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Effect of Using Additives on the Emission Properties of Vcr Diesel Engines Running On Rice Bran Bio-Diesel Blends

P. Somasekar Babu,
Research scholer,
JNTUA,Ananthapur ,
A.P, South India

Dr.V. Pandurangadu
Professor, Dept.of.Mech.Engg.
JNTUA,Ananthapur
A.P, South India.

Abstract :

Literature revealed that the emission properties are related with the addition of Ce O2 as an additive .However experimental analysis to verify above statements is not reported in the literature. Hence an attempt is made in this paper to conduct experiments and to analyze the effect of adding Ce O2 with the rice bran oil bio-diesel .Two compression ratios namely 16 and 18 are chosen .The percent blends of rice bran bio-diesel are 5,10,and 15.the PPM value of the Ce O2 added is 40.It has been observed that ,adding Ce O2 has an overall effect of reducing HC,CO,CO2,and NOx in the emission .

Keywords : Emission, Additives, Compression ratio, HC,CO,CO2.

1.0 INTRODUCTION

As seen from the availability of non renewable sources of energy, it has been concluded that the above source of energy namely petroleum products is very fast depleting and unless some alternative source of energy is available, it becomes impossible to meet out the future energy crisis. This has lead to the search of new source of unconventional source of energy. However petroleum source of energy remains the primary source. However to reduce the load on the petroleum and diesel fuels, blends of diesel or with other fatty and vegetables oils are the present trends. It has

been observed that adding additives like Ce O2 wiyh the diesel blend the emission properties are likely to improve .For the current study rice bran oil diesel blends are chosen. Experiments are conducted with and without Ce O2 . Bio diesel fuel is a clean burning alternative fuel that comes from 100% renewable sources. Bio diesel fuel is made through a process called transesterification compared to other alternative fuels, bio-diesel fuels have a number of advantages. It offers no health emission gases. Many researchers conducted work on CI engines by using bio fuels or bio diesel made out of many vegetables seed oils. The engines performs was studied using above bio diesels without major modifications of engine parameters. The bio fuel preparation by esterification process is suitable for bio fuel preparation. Instead of using pure bio diesel inside the engine, blending of bio fuel with diesel avoids major modification of engine settings.

2.0 LITERATURE RIVIEW

Ahmad etal[1],investigated the influence of additives – fuel on diesel engine performance and emissions. They made analytical modeling and experimental validation .They conducted experiments on a turbo charged engine .they concluded that adding additives in general improve the emission properties of the engine. Sathiyamoothi etal[2],Analyzed the effect of antioxidant additives on the performance and emission characteristics of DICI Engines. They concluded that adding additives produce increase in break thermal efficiency and a considerable reduction in NOx. Vivek etal[3],Worked on the effect of adding nano- fluid additives on the performance and emission properties on CI Engines. They made comparative study of the emission characteristics with and without the addition of nano fluid additives. Wojciech etal[4], Worked on alcohol diesel fuel combustion in the CI engines. They concluded that addition of methanol to the diesel engine fuel remarkably reduced NOx. Mohamed etal[5], did extensive work on effect of VCR on the combustion properties of diesel engine working on bio-diesel blends.They concluded that adding different additives to the blend remarkably reduces HC,CO,CO2. Rakopoulos etal[6],conducted experiments on combustion and emission properties of cotton seed oil and its bio-diesel blends with diethyl ether as additive. Their results, very well agreed with the findings of other research workers.

3.0 ISSUES AND CHALLANGES RELATED TO PRESENT WORK

A. The major challenge the present work is to choose the emission parameters like HC,CO,CO2,and NOx.

B. The blends have to be prepared by well mixing for sufficient long time, otherwise the results may be misleading

C. Environmental friendly seed oils must be chosen for bio diesel blend preparation in order that they do not pollute pollute the atmosphere

D. Careful consideration must be given for calculating the volume of the combustion chamber for arriving at VCR

4.0 SCOPE AND OBJECTIVES OF PRESENT WORK

The scope of present work is to conduct experiments with suitable seed oil diesel blend with the objective of optimizing the emission properties.

