
EFFECTS OF DIESEL ETHANOL EMULSION ON EXHAUST EMISSIONS IN DIESEL ENGINES

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Introduction

- ✚ Diesel engines have better fuel efficiency, high power output and greater thermal efficiency but generates undesirable emissions during the combustion process.
 - ✚ There are many techniques being adopted to control the emissions and to improve the performance of the Diesel engines.
 - ✚ Ethanol-Diesel emulsion was used in this investigation.
 - ✚ Various proportions of Ethanol and Diesel fuel were injected into the engine and the performance and emission characteristics were investigated.
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Diesel Engine Pollutants And Its Controlling Methods

Pollutant From Diesel Engine

- ☞ Smoke
- ☞ Oxides of Nitrogen
- ☞ Particulate matter
- ☞ Oxides of Sulphur
- ☞ Hydro carbon
- ☞ Carbon monoxide

Controlling Methods

- ❖ Design parameters
 - ❖ Operating parameters
 - ❖ In – cylinder combustion control
 - ❖ Exhaust gas treatment
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Techniques Of Using Ethanol In Diesel Engines

- ✓ Alcohol cannot be used as a neat fuel in C.I. engines due to its poor self ignition character, low calorific value, high latent heat of vapourisation and requires engine modification.
 - ✓ The easiest method by which ethanol could be used is in the form of solutions.
 - ✓ But ethanol has limited solubility in diesel.
 - ✓ This problem of limited solubility has been overcome by emulsions.
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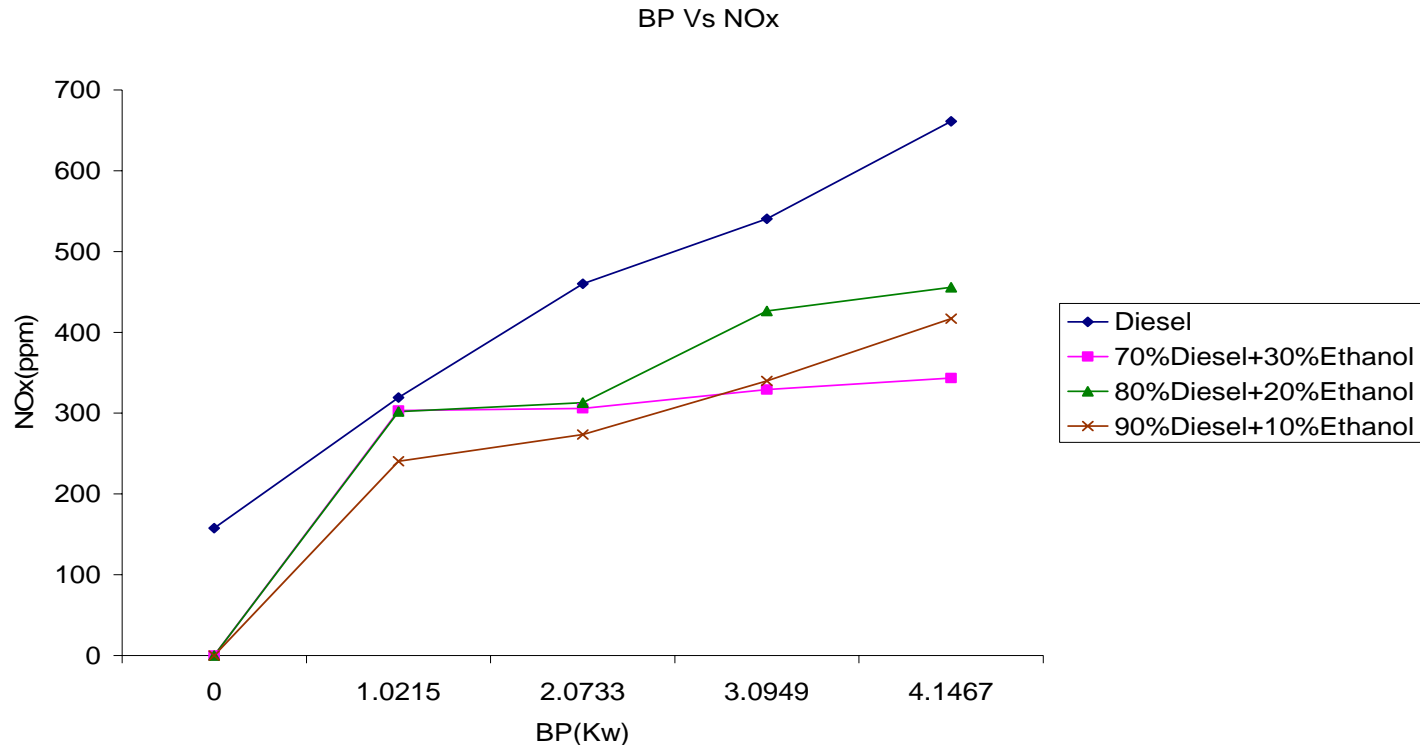
Present Investigation

- ❖ In the above said CI engine pollution control methods, Fuel modification method was adopted in this project work.
- ❖ Here in this work, Ethanol and Diesel were blended to form an Emulsion and this Emulsion was used as a fuel.
- ❖ Under normal conditions, Ethanol and Diesel remains un mixed.
- ❖ This is due to the density difference between the two liquids.
- ❖ In order to break the surface tension and to blend the two liquids each other an Emulsifying agent was used in this work.

