / m^3deg for 20% blends of MEOC, MEOJ & MEOR with diesel respectively.

- For 40% blends of MEOC, MEOJ & MEOR with diesel we have obtained max heat release at 1° BTDC 129.871 KJ / m^3deg, 114.953 KJ / m^3deg & 125.60 KJ / m^3deg respectively.

- For 60% blends of MEOC, MEOJ & MEOR with diesel we have obtained max heat release at 1° BTDC 122.583 KJ / m^3deg, 119.675 KJ / m^3deg &120.084 KJ / m^3deg respectively

- The Total fuel consumptions of diesel is 2.0507 Kg /hr. and 2.1115Kg /hr, 2.1475Kg /hr& 2.2091Kg /hr for 20% blends of MEOC, MEOJ & MEOR respectively with diesel.

- Total fuel consumptions for 40% blends of MEOC, MEOJ &MEOR with diesel are 2.1561Kg/hr, 2.0892 Kg/hr & 2.1687Kg/hr respectively.

- For 60 % blends bio diesel with diesel the TFC are 2.1671Kg /hr, 2.2100Kg /hr& 2.1928Kg /hr.

- We have obtained maximum Brake Thermal Efficiency of diesel is 20.4728% and 21.0291%, 19.7396% & 19.4533% for 20% blends of MEOC, MEOJ & MEOR respectively with diesel.

- For 40 % blends of MEOC, MEOJ & MEOR bio diesel with diesel, we have obtained maximum BTE efficiency of 20.6336%, 20.7996% & 20.0836%.

- The maximum BTE are 20.5872%, 19.7178% & 19.9892 % for 60% blends of MEOC, MEOJ & MEOR with diesel respectively.

- All the emissions are decreasing manner, we are using the bio diesel blends as fuel to run the engine except NOx.

- At maximum load we have got 0.16% by volume of CO for diesel and 0.04%, 0.16% & 0.03% by volume of CO for 20% blends of Biodiesel with diesel.

- For 40% blends of Bio diesel we have got maximum CO of 0.03%, 0.15% & 0.03% by Volume and for 60% blend 0.03%, 0.15% & 0.01% by volume.

- Whereas the NOx is an increased manner when we are increasing the blended ratio. For Fossil Diesel 472 PPM and for 20% blends of Bio Diesel of MEOC, MEOJ & MEOR are 491PPM, 423PPM & 373PPM.

- For 40% blends of Bio diesel with diesel we have obtained 499PPM, 390PPM & 430PPM and for 60% blends of bio diesel we have got 457PPM, 437PPM & 522PPM MEOC, MEOJ & MEOR respectively,

IV. SUMMARYAND CONCLUSION

The main aim of the experimental analysis is to find out the best alternative fuel considering the production of seeds for bio diesel production, cost of raw material and bio diesel production, environmental protection concerns encourage and employment of agricultural sectors we have chosen Cottonseed Oil, Jatropha & Rubber seed Oil for Bio Diesel production, blends and analysis.

After analysing in the proportions of 20%, 40% & 60% of MEOC, MEOJ & MEOR Bio Diesel blended with diesel separately and use these blends to run the engine as fuel and compare with pure fossil diesel.

We concluded that considering Brake Thermal Efficiency high & nearer to diesel and low emission for environmental protection40% of Bio Diesel Blends was give the maximum result nearer to pure fossil diesel without modification engine physically.

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