EMISSION AND PERFORMANCE CHARACTERISTICS OF A SINGLE CYLINDER C.I ENGINE OPERATING ON ESTERIFIED RICE BRAN VEGETABLE OIL AND DIESEL FUEL

BY

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- The alkyl monoesters of fatty acids derived from vegetable oils or animal fats, known as bio diesel.

- Bio-diesel-fueled engines produce less carbon monoxide, unburned hydrocarbons, and Particulate emissions than diesel-fueled engines .

- Rice bran oil can be converted into bio diesel fuel as ethyl ester by transestirification.

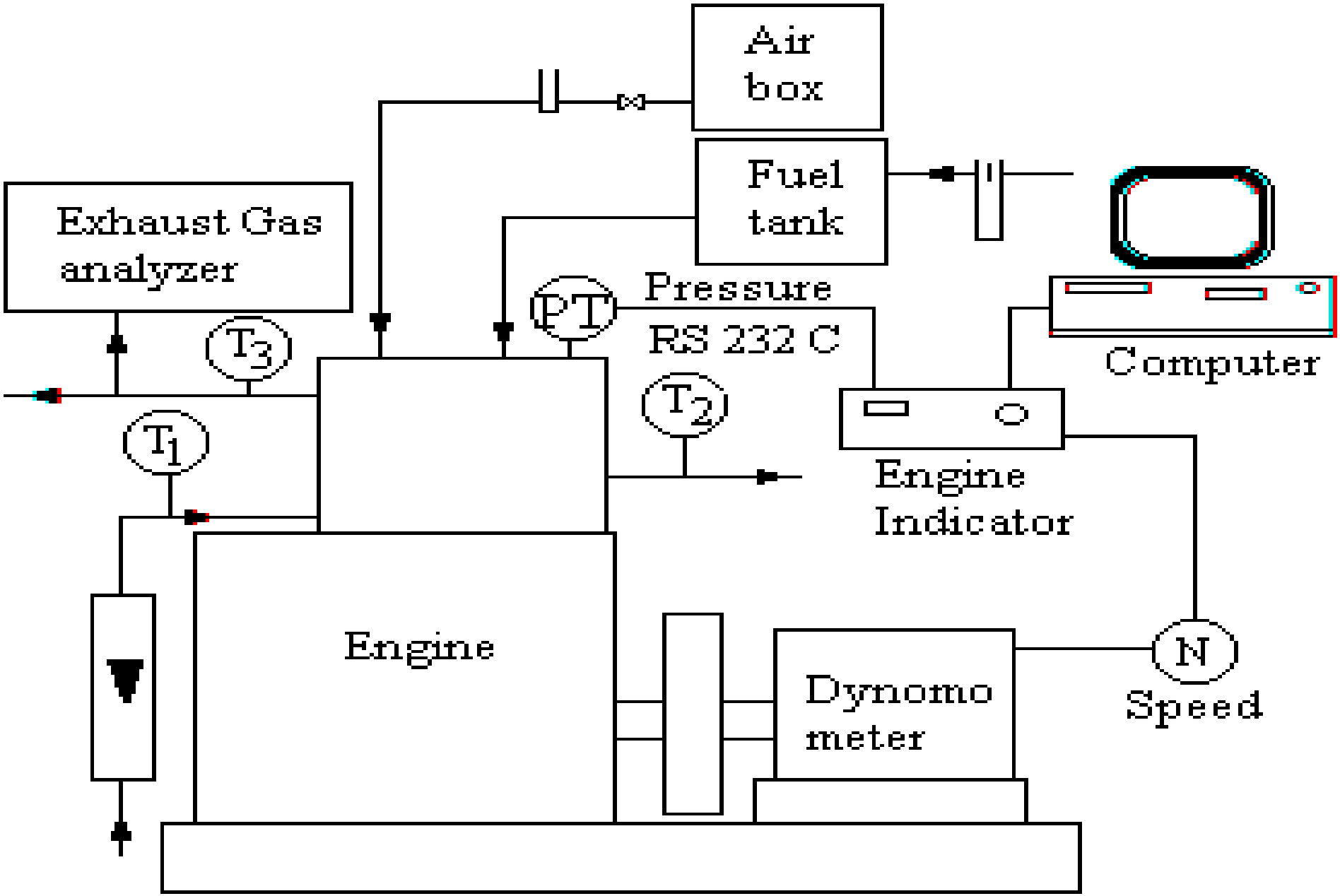
- The objective of this paper is to evaluate the effect of injection and combustion timing on bio diesel combustion and exhaust emissions.