5.0 FORMULATION OF PROBLEM

In view of anticipated future energy crises, lot of research must be undertaken for alternative fuels through bio diesel blends and optimizing the various parameters of the emission. Hence the problem is chosen as stated above

6.0 PRESENT WORK

The present work is split in to the following modules.

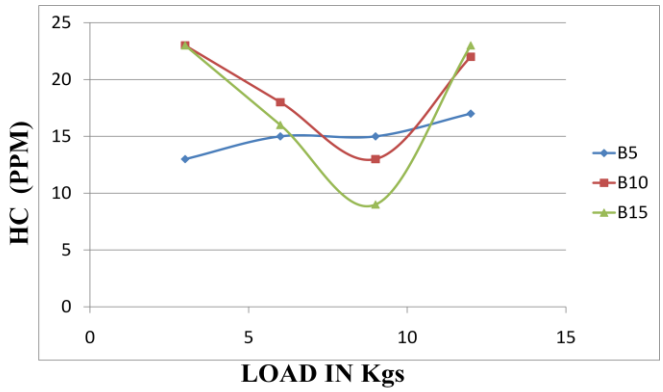
A. Choosing the diesel engine and the bio diesel under study for experimental investigation. The physical and chemical properties of the bio diesel are to be noted down.
B. Choosing the parameters of emission like HC,CO,CO2,and NOx. Arrangements to be made for measuring the HC,CO,CO2,and NOx. Identification and selection of suitable instrumentation for conducting the experimental work.

7.0 EXPERIMENTAL WORK

For the experimental work Rice bran oil which contains 5-15% of oil is chosen for bio diesel preparation in steps of 5%. If the study is limited to 15% blend, major modification in the engine need not be made. The standard test rig for conducting the load test and exhaust gas analysis is made use of in the experimental setup to find out the percentage of HC,CO,CO2,and NOx. For convenience eddy current dynamometer which can offer loading up to 15kg is used for loading the engine.

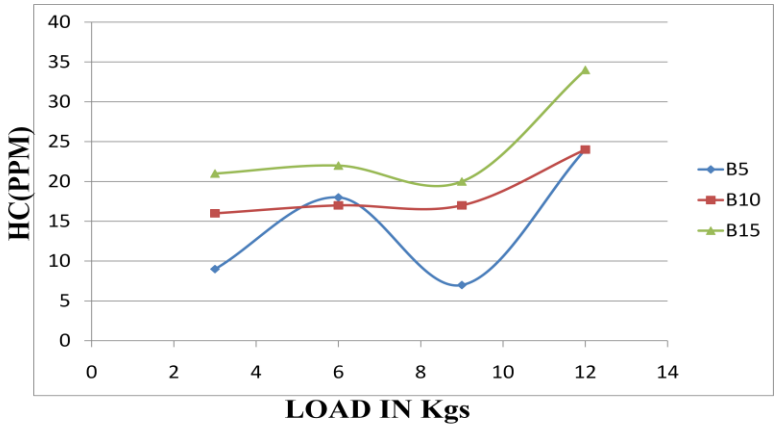
8.0 RESULTS AND DISCUSSIONS

Various graphs were drawn using the experimentally observed values and are presented through figures 1 to 16 and shown below



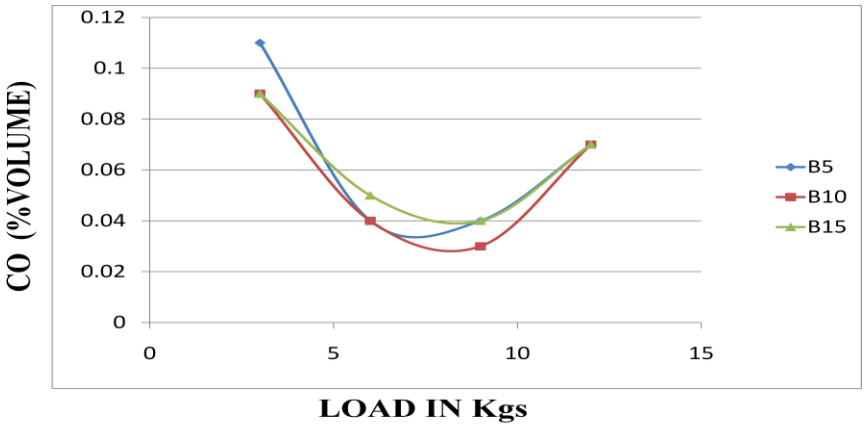
Comparison of variation of HC with LOAD at CR-16 without CEO_2

