Effect of Oxygenated Fuel on Performance & Emission Characteristics of Diesel Engine

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Abstract:- **The depletion of petroleum reserve has resulted in two crises that are rising of fuel prices & global warming problems. The energy security can be maintained by improving the efficient energy producing machines. Efforts are being made to find the alternatives. At this juncture bio-diesel has got sufficient attraction as vehicular fuel. But the properties of bio-diesels are not as the same as diesel fuels, including high viscosity & low volatility.**

Particulate matter & oxides of nitrogen are the main pollutants in the tail pipe emission of bio diesel fuelled engine. The present work represents blending of 1 and 2 % (V/V) of dibutyl ether with diesel. Addition of dibutyl ether will oxygenate the diesel oil. This research work investigates the effect of diesel blending with oxygenated fuels on performance & emission characteristics of diesel engine. The effect of fuel additives was to control the emission from diesel engine & to improve its performance. Further investigation is being carried out on oxygenated diesel application so as to make it environment friendly.

Key Words: Bio diesel, Emissions, Oxygenated fuels, Performance.

1. INTRODUCTION

The depletion of petroleum reserve has resulted in two crises that are rising of fuel prices & global warming problems. The energy security can be maintained by improving the efficient energy producing machines. Efforts are being made to find the alternatives. At this juncture bio-diesel has got sufficient attraction as vehicular fuel. But the properties of bio-diesel are not as the same as diesel fuels, including high viscosity & low voltality. Particulate matter & oxides of nitrogen are the main pollutants in the tail pipe emission of bio diesel fuelled engine.

Bhavin H Mehta, Hiren V Mand [1] have found that the addition of oxygenating agent into fuel oil is one of the effective method for obtaining the reduction in the particulate matter, carbon monoxide & hydro carbon emissions without a significant increase in the oxides of nitrogen emission. Hiroshi Nabetani & Martin [2] have studied the performance of the diesel engine using oxygenated blend in 20 & 40 % to the diesel. The engine performance was evaluated through torque, power & specific fuel consumption, while the emission was evaluated through carbon monoxide, hydro carbon, particulate matter, carbon dioxide, & oxides of nitrogen pollutants. Their results show that higher content of dimethyl carbonate can reduce the emission of carbon monoxide, hydro carbon, particulate matter & carbon dioxide. It was found that the addition oxygenates could increase the power & torque. Hanger Chi & Nathalie Gee [3] has studied the performance of diesel engine using diethylene glycol and dimethyl ether to oxygenate the diesel which resulted in reduction of particulate matter enhanced engine performance. Meager information is available as regarding addition of dibutyl ether to oxygenate diesel & to test the engine performance & its emission characteristics. The present work represents oxygenating diesel by blending 1 & 2% (v/v) of dibutyl ether and to investigate the effect of oxygenated diesel on the performance & emission characteristics of diesel engine.

2. EXPERIMENTAL DETAILS

To oxygenate the diesel oil di-butyl ether was blended with diesel in the proportion 1 and 2% (v/v). The pro1perties of dibutyl ether are shown in table 2.1 & engine specifications shown in table 2.2

Table 2.1: Properties OF Di Butyl Ether

Molecular Formula	Molar Mass	Appearance	Density	Melting Point	Boiling Point	Freezing Point	Vapor Pressure	Viscosity	Voltality
$C_8H_{18}O$	130.23 g/mol	Colorless	0.769	-97.9˚C	142.4˚C	-95˚C	3730 pa	0.741 cp	61%

Table 2.2: Engine Specifications

ENGINE PARAMETERS	SPECIFICTION
Engine Type	4-stroke Diesel
Number of cylinders	Single Cylinder
Rated power	5.2KW (7 HP) @1500RPM
Bore	87.5mm
Stroke	110mm
Cubic Capacity	661cc
Compression ratio	17.5:1
Rated Speed	1500 RPM
Dynamometer	Eddy Current dynamometer
Type of cooling	Water cooled
Fuel injection Pressure	190bar

The experiment was conducted in a single cylinder Kirloskar water cooled engine at variation load from 20 to 80 % with constant speed of 1500 rpm. The engine compression ratio was maintained at 17.5 & standard injection timing with an injection pressure of 200 bar.

