Experimental analysis on the performance, combustion/emission characteristics of a DI diesel engine using hydrogen in dual fuel mode

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ABSTRACT

Among alternative fuels, hydrogen has significant promise as both a fuel and a carrier of energy. Hydrogen is projected to be a key alternative fuel in the near future to meet stringent pollution standards. Internal combustion (IC) engines, gas turbine, and aerospace industries use hydrogen as a fuel because it is non-toxic, odorless with high calorific value (CV), and combustible across a wide temperature range while also being a long-term renewable and less polluting energy source. The objective of this study is to investigate the impact of using different hydrogen rations on combustion behaver, engine performance, and emission characteristics in a dual fuel compressed ignition (CI) diesel engine. The tests were performed at speeds of 1500, 2000, and 2500 rpm at difference operating conditions. Hydrogen was introduced at flow rates of 21.4, 28.5, 36.2, 42.8, and 49.6 L per minute for each load. The findings reveal that hydrogen flow rate of 21.4 l/min and 42.8 l/min gives significant impact to engine coefficient of variation (COV) and the performance of the engine. In addition, the emissions level of CO, CO_2 and smoke were improved at the same flow rate. Moreover, the break thermal efficiency (BTE) has shown significant improvement at 21.4 l/min of hydrogen flow rate due to the reduction in combustion length and the movement of the combustion phasing toward the ideal phase. The use of hydrogen as alternative energy has important role as a future green energy source.

KEYWORDS

Diesel engine; Dual fuel; Emission analysis; Hydrogen; Performance

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