CHARACTERISTIC CHANGE IN 4 STOCK ENGINE PERFORMANCES AFTER ADDITION OF EGM IN DIESEL

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ABSTRACT

As engine performance improvement need have capture attention of whole world. As diesel engine performance improvement is on peak here I have experiment with diesel engine with fuel and EGM as oxygenated additives to improve performance and result shows improvement which can be the inspiration for future research and development. Addition of such oxygenated additives may show the environment friendly behavior.

I. INTRODUCTION

The increasing industrialization and motorization of the world lead to a Sharp inclination in the demand of petroleum products. Petroleum based fuels are stored fuels in the earth. There are limited reserves of these stored fuels and they are irreplaceable. With our known reserves and the growing rate of consumption, it is feared that they are not going last long. These finite resources of petroleum and highly concentrated in certain regions of the world has given rise to frequent disruptions and un-certainties in its supply as well as price.

1.1 Need of Alternative Fuels [1]

The high cost of petroleum products.

- The emission problems of gasoline engines along with other air-polluting system.
- The large number of automobiles is a major contributor to the air quantity problem of the world.
- The large of crude oil must import from the other countries having larger oil fields.

1.1.1 Problems Being Faced While Using Alternative Fuels [1]

The engines used for alternative fuels are to be altered engines which are designed for gasoline fuelling originally.

1.2 Diesel Engine

An advantage of a diesel engine compare to a gasoline engine is the fuel-economy benefits and the extensive applications. Diesel engines are mainly used in industrial, transport and agricultural applications due to their high efficiency and reliability. Diesel engine has been widely used in such applications due to its reliability, durability and high fuel efficiency. However, high smoke and NOx emissions always remain the main hindrance for its developments. It is further subjected to increase of strict imposed emission regulations [2].

1.3 Diesel Engines Emissions

Emissions from diesel engines are same as those from petrol engines but concentration of various pollutants varies as discussed:

1.3.1 Carbon Monoxide (CO)

Carbon monoxide is produced by diesel engines also but its concentration is quite less as compared to gasoline engines. It is generally less than 2% in diesel engines as compared to 5% produced by gasoline engines.

1.3.2 Hydrocarbons (HC)

HC emission from diesel engines is also significant. Presence of carbon particles (soot) in the flue gases is the cause of black smoke in diesel engine exhaust, especially during racing periods.

1.3.3 Oxides of Nitrogen (NOx)

Diesel engines produce very high NOx during acceleration period as highest temperature is reached due to complete combustion.

1.4 Smoke and Particulars

Smoke represents the visible products of combustion caused by poor combustion of fuel and air. The color of smoke may be white smoke or black smoke.

Generally, white smoke is caused by liquid droplets of lubricating and fuel oil and it appears in exhaust under conditions of cold starting, idling and low loads

1.5 Oxygenated Additives

Oxygenated additive is nothing more than fuel that has a chemical compound containing oxygen. It is used to help fuel burn more efficiently and cut down on some types of atmospheric pollution. In many cases, it is credited with reducing the smog problem in major urban centers.

III. PRESENT WORK SET UP

3.1 Experiment Set Up

I have used four cylinder, four strokes, naturally aspirated, in-direct injection, water cooled CI engine to carry out experimental investigations which is situated in Thermal Engineering Laboratory at Faculty of Engineering and Technology, M.S.University, Vadodara.

Fig-1-Engine Test Rig

Table-1-Setup Specification

Make & Model	Stride Engine 1.5 E2 DSL make
General Details	Four stroke, Four cylinder, Compression ignition, Water cooled, Indirect injection
Bore	73 mm
Stroke	88.9 mm
Capacity	1489 cm^3
Compression Ratio	23:1
Lubricating Oil	SAE 30/ SAE 40
Max. Power	26.6 kW@4000 rpm
Max. Torque	83.4 N-m@ 2250 rpm
Clearance Volume	16.913 cm^3 / cylinder

3.2. Exhaust Gas Analyzer Specifications

A six gas Exhaust gas analyzer is used to measure emission data of the engine. Measurement of HC, NO, NO2, CO, Excess air and flue gas temperature can be possible with the analyzer.