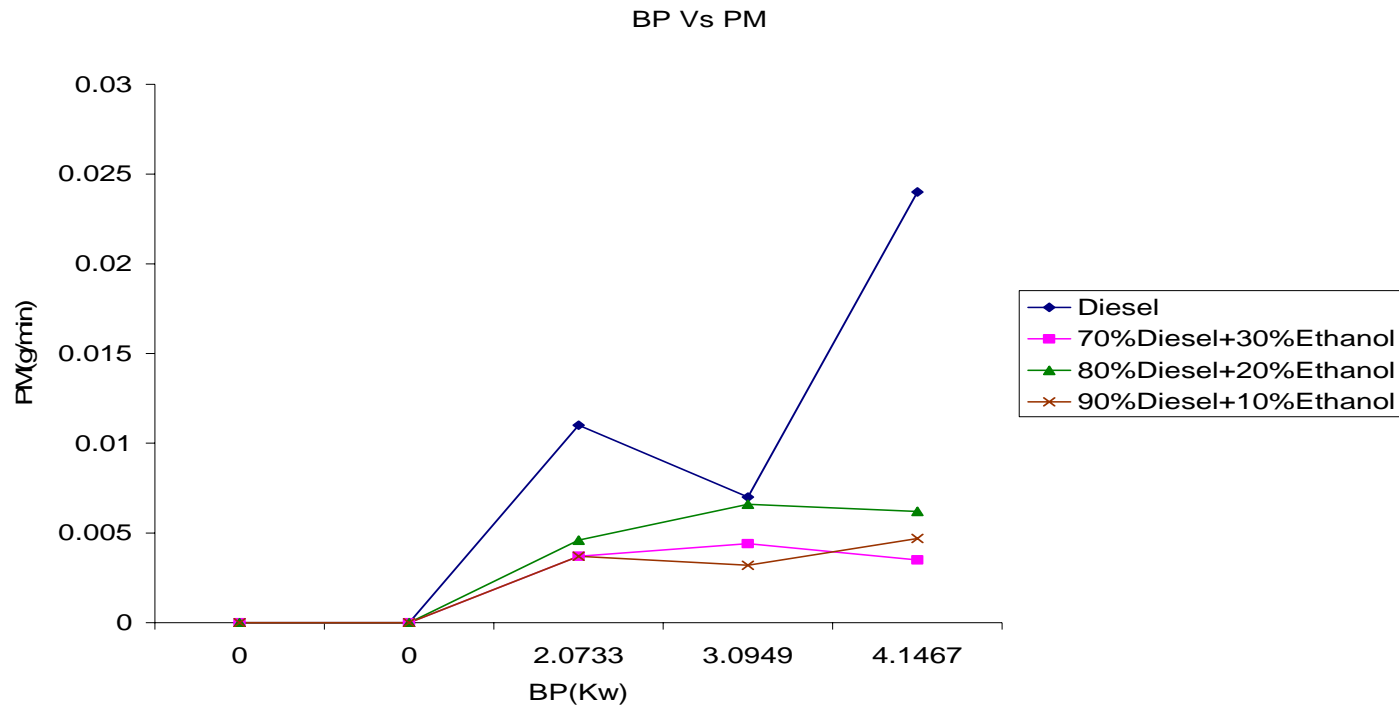
The following Emulsifiers were tried

- Sodium lauryl sulphate (SLS)
- Sorbitan mono oleate
- Triton -X –100

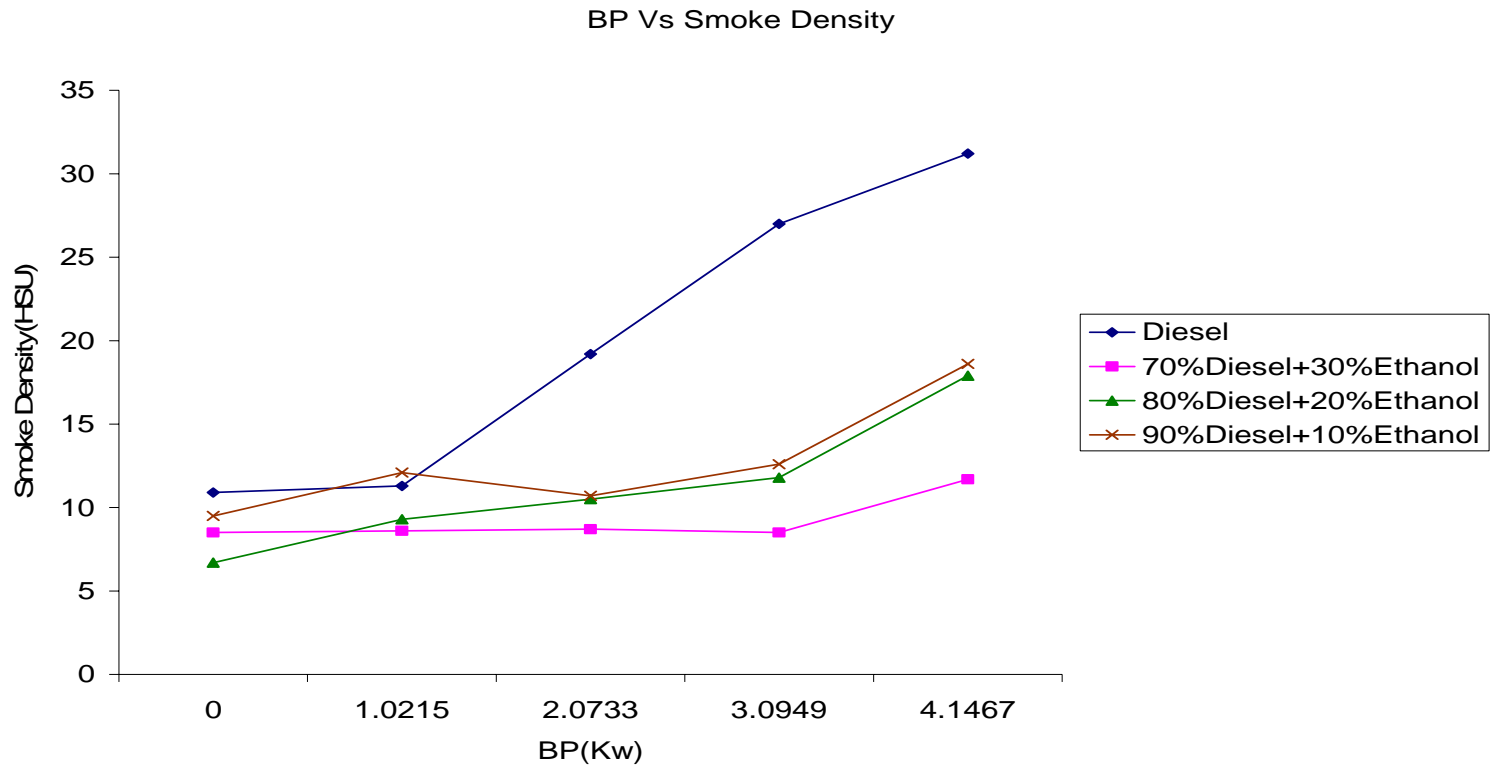