Fig.1



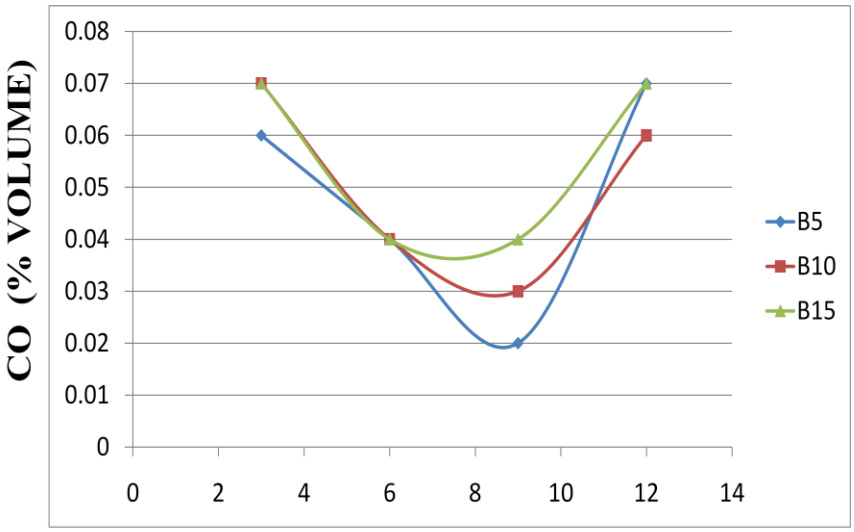
Comparison of variation of HC with LOAD at CR-16 with CEO_2

Fig.2,



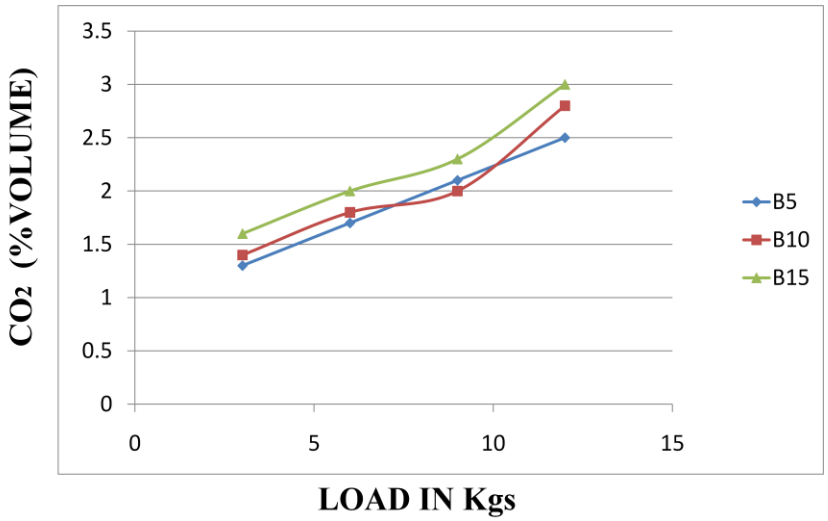
Comparison of variation of CO with LOAD at CR-16 without CEO_2