- Experimental investigations have been carried out using bio diesel as an alternative fuel in single cylinder, compression ignition engine under varying operating conditions and by varying the injection timings with respect to TDC .

- In this work various parameters such as brake power, peak pressure rise, and emissions during combustion process under varying operating conditions with diesel, bio diesel, bio-diesel blends were measured.

- The exhaust emissions from the engine were measured using exhaust gas analyzer.

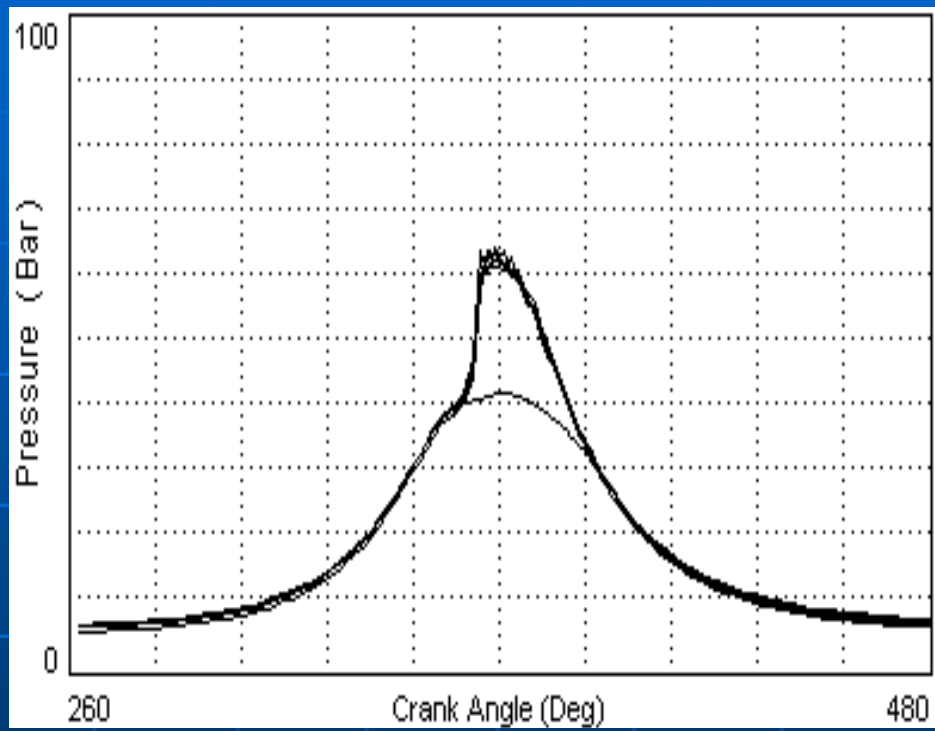
EXPERIMENTAL SET UP



A 4 Stroke,5.2 K.W,1500 RPM, Single cylinder water-cooled, diesel engine was used for this work.

RESULTS AND DISCUSSIONS

- Figure shows the pressure crank angle diagram for different blends of fuel for same load conditions .



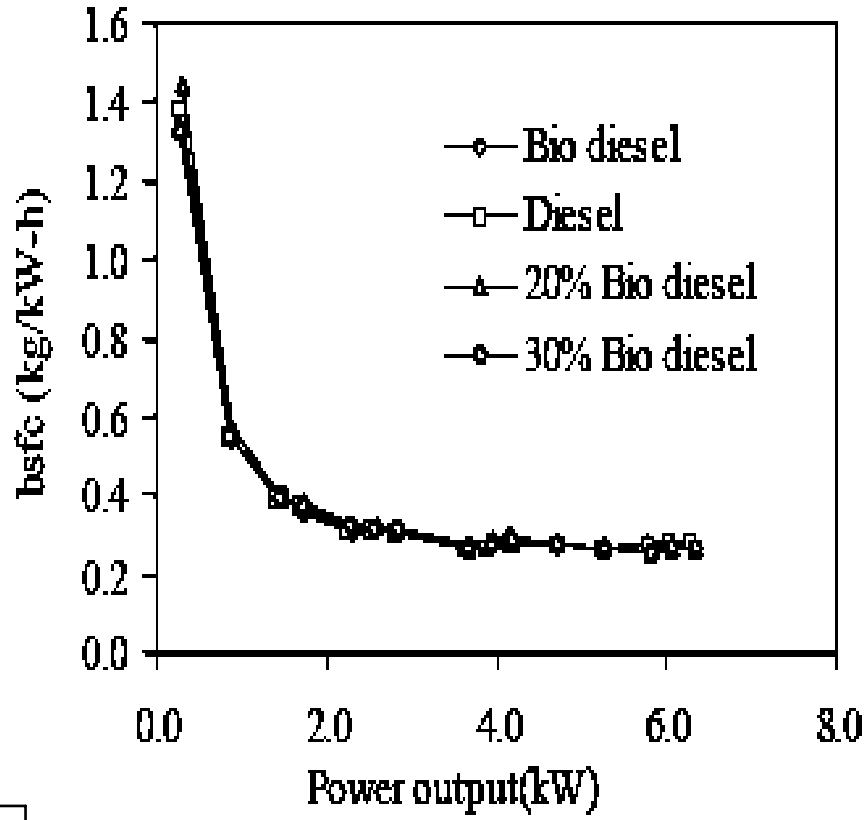
- It is observed from the figure that peak pressure rise at part load condition remain equal for all the fuels.

