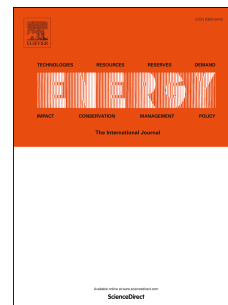


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Influence of Waste Cooking Oil Biodiesel on Combustion, Unregulated Gaseous Emissions and Particulate Emissions of a Direct-injection Diesel Engine

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Abstract

This study investigated the influence of waste cooking oil (WCO) biodiesel on the combustion, unregulated gaseous emissions and particulate emissions of a diesel engine. Experiments were carried out on a direct-injection diesel engine fueled with diesel, B20 (20% biodiesel on volume basis), B50, B75 and biodiesel, under the Japanese 13-mode test cycle.

Biodiesel increases the in-cylinder pressure, shortens the ignition delay and combustion duration, and lowers the maximum heat release rate. An increase of brake specific fuel consumption (BSFC) is also observed when using biodiesel. For brake thermal efficiency (BTE), no significant changes are found in most of the tested modes. Biodiesel increases the weighted brake specific emissions of formaldehyde, acetaldehyde, 1,3-butadiene, propene, ethene, benzene, but reduces the weighted brake specific emissions of toluene and xylene. No significant changes are observed for the ozone formation potential of these unregulated gaseous emissions among the tested fuels. Biodiesel reduces the weighted particle mass concentration (PMC) and the weighted geometric mean diameter (GMD) of the particles, however, significant reductions in the weighted total number concentration (TNC) are only observed when using B75 or biodiesel. Overall, the influence of biodiesel on the investigated emissions is proportional to the biodiesel content in the tested fuels.

Key words: biodiesel; diesel engine; combustion characteristics; unregulated gaseous

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