

Thesis Title	A Study of Combustion Characteristics of Ethanol Fuel Engine
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Abstract

A study of gasoline-ethanol blended as fuel for spark ignition engines was investigated. The objectives were to study combustion characteristic and effects on performance and emissions. A 4-cylinder, 1.6L, carbureted commercial engine was used for the whole test program. Fuels involved in the test runs were commercial 91-RON gasoline and blends of gasoline with ethanol of 10–50 percent by volume. Test runs were conducted at steady state conditions (at constant speed and power). The engine was tuned as factory setting without any modification. Results show that adding ethanol of 10/15/20/30/40/50 percent in gasoline gives rise to reduction of equivalence ratio from slightly rich to slightly lean (for the tests condition at constant speed and power). Thermal efficiencies are also increased with amount of ethanol in a range of 4.0/5.7/7.3/9.4/9.7/11.1 percent, respectively. However increasing of ethanol in the blends decreases the fuel heating values. This increases the values of brake specific fuel consumption by 0.5/1.2/1.9/4.8/9.5/13.5 percent, respectively 50/68/83/90/91/93 percent and 17/22/27/34/46/59 percent with the increases of ethanol decreases carbon monoxide and hydrocarbon levels. Oxides of nitrogen levels are maximum at 30 percent ethanol blends. This is believed that oxides of nitrogen are normally peaked near stoichiometric mixture on the lean side.

It is notified from the analysis of cylinder pressure data that gasoline produces highest burning rate and the burning rates are slower with the increasing amount of ethanol. It is shown that flame development period and flame propagation period in term of crank angle are

increase with the amount of ethanol. The values of COV of IMEP and COV of Pmax are also increased with amount of ethanol. The variations of period from spark timing to 10 percent mass burned fraction, IMEP, maximum rate of pressure rise and expansion polytropic index decreased with amount of ethanol. The variations of period from 10 percent to 90 percent mass burned fraction, increased with amount of ethanol.

It is shown that the trends of results from simulation (ISIS program) agree well with those from the experiment. However the calculated amount of carbon dioxide increase with ethanol content while that from the experiment is nearly constant. The calculated cylinder pressures are similar to those from experiment. Calculated IMEP and thermal efficiencies seem to be 14.3 percent and 3.1 percent higher than that from the experiment.

It can be concluded that from the results of engine performance, emission and combustion characteristics, adding ethanol of 10-20 percent by volume in gasoline is considered as the acceptable fuel to operate on standard commercial SI engines.

Keywords : Gasoline/ Ethanol / Spark Ignition Engine/ Cylinder Pressure
Combustion Characteristics / COV