- It is also observed that the peak pressures when run on bio diesel and blends of bio diesel changing mixture ratio 1:4 and 1:2.3 the peak pressure are occurring away top dead center when compared with diesel fuel mode.

- It is observed from the figure that there is no improvement in bsfc with bio diesel and blends of Bio-diesel when compared with that of diesel .

- This is probably because of calorific values of all the fuel are in the same range.

- The calorific values of the different fuel are shown in Table

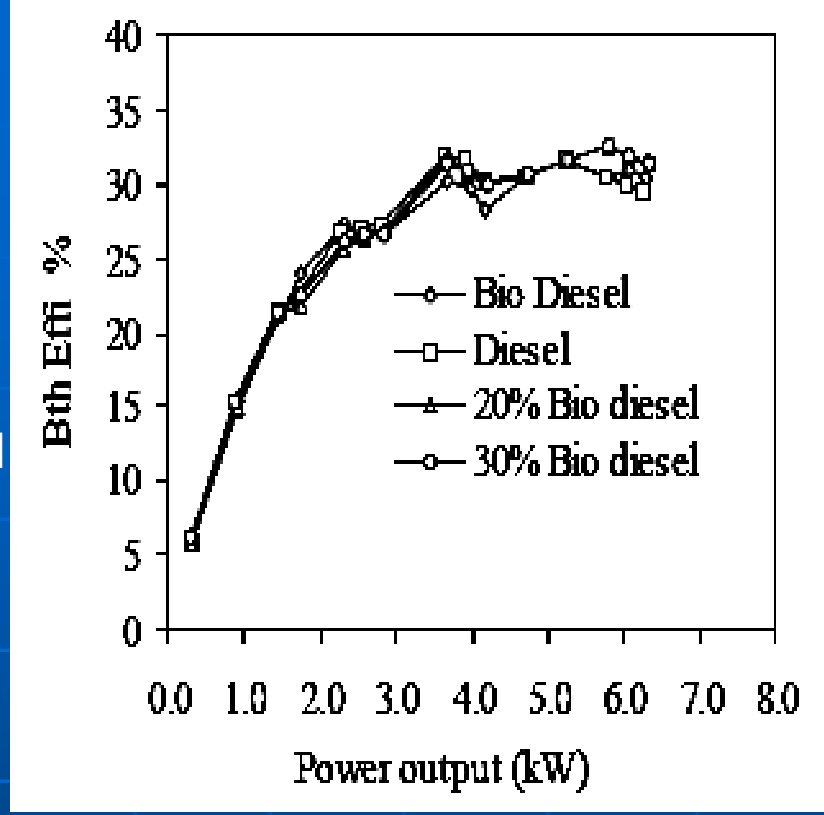