Results And Discussions



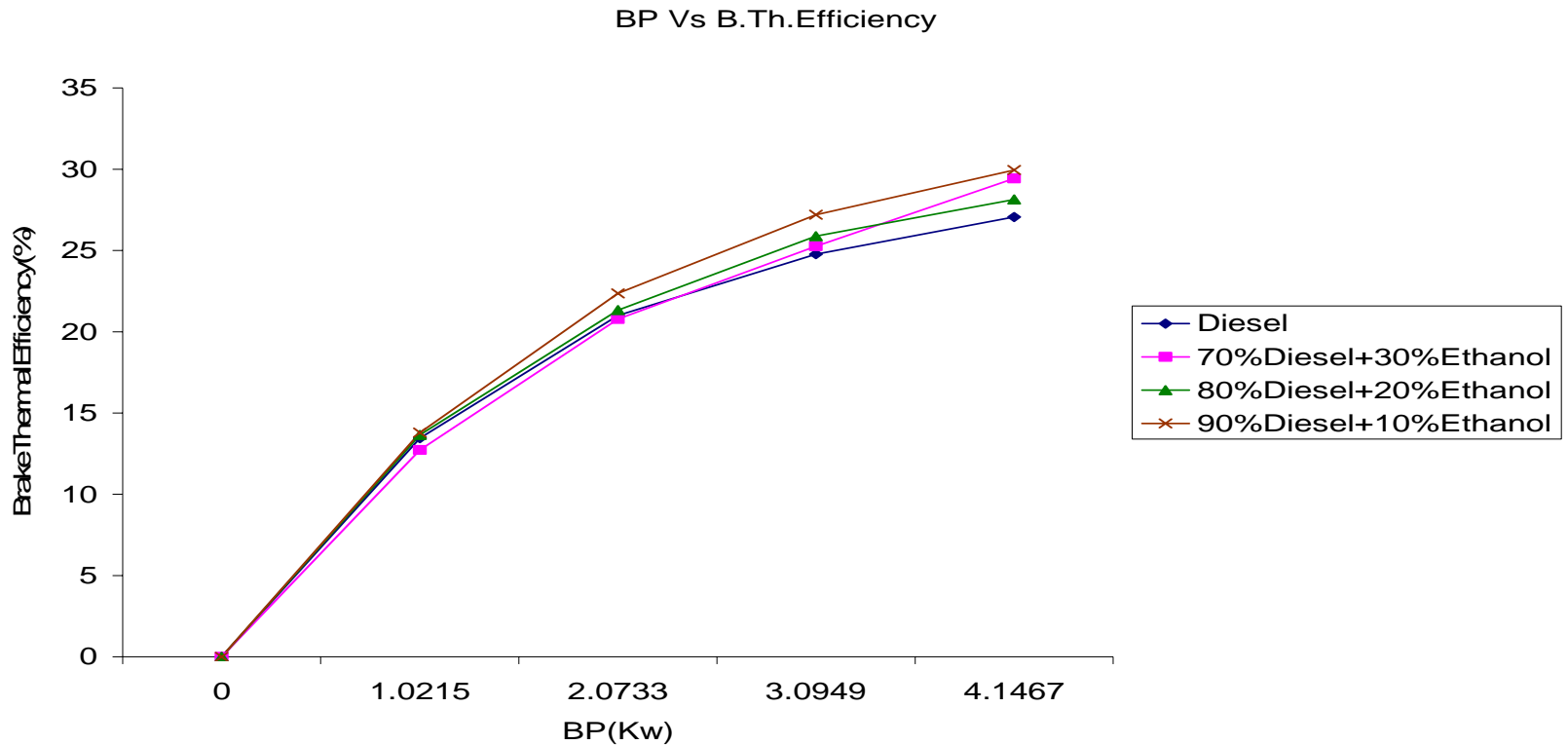
- As Brake Power increases, the NO_x level increases
- 70:30 proportion of emulsion reduces the NO_x level



