

Experimental investigation of hydrated butanol-acetone (BA) and diesel blend as alternative fuel for CI engines

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Abstract

A potential fuel for compression ignition engines (CI) is bio-butanol because of its beneficial physicochemical properties and ability to be produced from agriculture waste by fermentation. The feasibility of using bio-butanol from biomass is not yet clear due to its high production cost caused by low yields and expensive processes for separating it from acetone-butanol-ethanol (ABE), isopropanol-butanol-ethanol (IBE) or butanol-acetone (BA) fermentation. Instead using intermediate fermentation products of butanol (that is ABE, IBE or BA) as a fuel already been found to produce clean combustion. A step in producing these intermediate products is separation of water. It is therefore proposed that water-containing butanol-acetone (BA) as a fuel for CI engines could lead to extra reductions in BA production cost; and could improve the combustion by reducing the temperature. An experimental investigation in a direct injection (DI) diesel engine fuelled with water-containing BA-diesel blends was carried out in this study. The effects of low-purity BA (blend of 9% vol. BA, 1% vol. water blended and 90% vol. neat diesel: BA9W1D90) on combustion, performance, and emissions characteristics were investigated at three engine speeds and full load. The results were compared with neat diesel and a 10% BA-90% diesel blend. The BA9W1D90 blend showed some improvement in brake thermal efficiency. The exhaust gas temperature (EGT), CO, UHC and NO_x emissions were significantly reduced as a consequence of including water in the test blends. Thus, water-containing butanol-acetone (BA) could be a good alternative fuel for CI engines because of its production manner and reduced emissions.