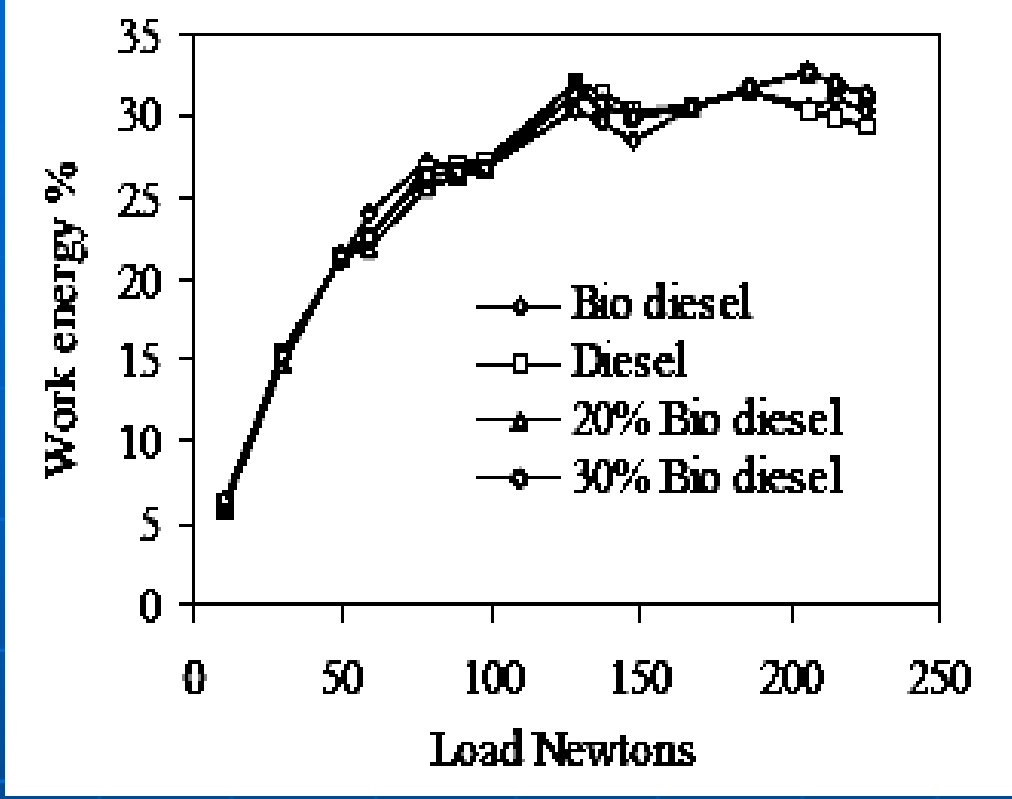
S.NO	FUEL USED	CALORIFIC VALUE(KJ/KG)
1	Diesel	42000
2	Biodiesel	42236
3	Rice Bran Oil	41090
4	20% diesel 80% Rice Bran Oil	41590

- It was observed from the figure that the thermal efficiency of the bio diesel is 4% less as compared to that of diesel

- The thermal efficiency at part load for bio diesel and blends of bio diesel is same for different load conditions.

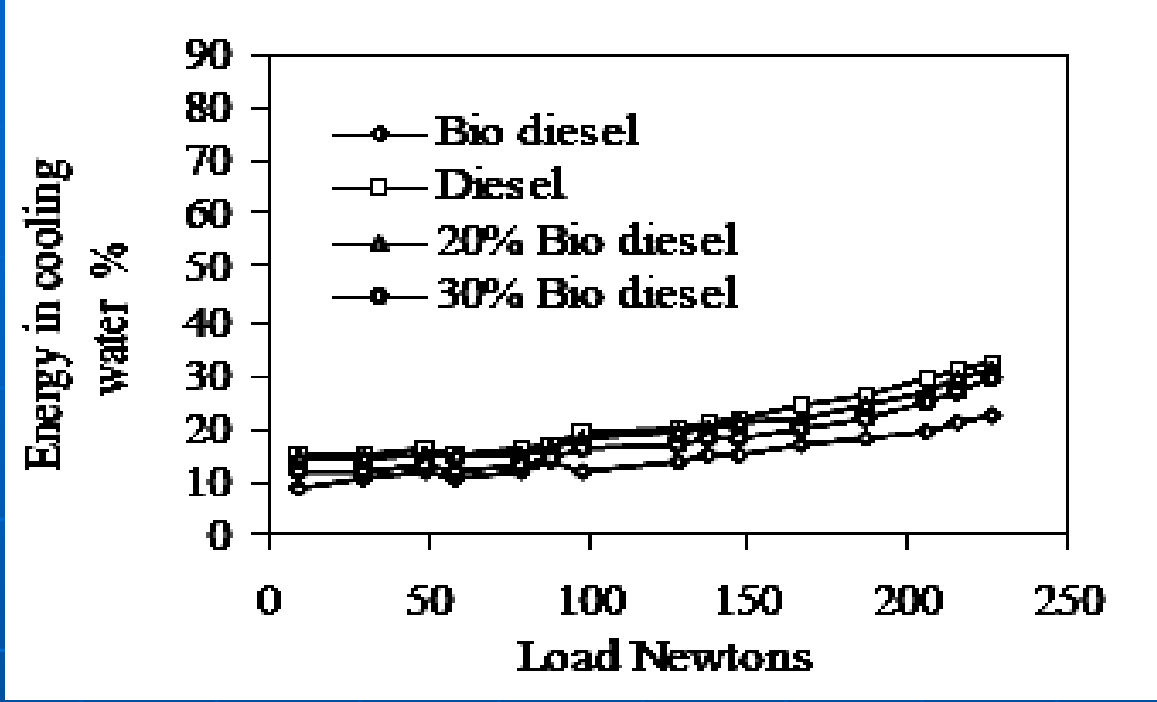
- However at maximum power out put the thermal efficiency for bio diesel blended fuel is 6% less than that of diesel fuel