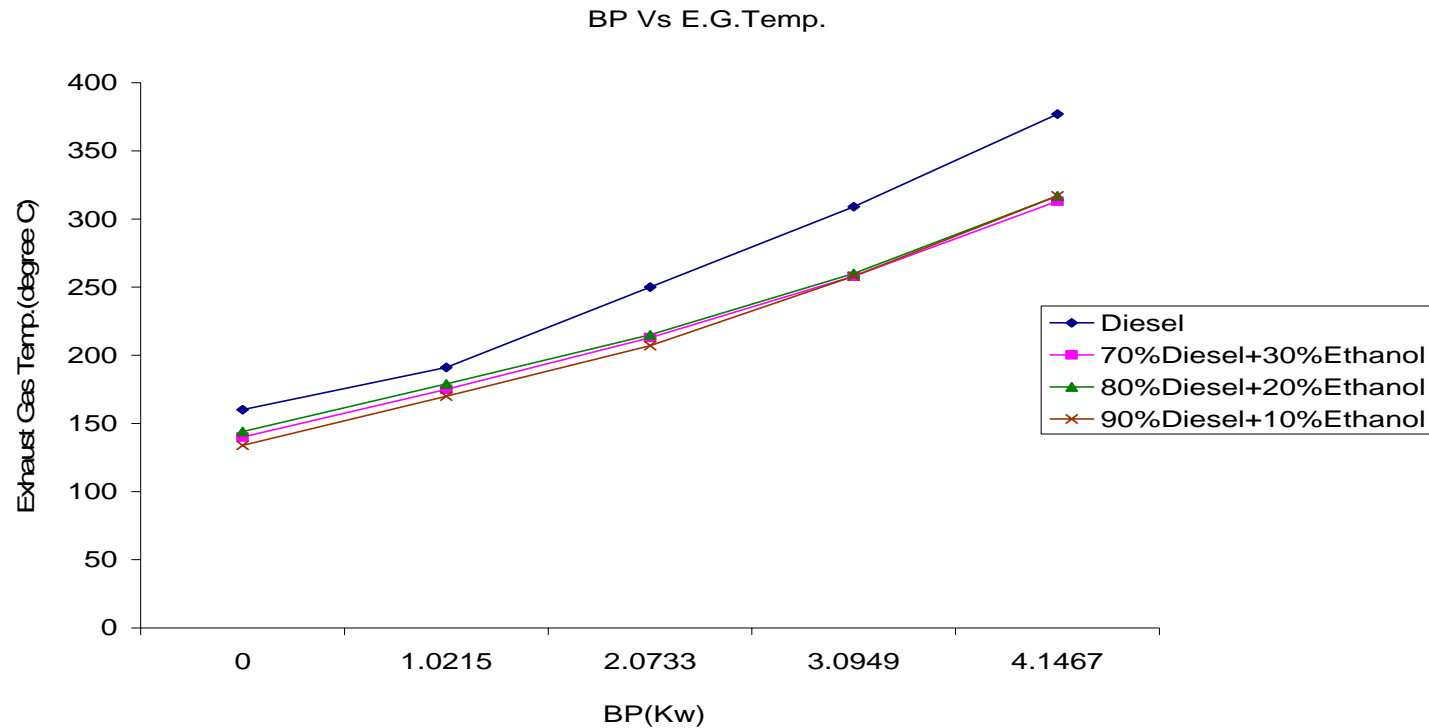
- As Brake Power increases, the Particulate matter increases
- 70: 30 and 90:10 ratios shows appreciable amount of reduction of particulate matter
- 80:20 ratio also comparatively reduces the particulate Matter emissions.



- 70:30 proportion of emulsion shows maximum reduction of smoke density compared to the other proportions



