Simultaneous reduction of nitric oxide and smoke opacity in TDI dual fuel engine fuelled with calophyllum-diesel blends and waste wood chip gas for modified inlet valve and injector nozzle geometry

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ABSTRACT

The present paper briefly elaborates the influence of inlet valve masking (IVM) and nozzle hole configuration on performance, emission and combustion behaviour of a single cylinder water cooled turbo-charged engine fuelled with Calophyllum inophyllum as injected fuel and babul wood chip generated producer gas from a downdraft gasifier as inducted fuel with modified mask angle and nozzle hole configuration keeping compression ratio, speed, injection parameters constant. Experimental results depicted a lower brake thermal efficiency of (2.1%↓ and 3.3%↓) and exhaust gas temperature of (50.3%↓ and 49.6%↓) with increased specific fuel consumption by (3.7%↑ and 4.3%↑) for IVM-90 and 4-hole nozzle. Considering emission characteristics, smoke opacity and nitric oxide were reduced by (42.7%↓ and 48.1%↓) for IVM-90 and (32.4%↓ and 41.7%↓) for 4-hole nozzle, with a marginal increment in carbon monoxide and hydrocarbon by (16.6%↑ and 4.5%↑) for IVM-90, while (16.7%↑ and 6.7%↑) for 4-hole nozzle. Moreover, heat release rate and cylinder pressure were on higher side in contrast to diesel injected single fuel mode. Hence, introduction of valve mask and modified nozzle hole with inducted gaseous fuel in dual fuel mode has proven to be effective in enhancing engine performance and combustion characteristics, thereby reducing emission levels.

KEYWORDS

Calophyllum inophyllum; Babul wood; Inlet valve mask angle; Nozzle geometry; Nitrogen oxide; Smoke opacity

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