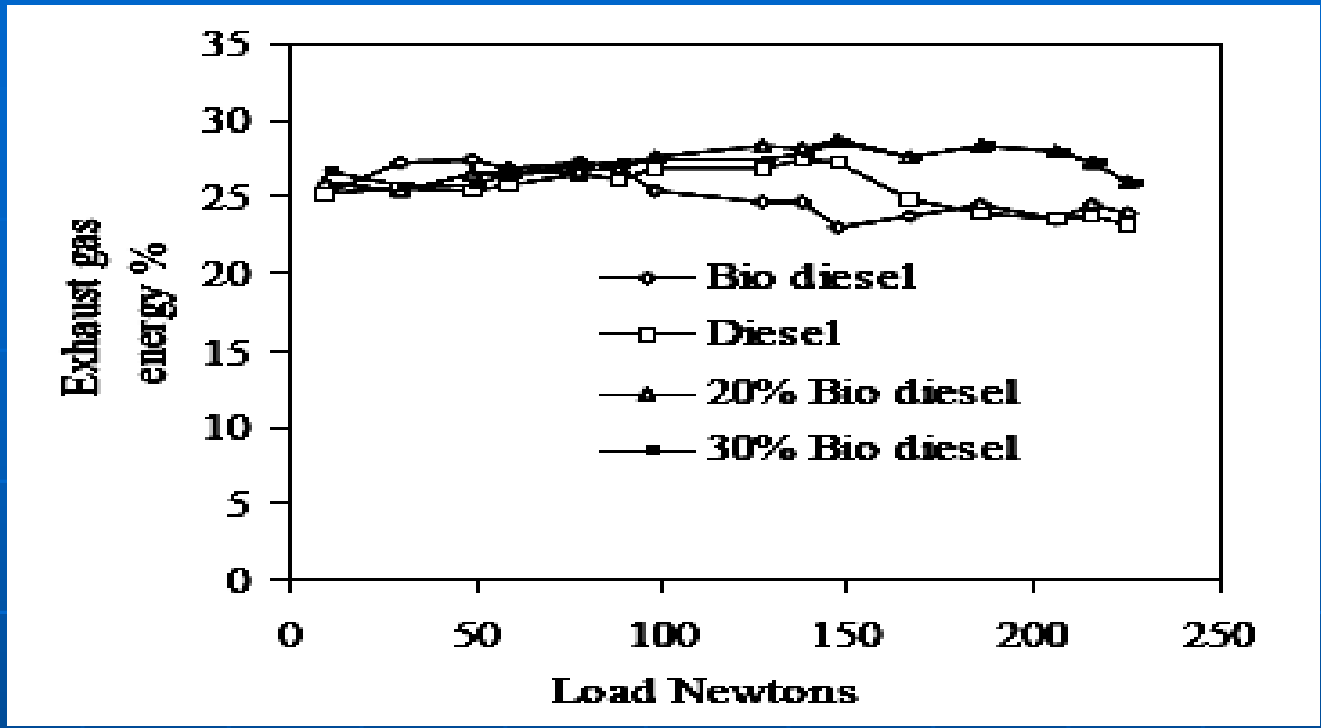


- It is observed from the above figure that the heat equivalent of work conversion for the blends of fuel remains same for different load condition.