3. RESULTS & DISCUSSION

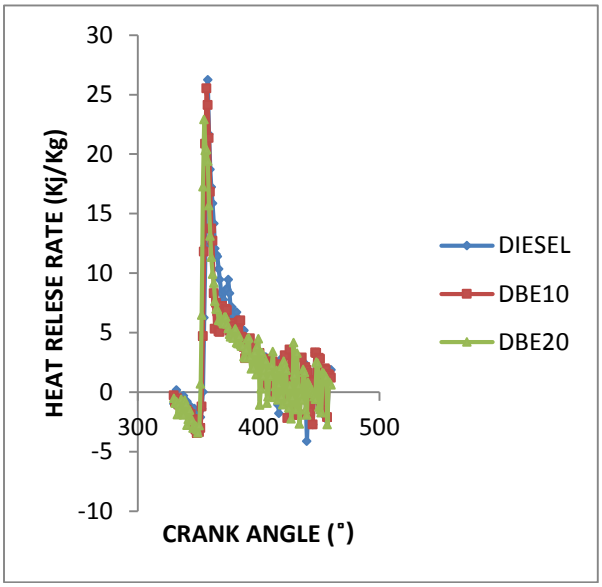

Fig 1:Comparision Of H R R With C A

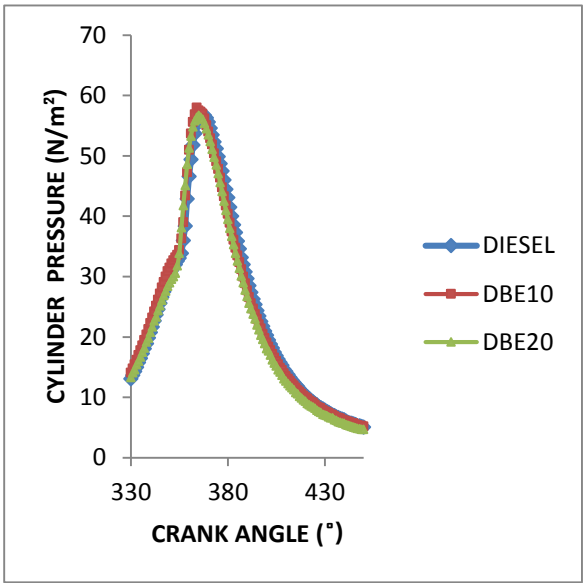

Fig 2:Comparision Of C P With C A

Fig.1 shows that comparision of heat relese rate with crank angle.From the fig it can be seen that heat release rate of diesel is more than that of oxygenated diesel.This can be attributed to high calorific value of neat diesel oil. Fig.2 shows comparision of cylinder pressure with crank angle.From the fig it is evident that the engine running with oxygenated fuel exihibit higher cylinder pressure when compared with neat diesel.The increse in cylinder pressure is due to high bulk modulus of oxygenated diesel.