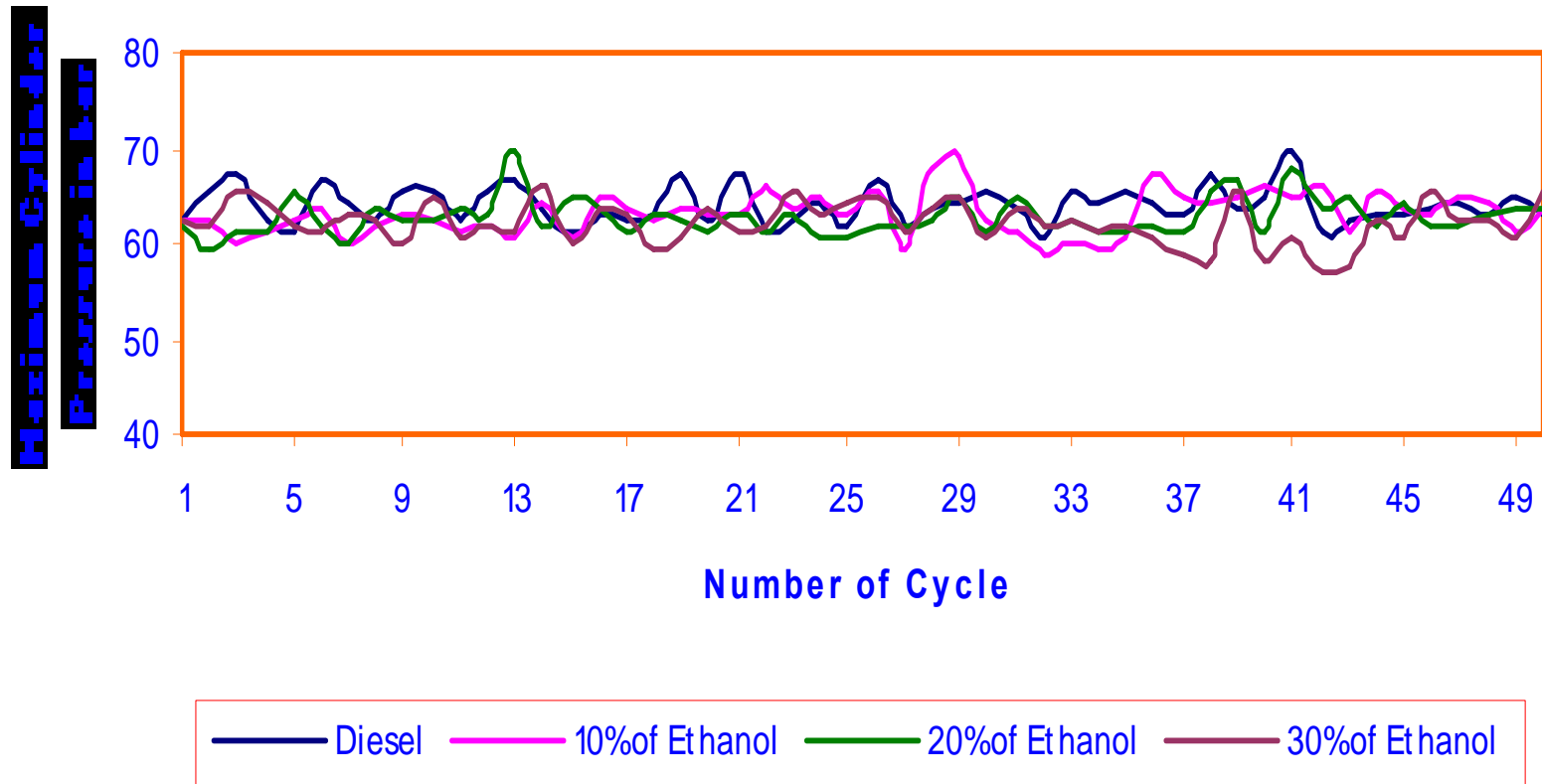
- Maximum Brake Thermal Efficiency of about 30% was obtained for 90:10 proportion.(27% for sole fuel)
- For other percentages, there is no appreciable changes in Efficiency.



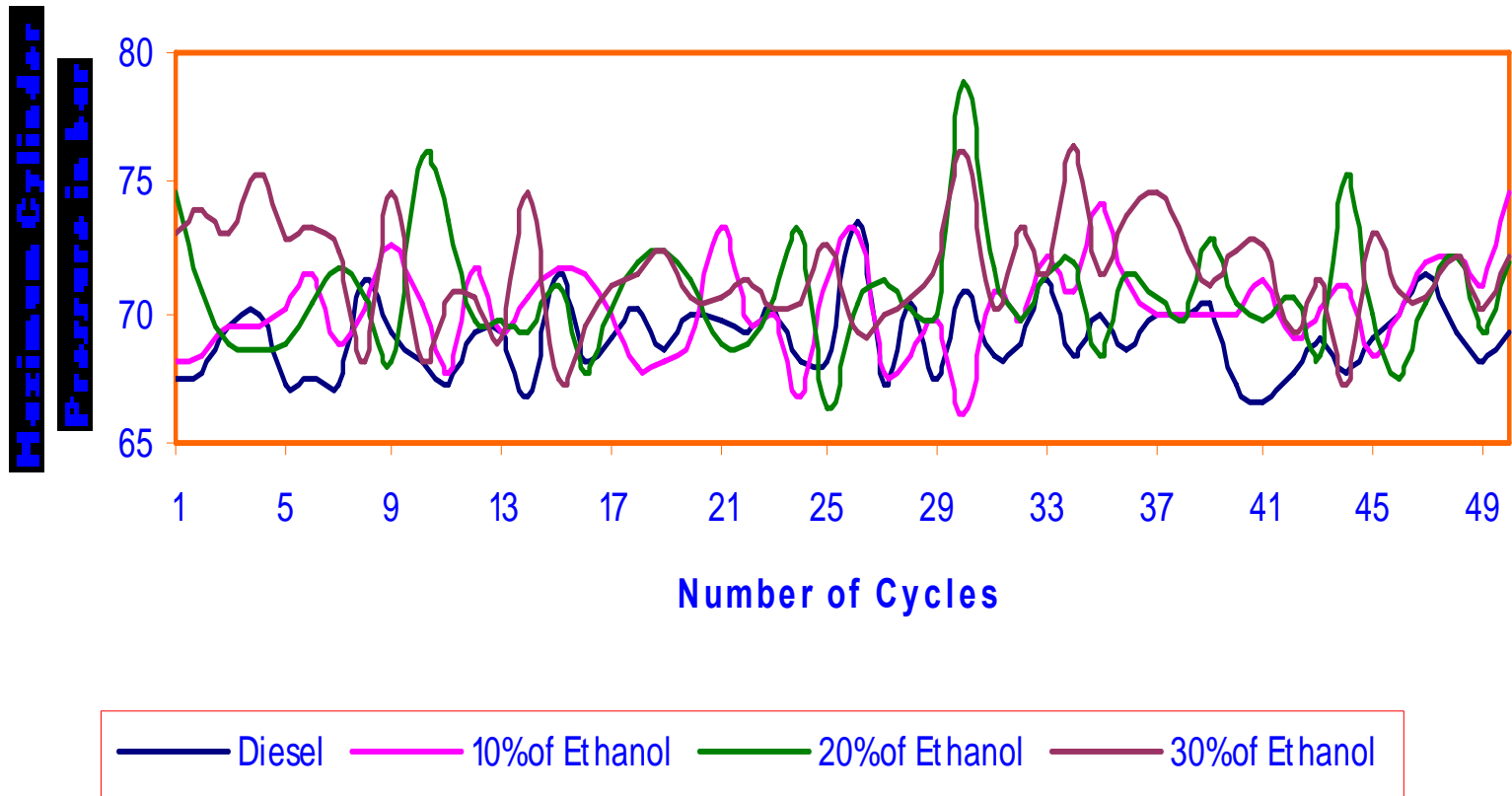
- As the Brake Power increases, the Exhaust gas temperature also increases.
- 90:10 proportion of Emulsion shows great reduction in Exhaust gas temperatures
- 70:30 and 80:20 proportions also shows appreciable change in exhaust gas temperature.