- There is slight increase in the conversion when the engine is running on 20 % bio diesel mode operation.



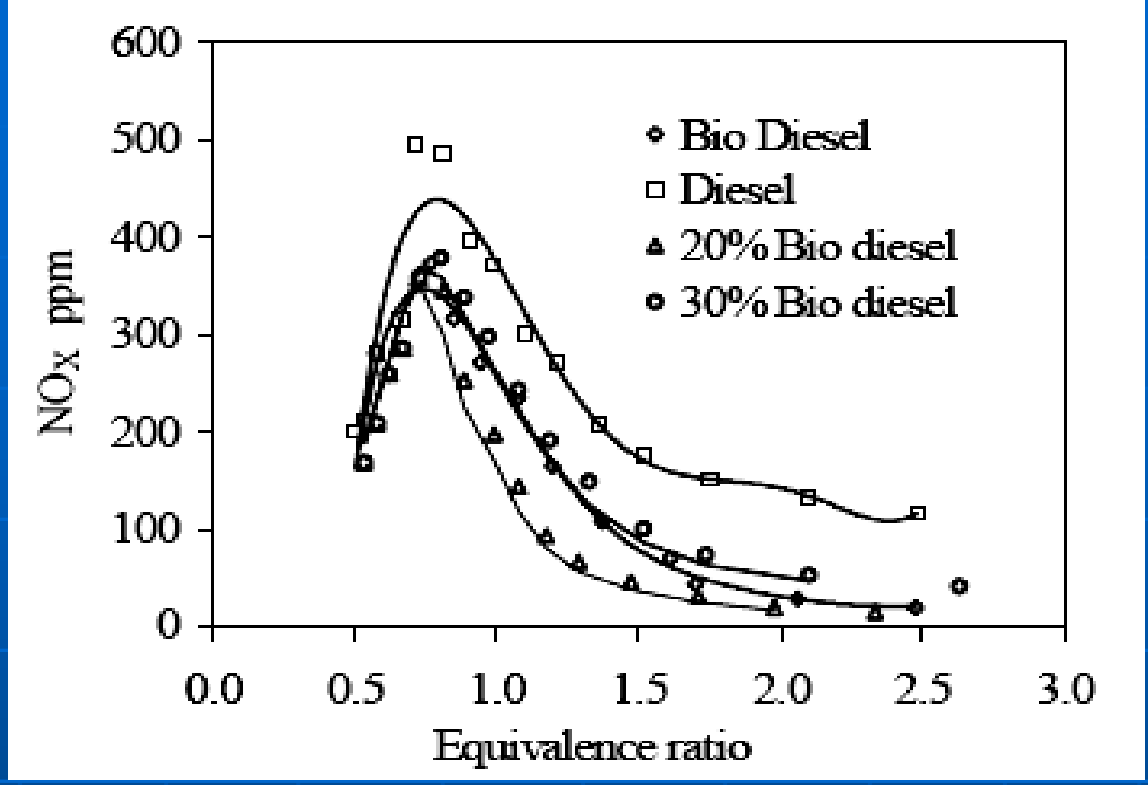
- Figure shows the variation of percentage heat equivalent in cooling water.
- Heat rejection to the coolant greatly depends on the load and speed. It is observed that the heat rejection is more when the engine is running on 20% bio diesel with 80% diesel ratio.
- There is a considerable reduction of heat rejection to the cooling water when the engine is running on pure bio diesel.
- It may be because of poor combustion characteristics of the bio-diesel and amount of heat release during combustion.
- Heat rejection to the cooling water more or less remains constant when engine is running on pure diesel and 20% bio diesel blend with diesel under part load condition.



