

Environmental and performance study of diesel engine powered with waste oil biodiesel and its blends

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Abstract

An experimental study has been done to examine the performance and emission of a diesel engine using different blend ratios of waste oil biodiesel (20 %, 40 %, 60 %, 80 %, and 100 %) at different engine speeds, namely 500 rpm, 750 rpm, 1000 rpm, 1250 rpm, and 1500 rpm. At each speed, the engine was operated at no load, quarter, half, three quarters, and full load for different blending ratios. The performance parameters evaluated include Brake Power (BP), Brake Mean Effective Pressure (BMEP), brake specific fuel consumption (BSFC), air to fuel ratio (AFR), excess air factor, brake thermal efficiency, volumetric efficiency and the temperature of exhaust gas whereas exhaust emissions include specific emissions of O₂, CO, CO₂, and NO_x. These parameters were assessed in diesel engine commonly utilized in the agriculture sector. Biodiesel blends result in a decrease of brake power by 30.8 %, decreases in air to fuel ratio by 18 %, decreases in brake thermal efficiency by 21 %, decreases in volumetric efficiency by 10.7 % and increases in brake specific fuel consumption by 32.18 %. The temperature of exhaust gas increases with the biodiesel fuel blends. Specific emission of O₂, CO, and NO_x increases with increasing the percentage of biodiesel in fuel blends. Specific emission of CO₂ decreases with increasing the rate of biodiesel in fuel blends. The results suggest that biodiesel obtained from waste oil could be a decent substitute to diesel fuel in the diesel engine.

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Biography

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