Fig.3



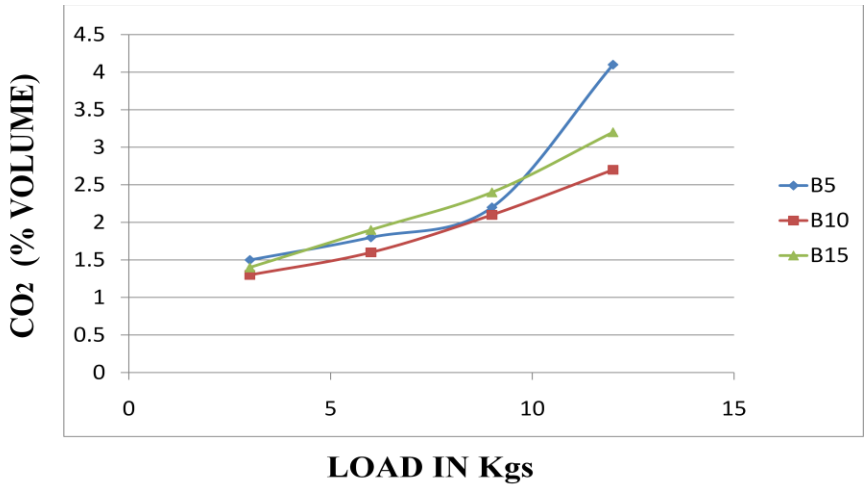
Comparison of variation of CO with LOAD at CR-16 with CEO_2

Fig.4



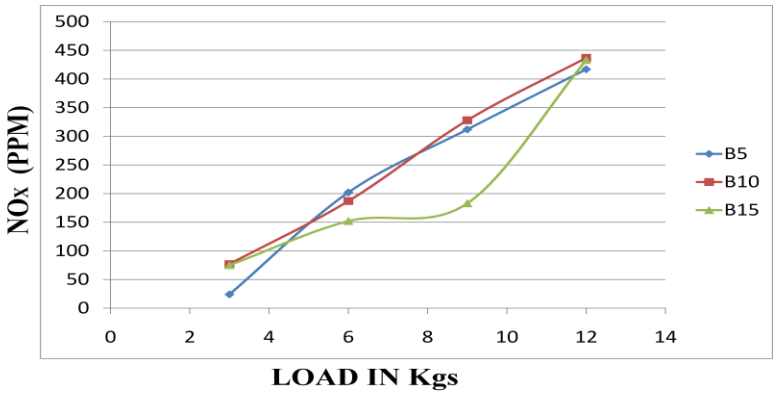
Comparison of variation of CO_2 with LOAD at CR-18 without CEO_2

Fig.5



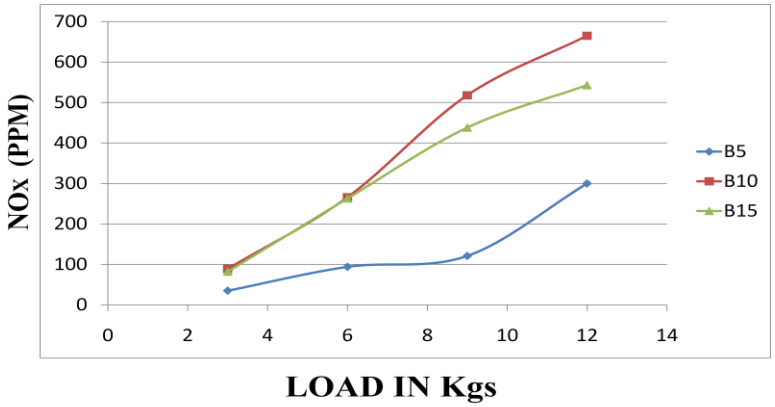
Comparison of variation of CO_2 with LOAD at CR-18 with CEO_2

Fig.6



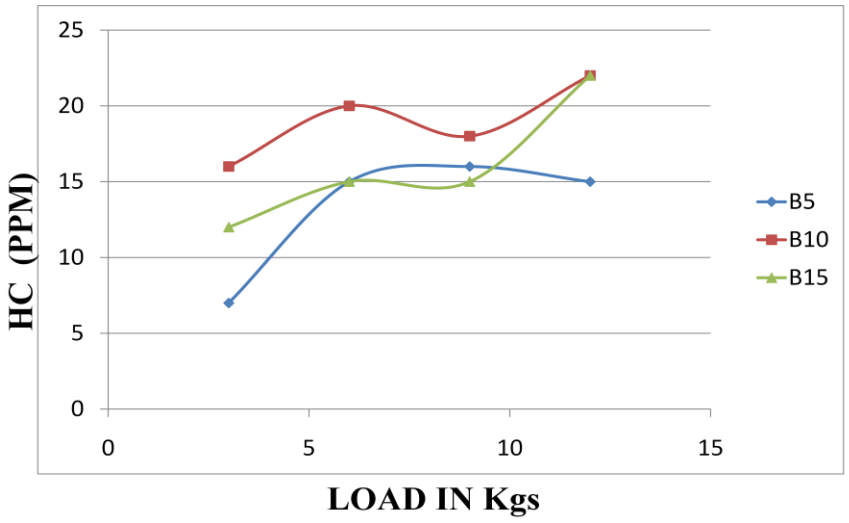
Comparison of variation of NOx with LOAD at CR-16 without CEO_2