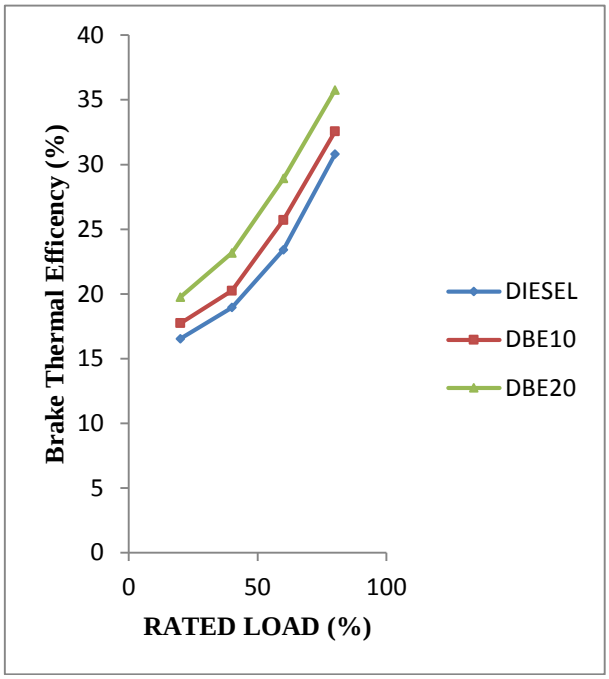

Fig 3:Comparision Of B Th E With Rated Load

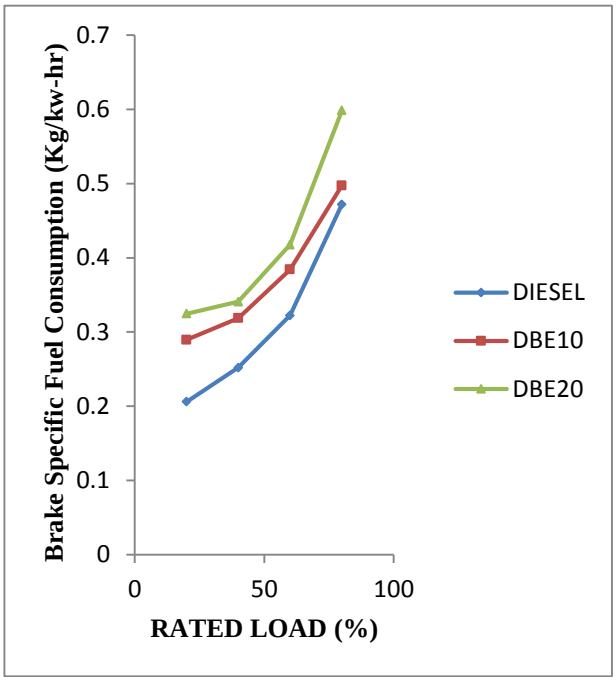

Fig 4:Comparision Of BSFC With Rated Load

Fig.3 shows the varition of brake thermal efficiency with rated load for neat & oxygenated diesel.From the fig it can be seen that the brake thermal efficiency of the engine running with oxygenated diesel (2 % v/v) is maximum.This can be atributed to high viscosity & voltality of oxygenated diesel (2 % v/v) compared to neat diesel & oxygenated diesel (1% v/v). Fig.4 indicates the variation of brake specific fuel consumption with rated load.From the fig it can be seen that brake specific fuel consumption of oxygenated diesel (2 % v/v) is maximum.This can be atributed to fuel burns at faster way in oxygenated diesel (2% v/v) compared to neat diesel & oxygenated diesel (1% v/v).