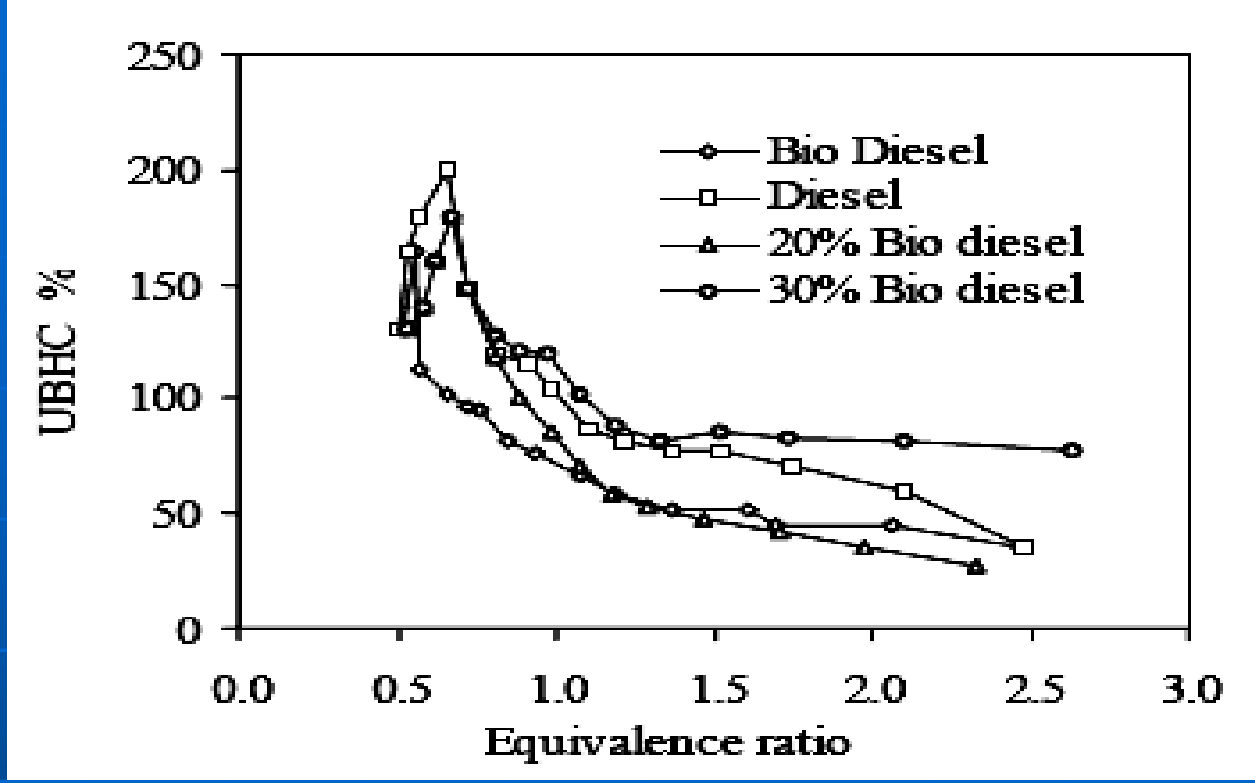
- It is observed from above diagram that the heat rejection to the exhaust gas depends on the combustion, load and speed.

- It is seen that heat rejection is more when the engine run on 20% bio diesel 80% diesel ratio.

- It is also observed that the less heat rejection in the exhaust is less when the engine runs on pure bio diesel