Fig.7



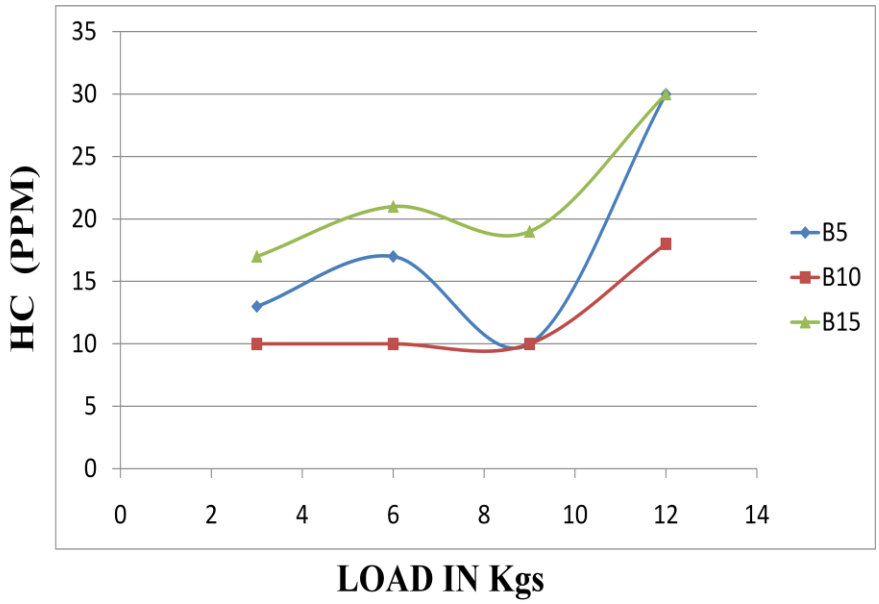
Comparison of variation of NOx with LOAD at CR-16 with CEO_2

Fig.8



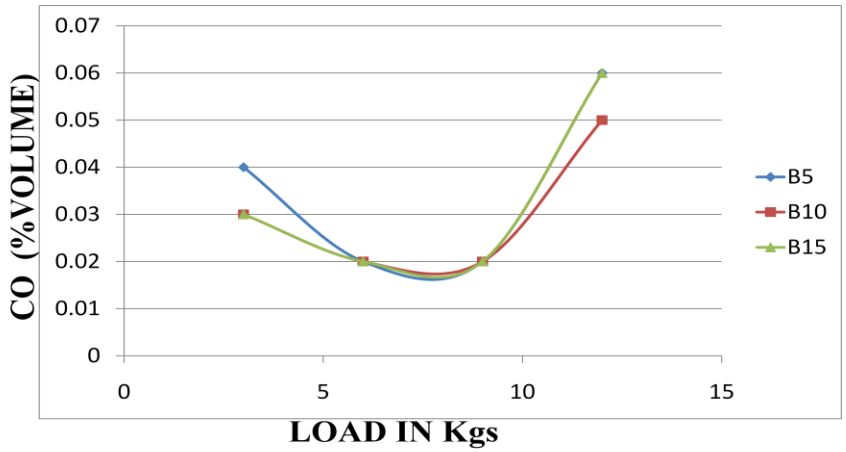
Comparison of variation of HC with LOAD at CR-18 without CEO_2

