Comparison between various Emissions in CI Engines with Palm Oil Methyl Ester blended with Diesel

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Abstract

The present work presents comparison between various emissions with experimental results on the palm oil base methyl ester as an additive in diesel as an alternate fuel. Emission characteristics are measured using AVL 5-gas analyzer. The results show significant improvement in the reduction of greenhouse gases. CO, HC, CO2, CO and O2 are measured and reported in the present work.

Introduction

Bio-diesel is produced from vegetable oils and animal fats [1]. The main sources for bio-diesel for production can be non-edible oils obtained from seeds of Jatropha Curcas, Pongamia Pinnata, Calophyllum inophyllum, Hevca brasiliensis etc. [2]. Bio-diesel can be blended with diesel to create a bio-diesel blend. Bio-diesel operating in CI requires little or no engine modifications [3]. Further, these bio-diesels can be stored easily and does not require special infrastructure. The emission from conventional diesel engines such as HC, CO, CO2 and PM are reduced due to the implementation of bio-diesel [4]. Bio-diesels are mainly esters and hence contains oxygen molecule in it. Further, no Sulphur component and no aromatic compounds are present thereby helping it to burn completely [5,6,7,8,9]. Higher cetane number of Bio-diesel aids the quality of ignition even in blended form.

RESULTS & DISCUSSIONS

Fig 1 show similar trend that for a 10 % blend with HSD, CO2 emissions are increased. This trend repeats for 20 % and 30 % blends also (Fig 2 & Fig 3). Fig 4 reveals that the NO2 emissions are maximum with HSD and minimum with 30 % blend with biodiesel. This is due to the fact that the further oxidation of the CO leads to the dissociation of NO2 and forms CO2.

