

# Combustion Behavior of Gasoline and Gasoline/Ethanol Blends in a Modern Direct-Injection 4-Cylinder Engine

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## **Abstract**

Early in 2007 President Bush announced in his State of the Union Address a plan to off-set 20% of gasoline with alternative fuels in the next ten years. Ethanol, due to its excellent fuel properties for example, high octane number, renewable character, etc., appears to be a favorable alternative fuel from an engine perspective. Replacing gasoline with ethanol without any additional measures results in unacceptable disadvantages mainly in terms of vehicle range.

This paper summarizes combustion studies performed with gasoline as well as blends of gasoline and ethanol. These tests were performed on a modern, 4-cylinder spark ignition engine with direct fuel injection and exhaust gas recirculation. To evaluate the influence of blending on the combustion behavior the engine was operated on the base gasoline calibration. Cylinder pressure data taken during the testing allowed for detailed analysis of rates of heat release and combustion stability. The different fuels are compared in terms of combustion behavior, engine efficiency, as well as regulated emissions.

Further studies will include advanced sensing tools to identify the consistency of the blend as well as optimized engine calibrations for the different blends based on sensor feedback. Also, the range of tested fuels will be extended to higher alcohols.

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