

Ethanol as a lead / MTBE replacement for spark ignition engines in Libya

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Abstract Considering pollution problems today, investigations have been concentrated on lowering the concentration of toxic components in combustion products. In Libya, gasoline lead additives at concentration of 0.6 g/l were used to provide a gasoline with octane number of 98. In the last years, proponents of the phase out of leaded gasoline have typically focused on the addition of methyl tertiary butyl ether (MTBE) as strategies for replacing lead additives. Presently, 15% by volume of MTBE can be added to unleaded gasoline to provide a gasoline with an octane number of 98.

The purpose of this research is to experimentally study of using the ethanol as a lead / MTBE replacement for spark ignition engines in Libya. The effect of ethanol addition to unleaded gasoline on the research octane number, performance and pollutant emission of the spark ignition engine is studied. Results showed that the use of 15 vol.% of ethanol blending appears to be a good option for replacing lead or MTBE in gasoline and in this blended ratio the resulted fuel mixture satisfy the Libyan specification.

The results of the standard ASTM methods showed that with increasing the ethanol content, the research octane number of the blended fuels increases, while the Reid vapor pressure of the blended fuels initially increases to a maximum at 10 vol.% ethanol addition, and then decreases.

The results of the Ricardo E6/US research engine tests showed that the addition of ethanol, (from 0 to 30% by volume), increases the break power, break thermal efficiency and break specific fuel consumption, and reduces NO_x, CO, and HC emissions. The high useful compression ratio, which produced maximum break power, directly proportional with ethanol percentage in mixture.

Keywords: RON; ethanol; lead; MTBE; alternative fuel; pollution.