

Effect of Hydrogen on the Performance of a Methanol SI-Engine at City Driving Conditions

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Abstract : Methanol is one of the most suitable alternative fuels for replacing gasoline in present and future spark-ignited engines. However, for pure methanol engines, cold start problems and misfires are observed under certain operating conditions. Hydrogen provides a solution for such problems. This paper experimentally investigated the effect of hydrogen on the performance of a pure methanol SI-engine at city driving conditions (1500 rpm speed and 1.18 excess air ratio). Hydrogen was used as a part of methanol reformed syngas (67% hydrogen by volume). 4% by mass of the total methanol converted to hydrogen and other constituent gases, was used in each cycle. Port fuel injection was used to inject methanol and hydrogen-rich syngas into the 4-cylinder engine. The results indicated an increase in brake thermal efficiency up to 5% with the addition of hydrogen, a decrease in brake specific fuel consumption up to 200 g/kWh, and a decrease in exhaust gas temperature by 100°C for all mean effective pressures. Hydrogen addition also decreased harmful exhaust emissions significantly. There was a reduction in THC emissions up to 95% and CO emissions up to 50%. NOx emissions were slightly increased (up to 15%), but they can be reduced to zero by lean burn strategy.

Keywords : alternative fuels, hydrogen, methanol, performance, spark ignition engines

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