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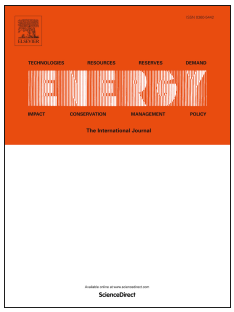

Effects of biodiesel-ethanol and biodiesel-butanol blends on the combustion, performance and emissions of a diesel engine

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Effects of biodiesel-ethanol and biodiesel-butanol blends on the combustion, performance and emissions of a diesel engine

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Abstract

The present study is aimed to investigate and compare effects of biodiesel-ethanol (BE) and biodiesel-n-butanol (BBu) blends on combustion, performance and emissions of a direct-injection diesel engine. Experiments were conducted on BE5 (5% ethanol and 95% biodiesel, v/v), BE10, BE15, BBu5, BBu10 and BBu15, at five engine loads and at 1800 rpm. In regard to combustion characteristics, effects on maximum heat release rate, maximum in-cylinder pressure, start of combustion, combustion duration and coefficients of variations (COVs) of IMEP and maximum increase rate of in-cylinder pressure were investigated. In regard to engine performance, effects on BSFC and BTE were investigated. The blended fuels have adverse effects on engine performance especially at low load, with the BE blends having more adverse effects than the BBu blends. Moreover, on average of the five engine loads, the BBu and BE blends increase CO emission by 13.7% and 22.8% and HC emission by 5.6% and 29.2%, respectively; but reduce NO_x emission by 6.5% and 28.0%, particle mass concentration by 20.7% and 20.6% and particle number concentration by 22% and 21%, respectively. Overall, the BE blends are more effective in reducing particulate and NO_x emissions but the BBu blends would lead to less increase in CO and HC emissions.

Key words: diesel engine; biodiesel; butanol; ethanol; emissions.