CHAPTER 7

CONCLUSION AND SCOPE FOR FUTURE WORK

7.1 CONCLUSION

Based on the investigations carried out on a single cylinder four stroke water cooled diesel engine using oxygen enriched combustion, the following conclusions are drawn

- Using oxygen enriched combustion technology in diesel engine causes an improvement in engine performance and significant reduction in exhaust emissions.

- Brake power increases significantly with load for all levels of oxygen enrichment. Up to 30% improvement in Brake power was experienced for higher levels of oxygen enrichment. There are no major variations in brake power when injection pressure increases from 190 bar to 200 bar. It Increases slightly about 2 to 3% for every increment of 10 bar fuel injection pressure (i.e. from 200 bar to 230 bar).

- By applying OECT an amount of 20% reduction in SFC was experienced. An another reduction of 2 to 3% was arrived by increasing fuel injection pressure 190 bar to 200 bar. SFC decreases almost uniformly for all levels of loads.

- Brake mean effective pressure can be elevated by an amount of 25% by using the enrichment level of 3 LPM. At lower range of load condition the rate of increase in BMEP was
found to be low. The conflicting trend holds good for higher range loading. An amount of 3% to 10% in creases in BMEP was experienced by increasing the fuel injection pressure from 190 bar to 230 bar.

- Exhaust gas temperature increases an amount of $30^\circ$C for the entire range of load with respect to the enrichment level of 3 LPM. A reduction of $10^\circ$C was experienced for every increases in 10 bar fuel injection pressure. (ie from 190 bar to 230 bar)

- CO decreases considerably by oxygen enrichment. A maximum of 65% reduction in CO was experienced for higher levels of oxygen enrichment ie 3 LPM. A reduction of 3% to 15% was experienced by increasing fuel injection pressure from 190 bar to 230 bar. Decrease in CO was lower for lower levels of load.

- An increment of 33% in CO$_2$ was observed when oxygen concentration increases to a level of 3 LPM. The rate of increase in CO$_2$ was higher for higher loads. An another increase rate of 3% in CO$_2$ was experienced for every increases in 10 bar of fuel injection pressure. ( ie from 190 bar to 230 bar).

- A maximum of 18% increase in NO$_x$ for the enrichment level of 3 LPM was observed. Moreover an average increase of 8% NO$_x$ was found for the increment of 10 bar fuel injection pressure. Increase in NO$_x$ was almost uniform for the entire range of loading.
The heat release rate was elevated considerably for all percentages of load. Heat release rate was elevated by an amount of 12 J/deg for lower levels of load. Similarly an amount of 7 J/deg for higher percentages of load. An amount of 5% increases in heat release rate was observed by increasing the nozzle pressure about 10 bar.

From the experimental results a reduction in ignition delay was observed with oxygen enrichment. A reduction of 3 deg BTDC was resulted for the enrichment level of 3 LPM. Reduction period was comparatively higher for lower levels of oxygen enrichment. Moreover ignition delay become shortest by 3 to 4 deg BTDC for every increment of 10 bar injection pressure.

An average reduction of 10% ignition delay was observed for 15% EGR. This Phenomena were reversed for higher percentages of EGR. Ignition delay was increased to a level of 15 to 20%. This prediction holds good for higher levels of O\textsubscript{2} enrichment also. Changes in cylinder pressure is negligible up to 15% of EGR. A maximum decrease of 5 bar was observed for 45% of EGR with 1LPM of O\textsubscript{2}. The same trend applies for higher levels of oxygen enrichment also

The overall research work depicts that OECT can be suggested as a method to improve performance and reduce exhaust emissions for diesel engines.
7.2 SUGGESTION FOR FUTURE WORK

The following points are suggested for the future work in OECT,

- The present work can be extended to a multi cylinder automotive engine.

- CFD analysis can be made to study the effects of OECT for different loads with respect to different levels of oxygen enrichment.

- Effects of oxygen enrichment with respect to different alternate fuels for various nozzle pressures also can be studied.