Fig.9



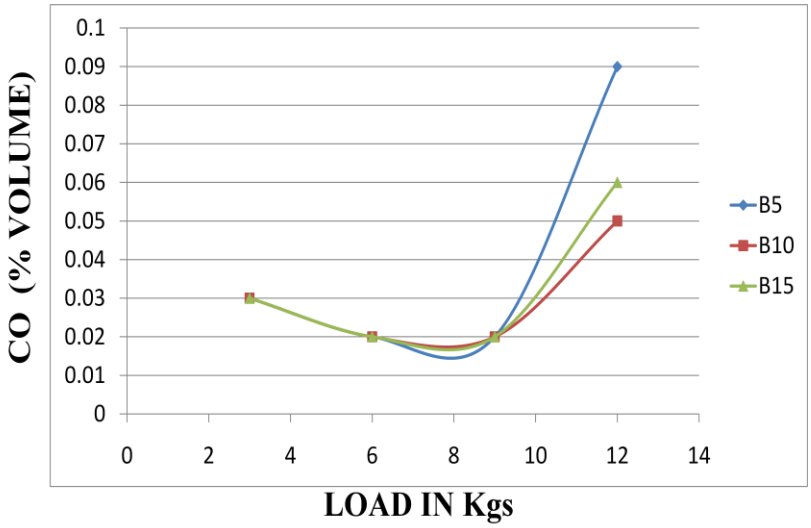
Comparison of variation of HC with LOAD at CR-18 with CEO_2

Fig.10



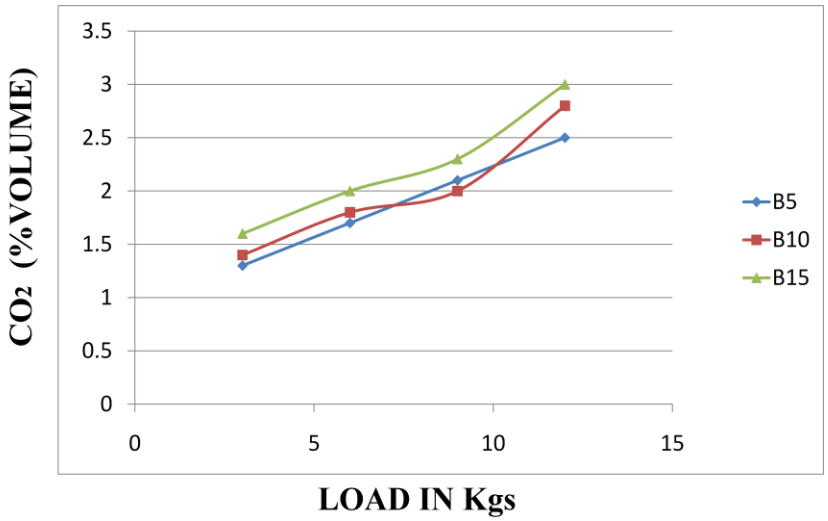
Comparison of variation of CO with LOAD at CR-18 without CEO_2

Fig.11



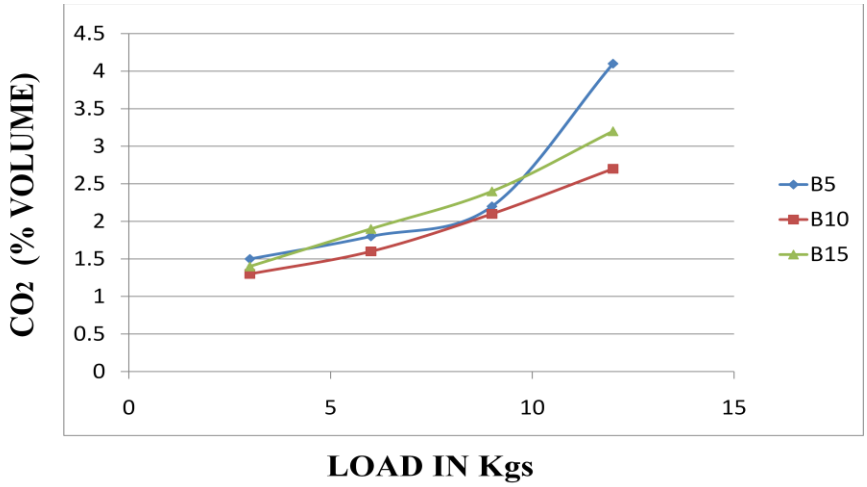
Comparison of variation of CO with LOAD at CR-18 with CEO_2