Fig-2-Exhaust Gas Analyzer

IV. RESULT AND DISCUSSION

4.1 Engine Performance Parameters

4.1.1 Brake Thermal Efficiency

FIG-4 represents comparison of brake thermal efficiency with diesel and different blends of EGM-diesel as fuel at varying brake power. From figure 4.1 it's visible that as brake power increases the brake thermal efficiency increases for all fuels viz. diesel and EGM-diesel blends.

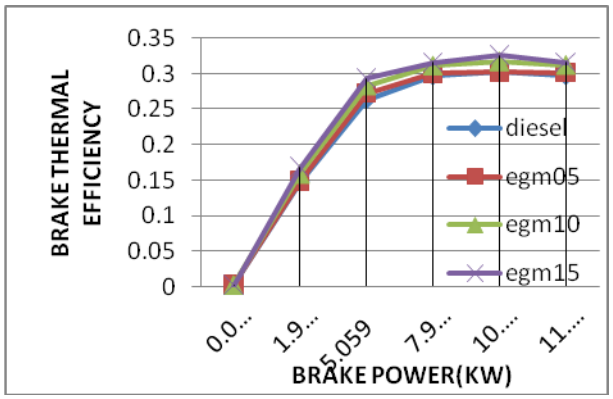

Fig-3-Graph of BP v/s BTE

4.1.2 Brake Specific Energy Consumption

it clearly indicates as brake power increases the brake specific energy consumption decreases for all fuels viz. diesel and EGM-diesel blends. This may be due to a part load, lower engine temperature results in incomplete combustion of fuel. As load on engine increases temperature inside cylinder increases which results in tends to complete more combustion of fuel.

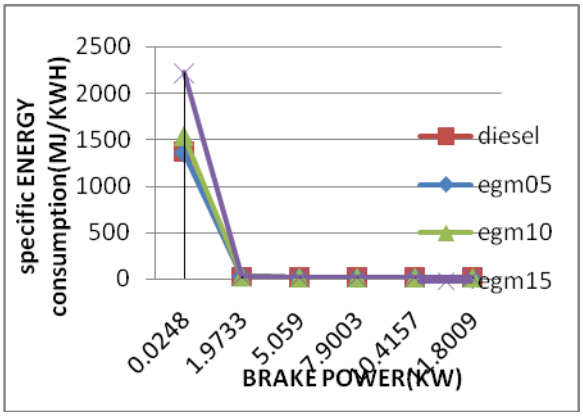

FIG-4-A Graph of BP V/S SEC

4.1.3 Exhaust Gas Temperature

Fig-5 shows variations in exhaust gas temperature with brake power. EGT increases with increase in brake power for all fuels. In contrast to BTE and BSEC trends, highest EGT is reached at maximum brake power for all fuels. Maximum EGT measured for diesel, EGM05, EGM10 and EGM5 fuels are 345 ˚C, 365 ˚C, 380 ˚C and 383 ˚C respectively. The primary reason of higher value of EGT of EGM-diesel blends as fuels are contributed towards inbuilt oxygen content and lower duration of combustion.