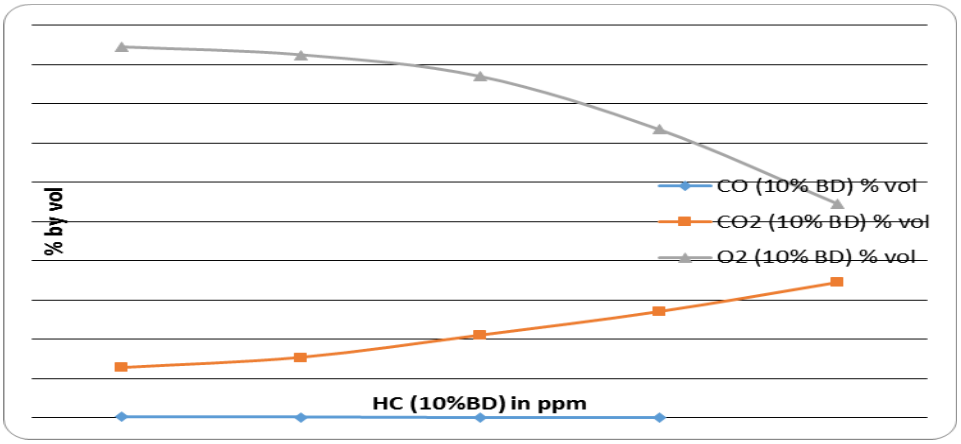

Fig 1 HC Vs CO, CO_2 and O_2 % by vol at 10 % BD

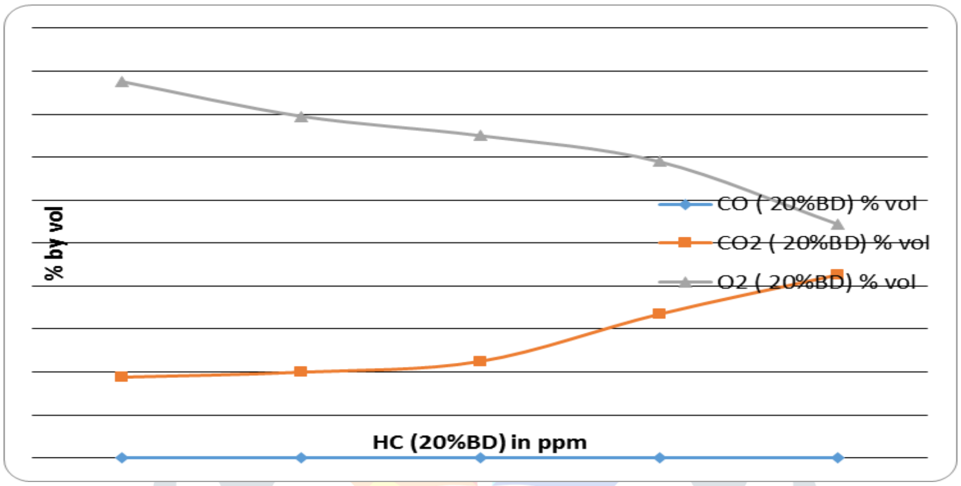

Fig 2 HC Vs CO, CO_2 and O_2 % by vol at 20 % BD

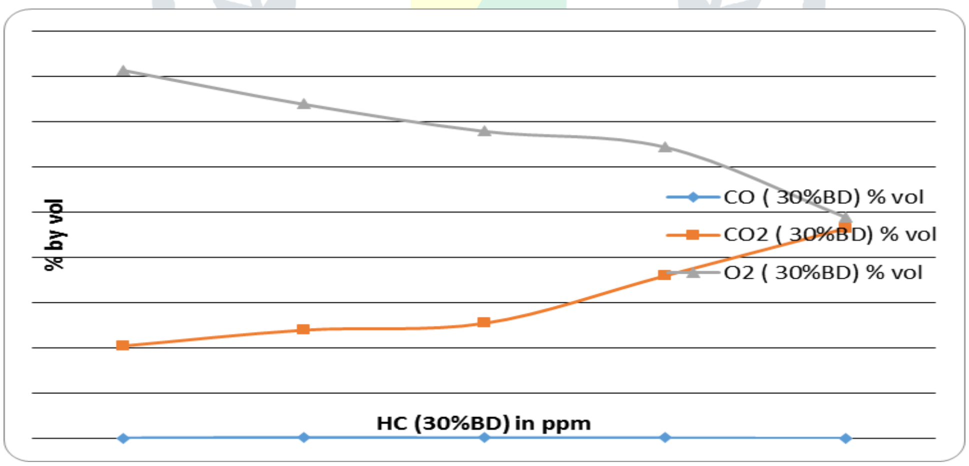

Fig 3 HC Vs CO, CO_2 and O_2 % by vol at 30 % BD

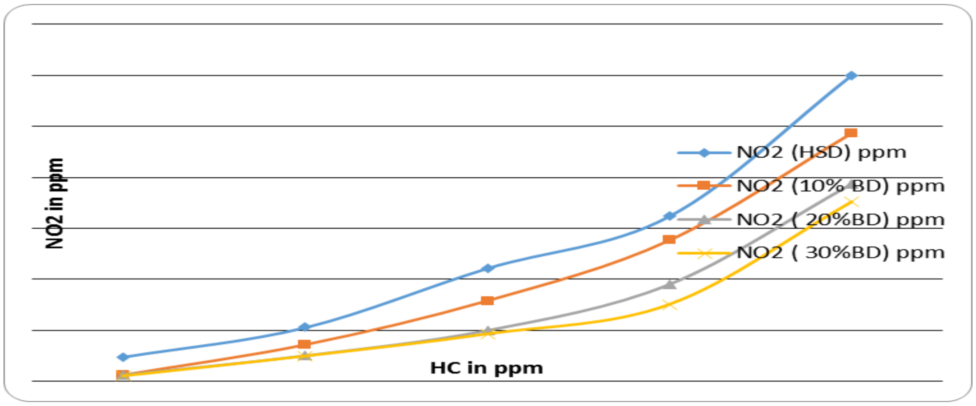

