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The Effect of Hydrogen on Performance and Emissions of a Methanol Si-Engine at Part Load

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Abstract : Methanol and hydrogen are the most suitable alternative fuel resources for the existing and future internal combustion engines. This paper experimentally examined the effects of hydrogen addition on the performance and emission characteristics of a spark-ignition engine fueled with methanol at part load conditions. The experiments were carried out for various engine speeds and loads. Hydrogen-rich syngas was used to enhance the performance of the test engine. It was formed by catalytic dissociation of methanol itself, and volumetric hydrogen fraction in syngas was about 67%. A certain amount of syngas dissociated from methanol was injected into the intake manifold in each engine cycle, and the low heating value (LHV) of hydrogen-rich syngas used was 4% of methanol in each cycle. Both the fuels were injected separately using port fuel injectors. The results showed that brake thermal efficiency of the engine was enhanced by 3-5% with hydrogen addition, while brake specific fuel consumption and exhaust gas temperature were reduced. There was a significant reduction (90-95%) in THC and (35-50%) in CO emissions at the exhaust. NOx emissions from hydrogen blended methanol increased slightly (10-15%), but they can be reduced by using lean fuel-air mixture to keep the cylinder temperature low.

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