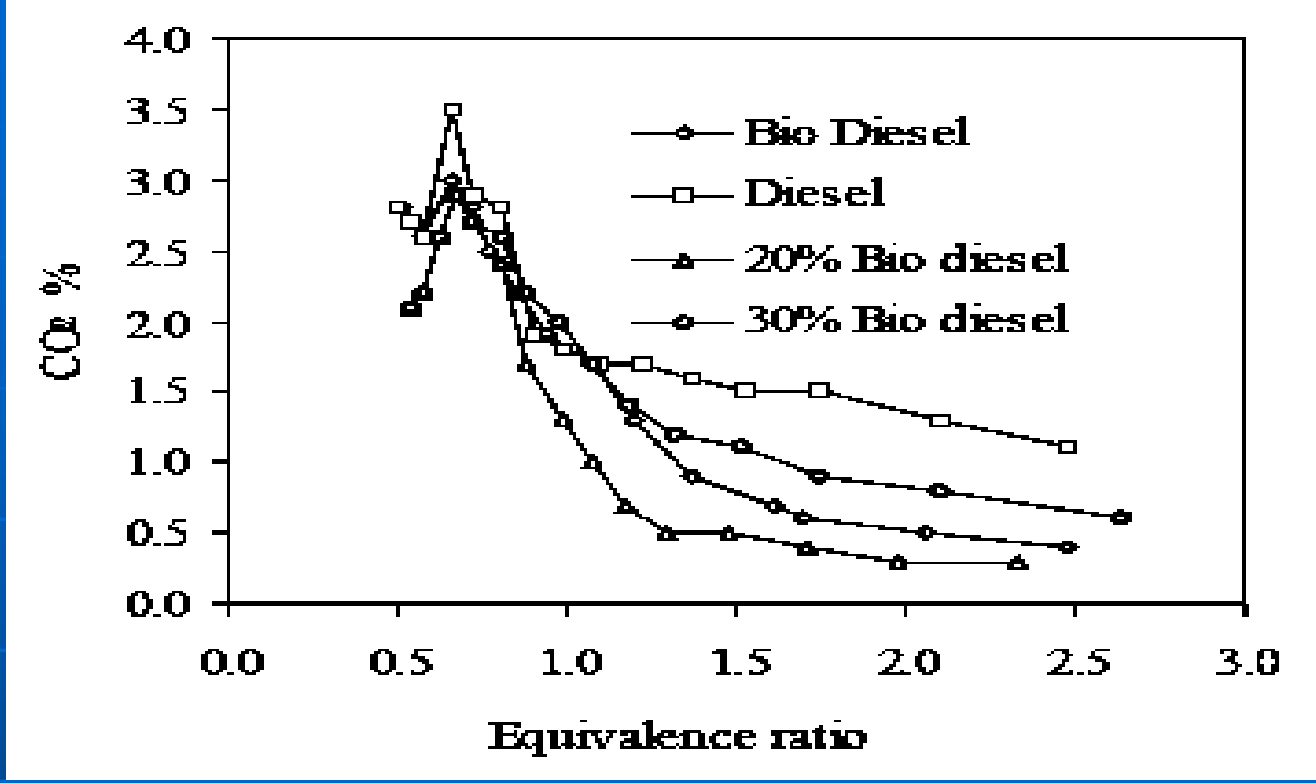
- It is observed from the above figure that the NOx emission is high for diesel and low for blends of bio diesel.
- It is also observed that NOx is low for pure bio diesel operation under part load condition.
- This reduction in NOx is probably because of low exhaust temperature of blended fuel.
- It is also seen that NOx decreases when the engine runs on 20% bio diesel.
- There is a considerable increase in the NOx emission for 30% bio diesel operation when compared with 20% bio diesel operation



- For different fuels it is observed from the above figure that at lower equivalence ratio increases in the unburnt hydrocarbon were seen.

- Unburnt hydrocarbon emission is lower for the 20% bio diesel mode operation when compared with the diesel mode operation.

- It is also observed that unburnt hydrocarbon emission from 30% bio diesel mixture is higher than that of blended fuel of 20%.



- It is observed from the above figure that low emissions of CO2 for bio diesel were observed as compared with diesel and blends of bio diesel fuel under part load conditions.

- Emission CO2 is high at part load condition for 30 % bio diesel operation when compared with diesel.

- Increased CO2 emission was seen for different fuels under full load condition.

CONCLUSION

- Experimental investigations have been carried out using bio diesel as an alternative fuel in single cylinder, compression ignition engine under varying operating conditions.

- In this work various parameters such as brake power, peak pressure rise, and emissions during combustion process under varying operating conditions with diesel, bio diesel, bio diesel blends were measured.

- For bio diesel fuel a considerable improvement in emission can be obtained under part and full load operation of the engine.

- It is observed that there is no improvement in bsfc with bio diesel and blends of bio diesel when compared with that of diesel. This is probably because of calorific values of all the fuel are in the same range.

- It was observed that the thermal efficiency of the bio diesel is 4% less as compared to that of diesel. The thermal efficiency at part load for bio diesel and blends of bio diesel is same for different load conditions.

It is observed that heat rejection to the cooling water is less when the engine runs on pure bio diesel. It may be because of poor combustion characteristics of the bio diesel and amount of heat release during combustion.

- Low NOx for pure bio diesel operations under part load condition were observed. This reduction in NOx is probably because of low exhaust temperature of blended fuel. It is also seen that NOx were decreased when the engine runs on 20% bio diesel.

- It is observed that an emission of CO2 is less for bio diesel as compared with diesel and blends of bio diesel fuel under part load conditions.

- Unburnt hydrocarbon emission is lower for the 20% bio diesel mode operation when compared with the diesel mode operation. It is also observed that unburnt hydrocarbon emission from 30% bio diesel mixture is higher than that of blended fuel of 20%.

- Engine was over loaded to about 30% more than the rated load and under this condition engine continued to run with out knocking. It is observed that the engine continues to take the load with very high rate of pressure rise during combustion for blends of bio diesel fuel.

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