Load Variation Effects on Combustion Regimes in A Hydrogen-Diesel Dual Fuel Engine

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Abstract

This work presents an experimental study about the impacts of the use of hydrogen as a partial substitution in a direct injection diesel engine. Hydrogen gas was fumigated into the intake manifold of a single cylinder diesel engine to mix with fresh air before entering the combustion chamber of the engine at constant speed with load variation. The homogeneous charges of air-hydrogen mixture were then ignited in the chamber by the main diesel injected. The added hydrogen amounts generated the hydrogen-to-diesel ratios. These affect combustion pressure, heat release rate, and combustion variation in the three regimes investigated, i.e. ignition delay, premixed combustion phase, and mixing-controlled combustion phase as well as the heat release in each combustion phase due to the different hydrogen-to-diesel ratios. The obtained results have shown the reductions in diesel and total fuel consumptions, including exhaust gas emissions when adding hydrogen. These lead the thermal efficiencies to be higher when adding hydrogen. The benefits of this research will be appropriately used in the improvement and development of hydrogen-diesel dual fuel engine and its fuel strategy management in the near future.

Keywords : Hydrogen, dual fuel, diesel, engine, thermal efficiency

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