Fig 4 NO2 Vs HC at different blends

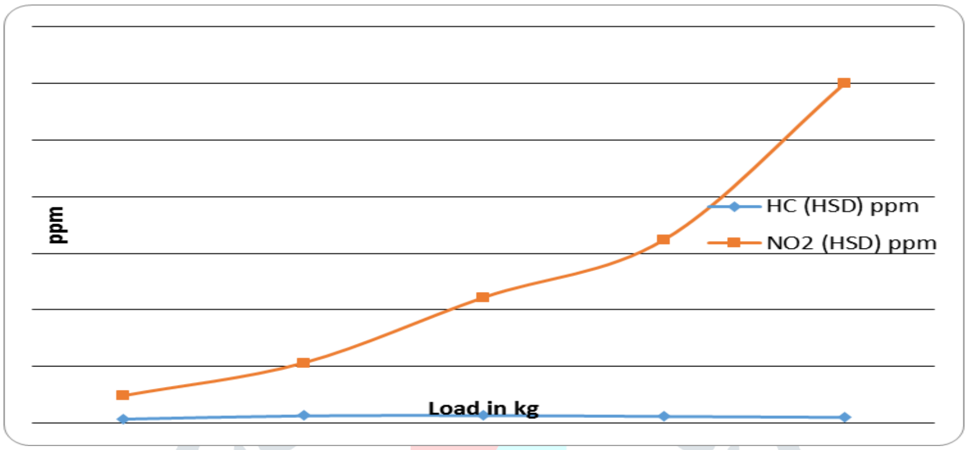

Fig 5 Load Vs HC and NO2 with HSD

Figures 5, 6, 7 and 8 show the variation of HC and NO2 with respect to Load at different blends. Figure 9, 10, 11 and 12 show the variation of CO, CO2 and O2 with respect to load at different blends.