Combustion Graphs

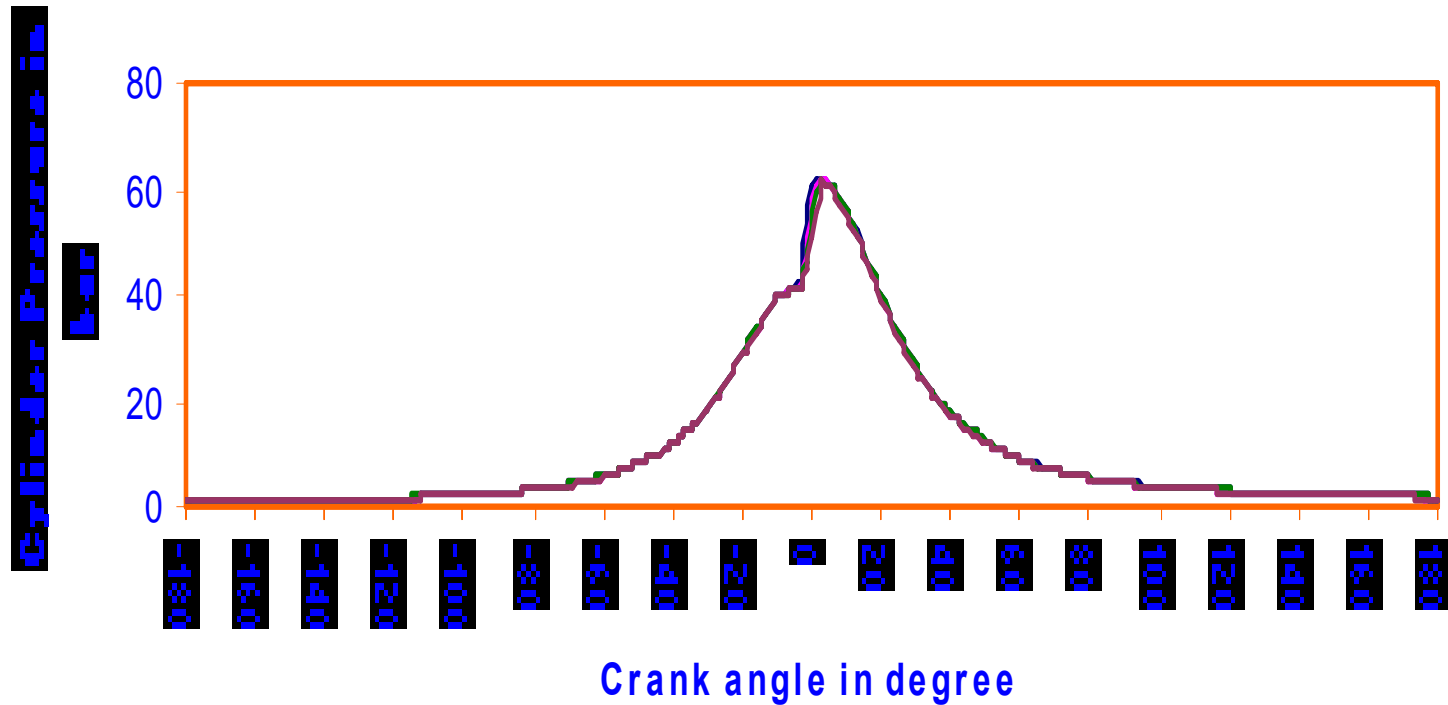
Variation of Max. Cylinder Pressure at 40 % of Load