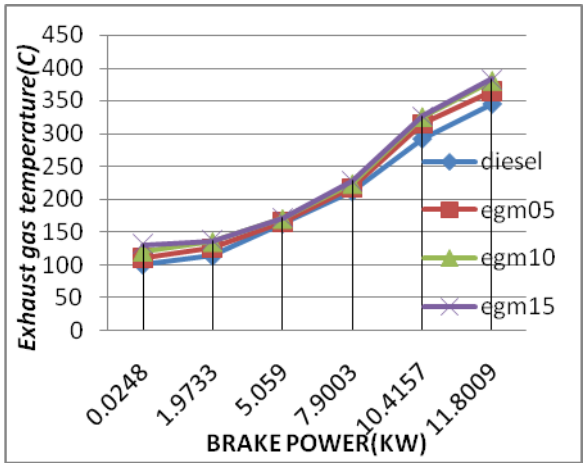

Fig-5- Graph of BP V/S EGT

4.2 Engine Emission Parameters

4.2.1 Carbon Monoxide Emissions

Fig-6 compare emissions of Carbon monoxide using diesel, EGM05, EGM10 and EGM15 as fuels with variations in brake power. It can be seen from figure 4.4, CO emissions decreases with load starting from no load for all fuels.

After reaching minimum value, emissions of CO increase again for all fuels. This rise is continued up to the maximum brake power for all fuels.

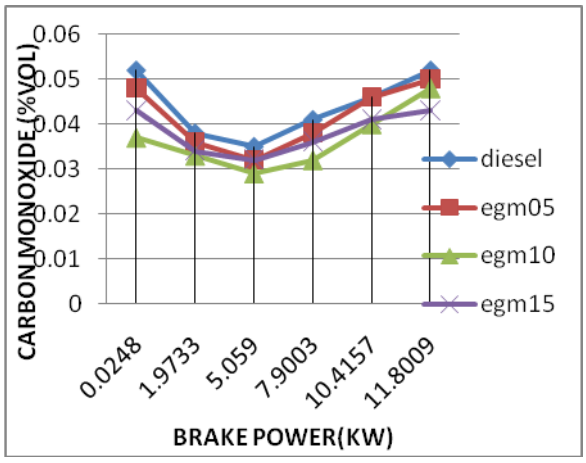

Fig-6-Graph of BP V/S CO Emission

4.2.2 Nitrogen Oxide Emissions

Fig-7 emissions of NOx increases with rise in brake power for all fuels.

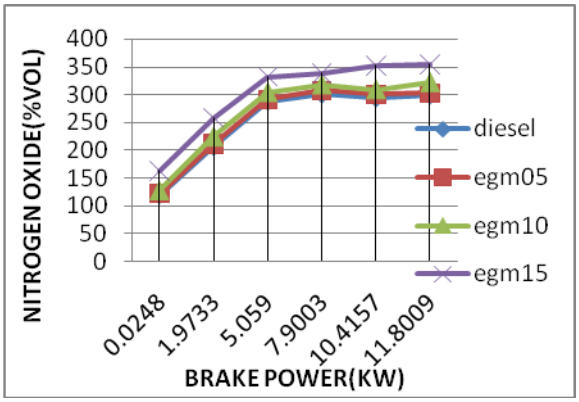

Fig-7 Graph of BP V/S NO Emission

Variations in NOx emissions are similar as EGT with variation in brake power. However, variations in NOx emissions with increasing brake power are less compared to EGT. Maximum NOx emissions measured for diesel, EGM05, EGM10 and EGM5 fuels are 302 ppm, 307 ppm, 323 ppm and 355 ppm respectively. The primary reason of higher value of NOx emissions of EGM-diesel blends as fuels are contributed towards inbuilt oxygen content and lower duration of combustion. With increase in EGM percentage in blend the oxygen content increases and hence EGM05, EGM10 and EGM15 show higher NOx emissions compared to diesel.

V. CONCLUSION

- The addition of EGM a in diesel fuel creates changes the properties of blends.
- AS Kinematic viscosity depends on the molecular structure of the blended fuel. On addition of EGM to diesel the kinematic viscosity of blends decreases and it will show improvement in the shape of fuel spray and atomization. These finer fuel droplets tend to mix thoroughly with air and hence improving the combustion.

- Maximum brake thermal efficiency with EGM15 blends are contributed due to oxygen content EGM helps in complete combustion of fuel.

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