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# ABSTRACT

The engine efficiency can be analyzed by doing the thermodynamic analysis of the engine cycle and engine design. However, practical systems are far from the thermal efficiencies predicted by the first law because analysis based on first law is often fail to identify the deviation from ideality. First law of thermodynamics cannot identify and quantify the sources of losses (irreversibilities) in the engine. The second law of thermodynamics offers a new perspective for the analysis of the performance of the engine based on the concept of exergy.

The effect of change in compression and equivalence ratio on the main parameters has been observed using entropy balance and exergy balance approach. The result shows that the exergy destruction during combustion and exhaust processes decreases with the increase in compression ratio for all the examined fuels. Considering heat transfer through the cylinder wall, the second law efficiency of LPG is 1.67% greater than the iso-octane and 3.20 & 5.98% greater than the methanol and ethanol respectively at a compression ratio of 10. The exergy destruction during combustion of iso-octane fuel is 13.85, 12.35 and 8.09% greater than the methanol, LPG and ethanol, respectively at a compression ratio of 10.

The effect of change in crank angle and equivalence ratio is observed experimentally on the main parameters using iso-octane, different proportion (5, 10 & 20%) of ethanol iso-octane blended fuels and different proportions (5, 10 & 20%) of methanol iso-octane blended fuels at different speed and loads. The engine speed was varied from 1200 to 1750 rpm.

The outcome is that the exergy destruction during combustion decreases with the increase in crank angle and exergetic efficiency increases with the increase in crank angle. The exergy destruction during combustion mainly depends upon the fuel air equivalence ratio and it is very less dependent on engine speed. The cyclic variation of exergy destruction during combustion is lowest at stoichiometric condition for all the fuels and it increases with the richness or leanness of the fuels.

From exergy destruction during combustion point of view, the best fuel is iso-octane in comparison to the E5, M5, E10, M10, E20 and M20 at the same speed. Among blending of the fuels, the best fuel is M5

From exergy destruction during combustion point of view, upto 10% blending of methanol with iso-octane is more advantageous than the ethanol blending in iso-octane. The indicated power developed by the ethanol iso-octane blends is more than the methanol iso-octane blends and base fuel at different loads and speeds. Exergetic efficiency is the maximum for absorption system operated with exhaust gases of iso-octane and it is 40.98% & 16.15% higher than the E10 and M10 fuels, respectively