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The Performance of a Modern Vehicle on a Variety of Alcohol-Gasoline Fuel Blends

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ABSTRACT
An unmodified, conventionally fuelled, 2009 Class D vehicle with a 2.0L turbocharged gasoline direct injection engine was operated on a range of gasoline, gasoline-ethanol and gasoline-butanol fuel blends over NEDC drive cycles and WOT power curves on a chassis dynamometer. Engine performance, engine management system parameters and vehicle out emissions were recorded to investigate the response of a current state-of-the-art technology vehicle to various alcohol fuel blends.

The vehicle fired on all fuels and was capable of adapting its long term fuelling trim to cope with the increased fuel flow demand for alcohol fuels up to E85. Over the NEDC tests, the volumetric fuel consumption was very strongly related to the calorific content of the fuel. CO and NO_x emissions were largely unaffected for the mid alcohol blends, but CO emissions decreased and NO_x emissions increased significantly for the high alcohol fuels. THC emissions were largely unaffected. Particulate mass initially reduced as the alcohol content increased, but then increased significantly for the higher alcohols. This was likely due to the poor vaporisation during cold start.

During the power curves, WOT performance increased with the oxygen content in the fuel. The performance on 95RON was slightly restricted by occasional activation of the knock controller, which retarded the mean spark timing. The alcohol fuels did not suffer from knocking events but were able to use additional fuel-sourced oxygen to increase the power output and increase the turbine enthalpy.