Fig.12



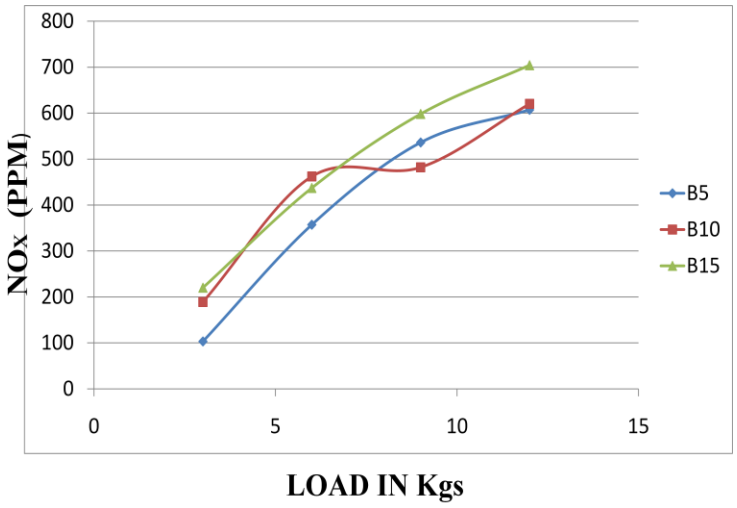
Comparison of variation of CO_2 with LOAD at CR-18 without CEO_2

Fig.13



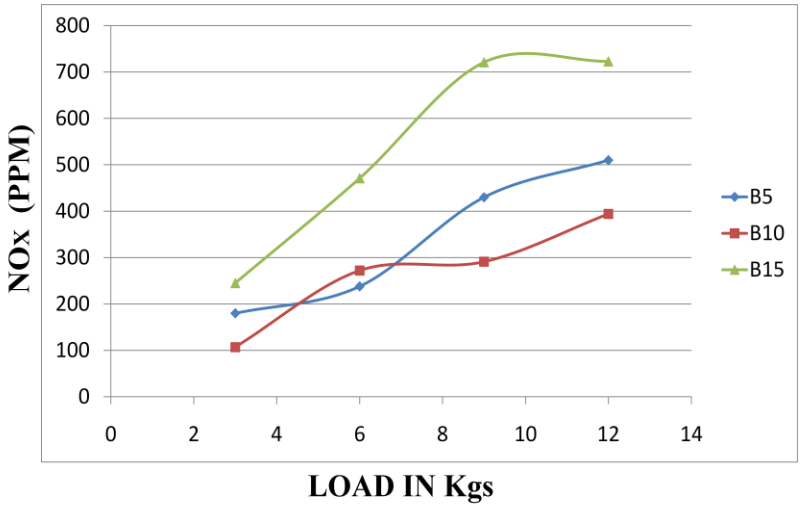
Comparison of variation of CO_2 with LOAD at CR-18 with CEO_2

Fig.14



Comparison of variation of NOx with LOAD at CR-18 without CEO2

Fig.15



Comparison of variation of NOx with LOAD at CR-18 with CEO2

Fig:16

9.0 Conclusions

From the experimental results and figures 1-16,the major conclusions that are drawn are shown below.

1. HC Emissions are reduced by 40% with CEO2 addition for CR-18

2. At 15% blend and a load of 9 Kg gives lowest emission for CR-16

3. CO Emission at CR-18 did not give any change with addition of CeO2

4. At CR-16 ,CO Emission is reduced by using CeO2.however 55 blend gave the best results.

5. CO2 emission at CR-18 did not give any variation with the addition of CeO2.however at CR-16 and 5% blend the CO2 emission is reduced by 25%

6. NOx was minimum at 5%and 10% blend using CeO2.yhe reduction was by 25%. However at 15% blend the reduction is by 5% at CR-18

7. For CR-16, 5% blend gave the best results with 15% reduction in NOx.

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