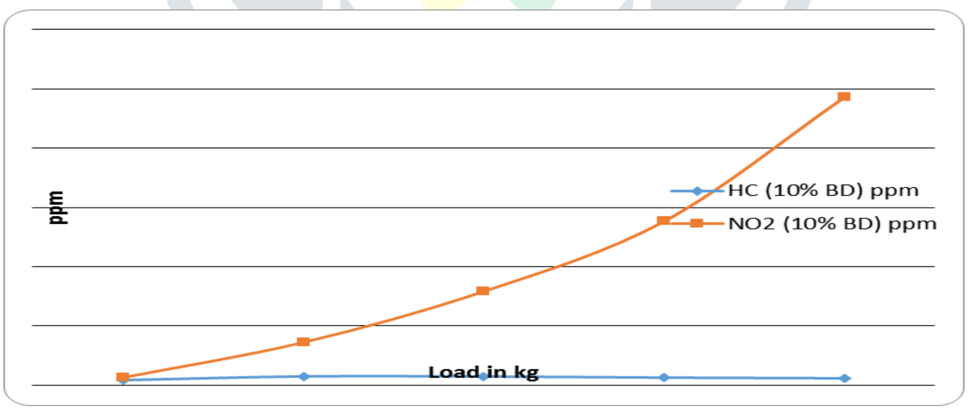

Fig 6 Load Vs HC and NO2 at 10 % BD

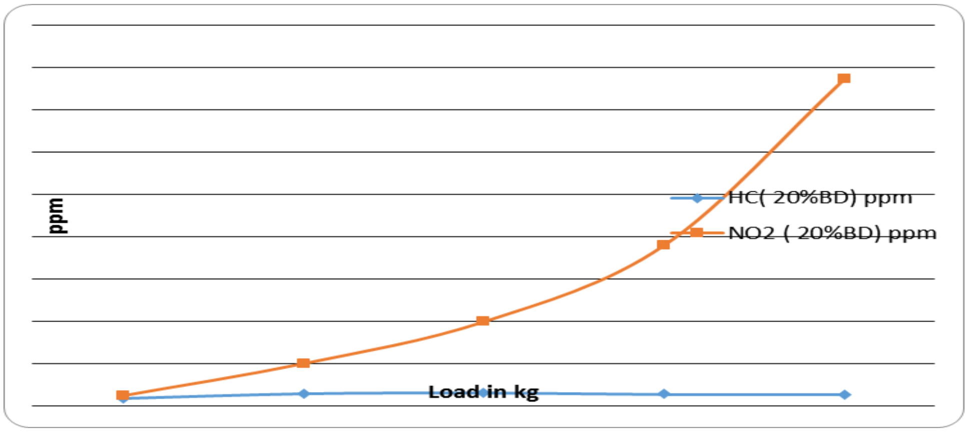

Fig 7 Load Vs HC and NO2 at 20 % BD

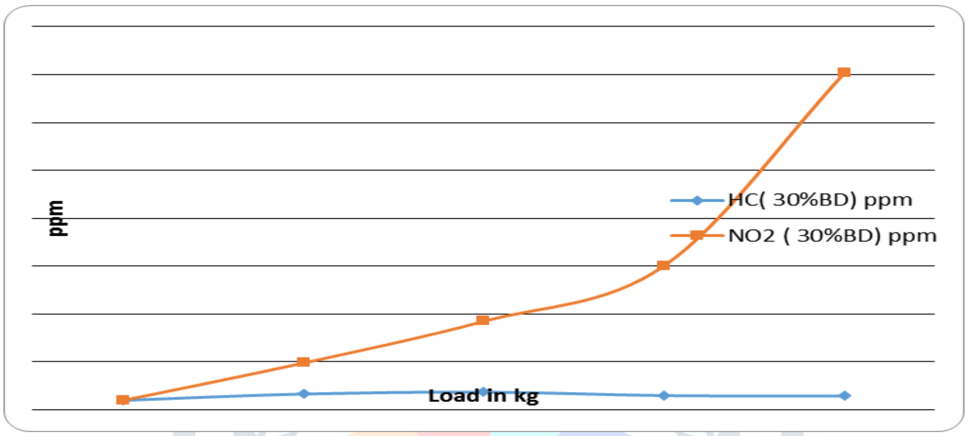

Fig 8 Load Vs HC and NO2 at 30 % BD

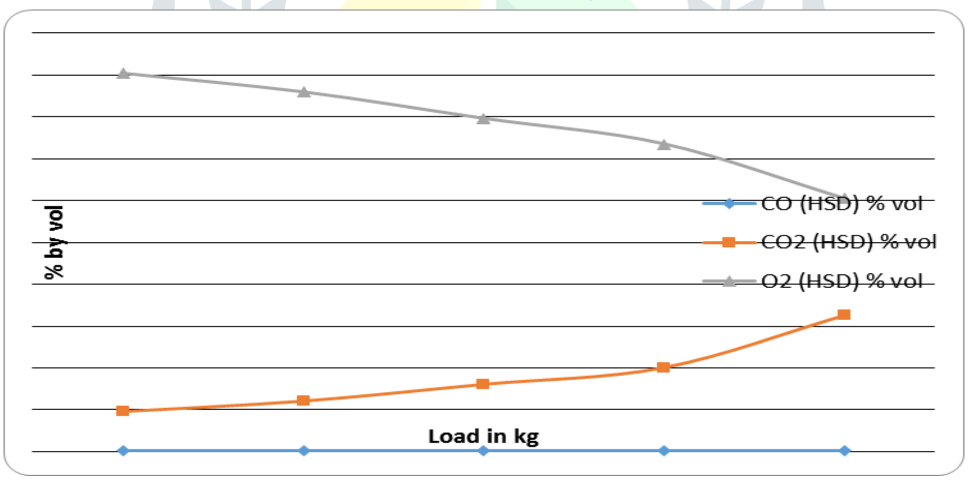

Fig 9 Load Vs CO, CO2and O2 with HSD

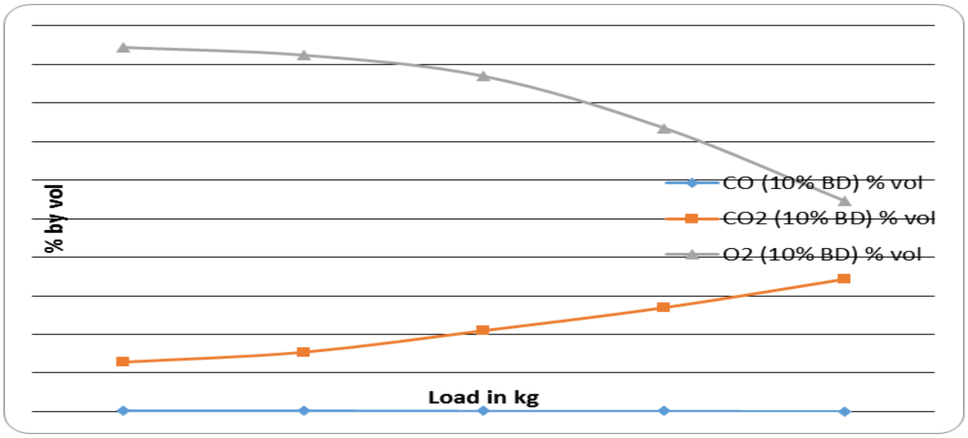

Fig 10 Load Vs CO, CO2and O2 at 10 % BD

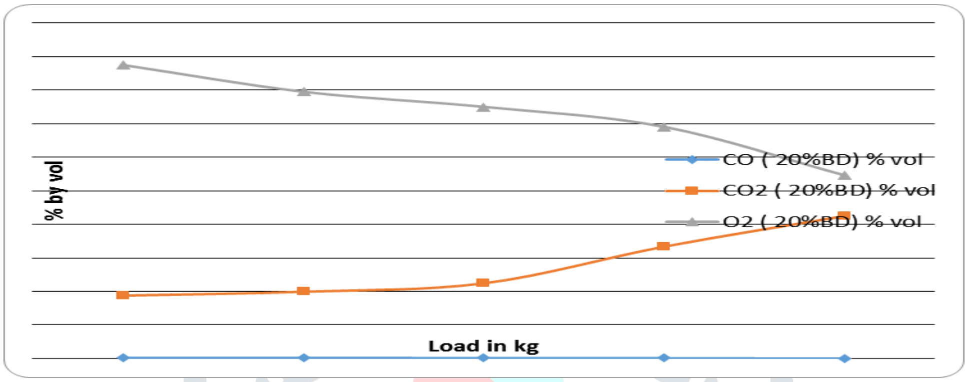

Fig 11 Load Vs CO, CO2and O2 at 20 % BD

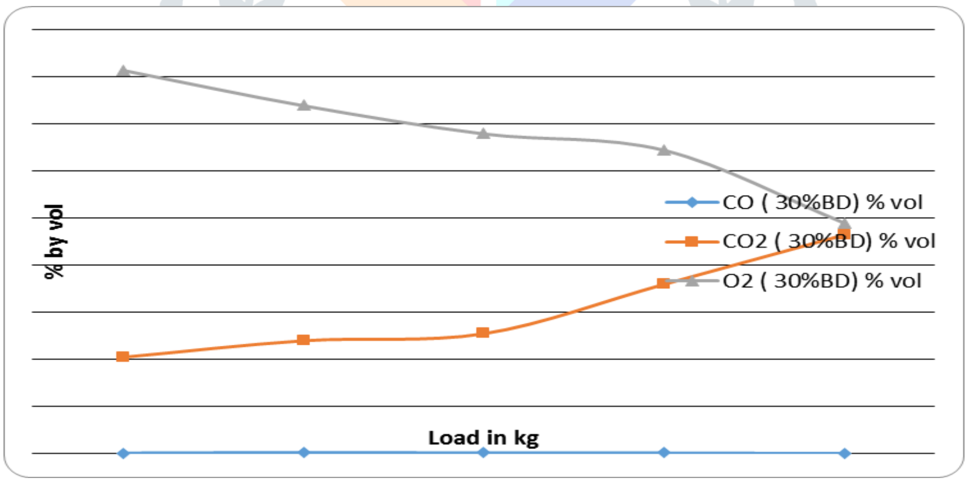

Fig 12 Load Vs CO, CO2and O2 at 30 % BD

These figures reveal that the emissions of O2 is reduced which is due to the reason that it helped in decreasing the CO emissions as well as helped in dissociating the NO2. It is concluded that the feasibility of blends that can be used with HSD is increased with the use of palm oil methyl ester biodiesel. The general accepted blend was up to B20. But POME biodiesel can be used up to B30 without any modifications in the engine.

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