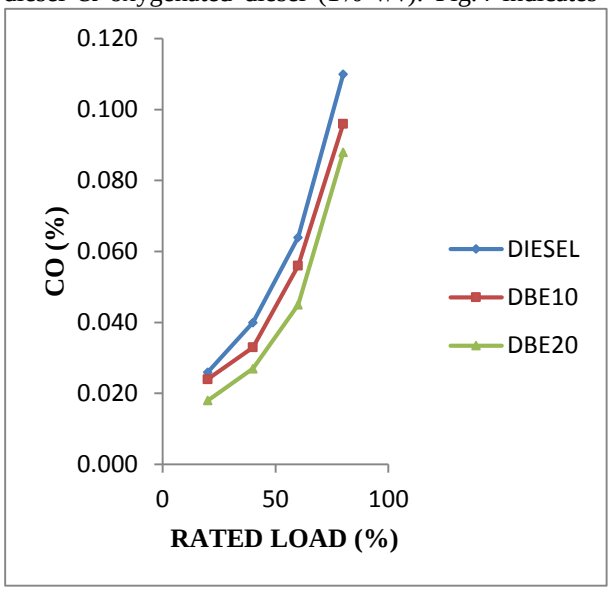

Fig 5 :Comparision Of CO With Rated Load

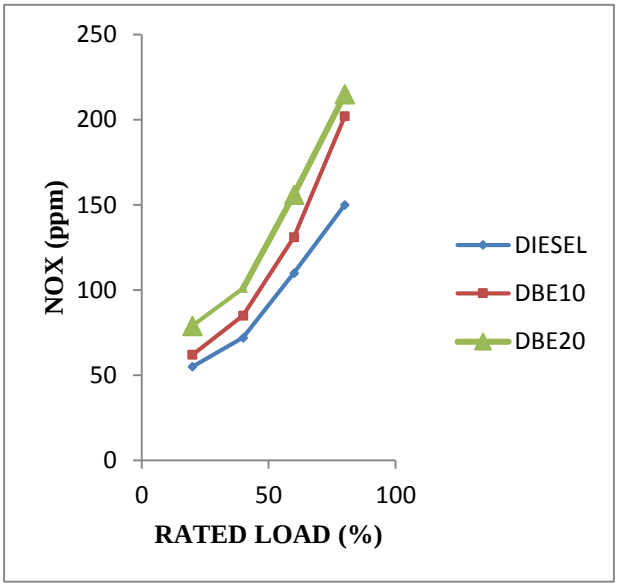

Fig 6 :Comparision Of N0x With Rated Load

Fig 5 shows the variation of carbon monoxide with rated load for neat & oxygenated diesel.From the fig it can be seen that the carbon monoxide of the engine running with neat diesel is maximum.This can be atributed to lower oxygen proption of neat diesel compared to oxygenated fuel (1 & 2 % v/v). Fig 6 shows the variation of NOx with rated load for neat & oxygenated diesel.From the fig it can be seen that NOx of engine running with oxygenated fuel (2 % v/v) is maximum. .This can be atributed to heat release rate is high in oxygenated diesel (1 & 2 % v/v) compared to neat diesel.

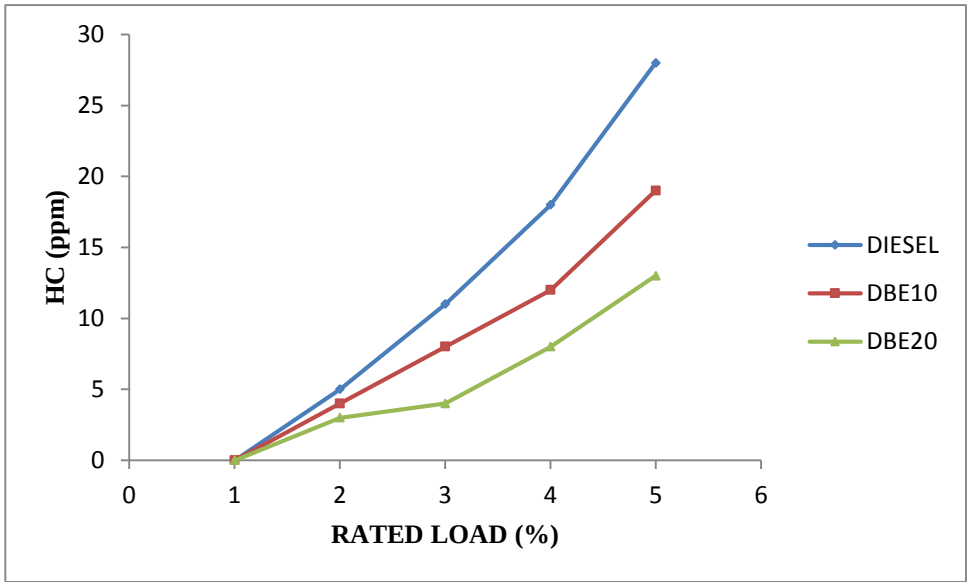

Fig 7:Comparision Of HC With Rated Load

Fig 7 shows the variation of hydro carbon with rated load for neat & oxygenated diesel. From the fig it can be seen that hydro carbon of the engine running with neat diesel is maximum. This can be atributed to lower combustion in neat diesel compared to oxygenated fuel (1 & 2 % v/v).

4. CONCLUSION

1) The effect of fuel additives was to control the emission from diesel engine
2) Fuel additives gives better engine performance.
3) The complete combustion was obtained when using oxygenated fuels with diesel.
4) Burning rate of fuel mixture will be incresed.
5) The oxygenated fuel is environmental friendly.

5. REFERENCES

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