Variation of Max. Cylinder Pressure at 80% of Load

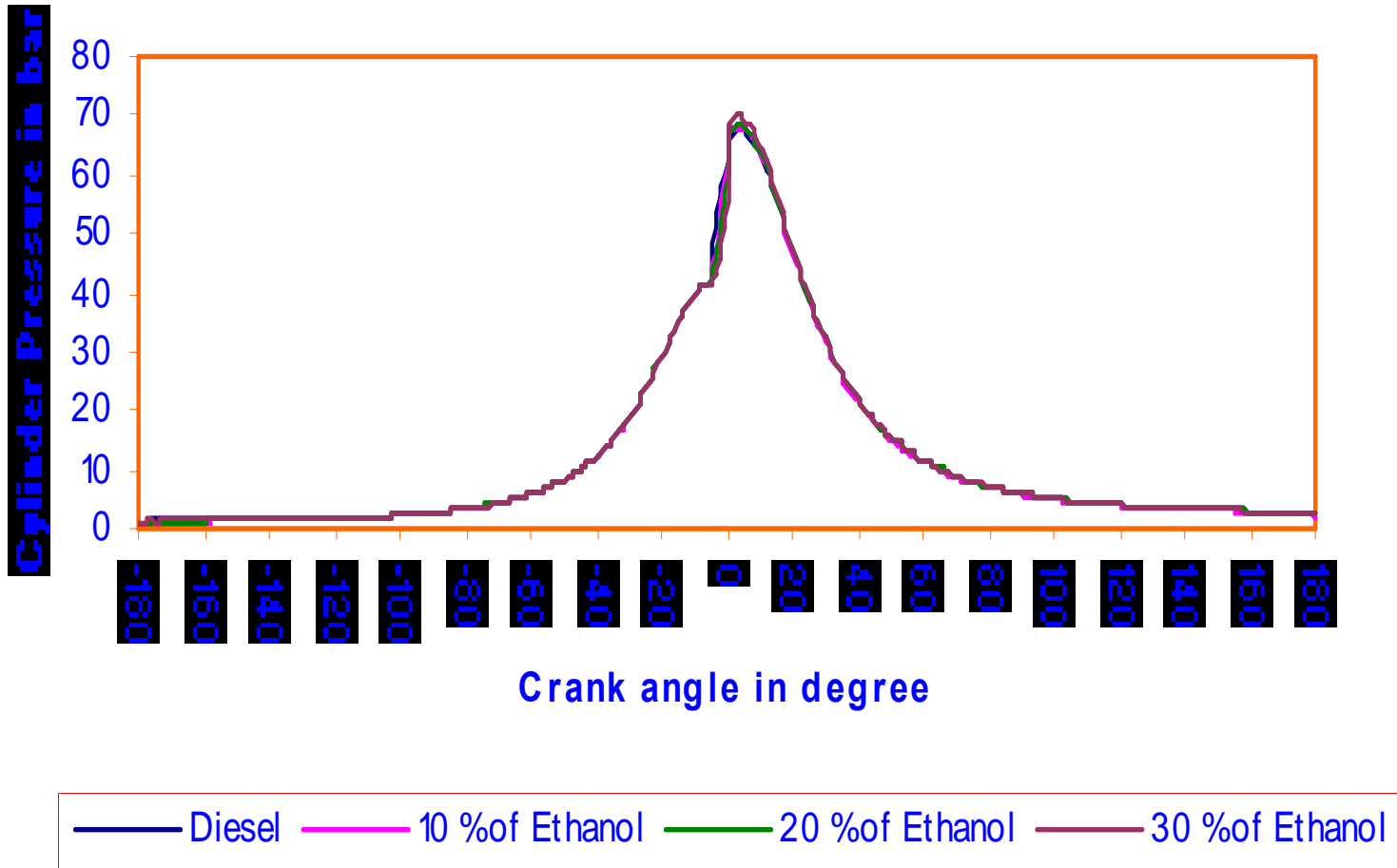


P-θ Diagram at 40 % of Load

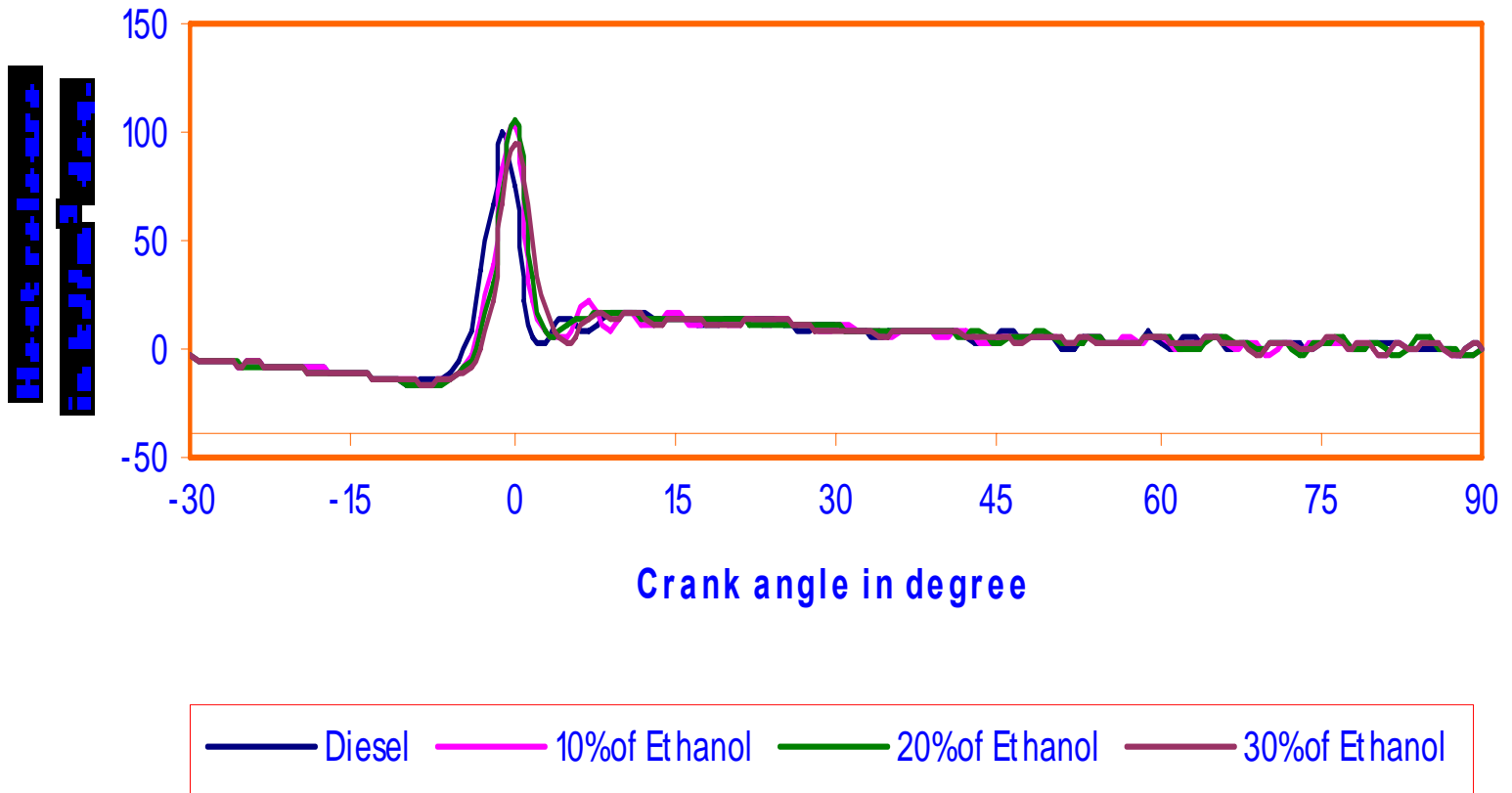


— Diesel — 10% of Ethanol — 20% of Ethanol — 30% of Ethanol

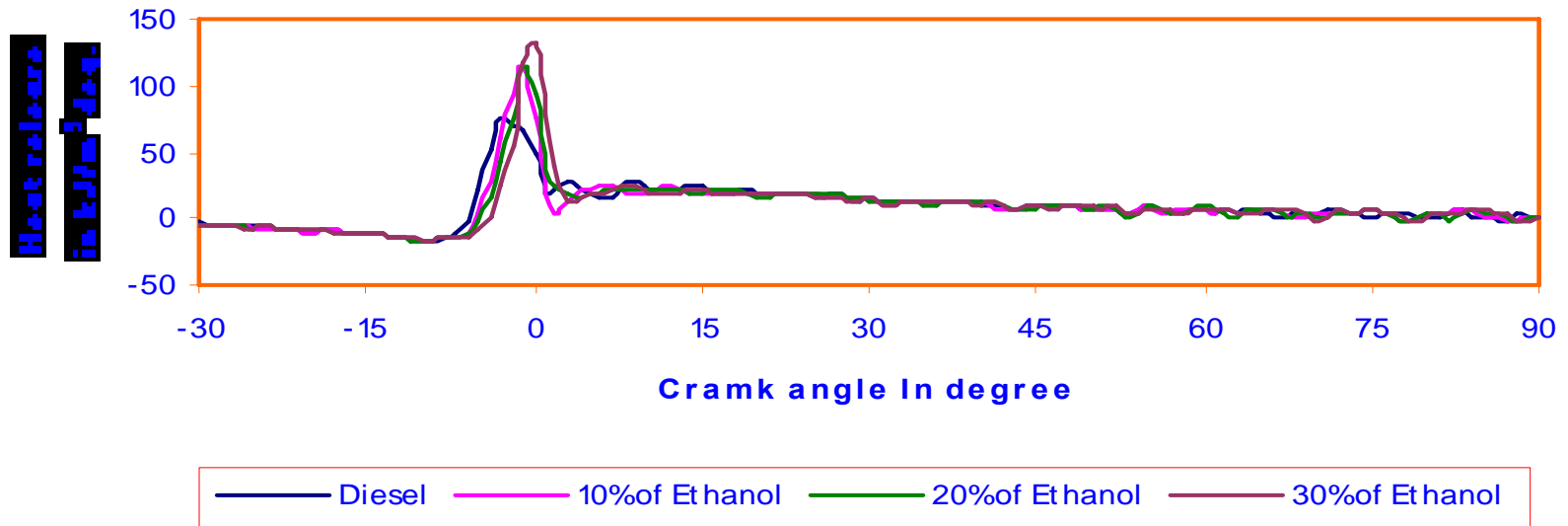
P-θ Diagram at 80 % of Load



Variation of Heat Release at 40 % of Load



Variation of Heat Release at 80% of Load



- The pressure curve, rate of pressure rise and cumulative heat release rate curves with crank angle are shown above.
- The release of heat energy for 70:30 emulsion is higher and combustion starts earlier
- The rate of pressure rise also increases marginally for the same percentage.

Conclusions

From the Experimental investigations, the following conclusions are arrived

- Increase of Brake Thermal efficiency by 1% for 80:20 proportion, 0.5% for 70:30 and 2.4% for 90:10 proportion were achieved
 - The exhaust gas temperature got reduced while using emulsions.
 - The emission levels of smoke, NO_x , Particulate Matter also lowered while using the emulsions.
 - The cumulative heat release start early and total heat release is higher with emulsion blended with Diesel.
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THE END
