

Enhancing the combustion and emission parameters of a diesel engine fueled by waste cooking oil biodiesel and gasoline additives

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Abstract

The main challenges of utilizing the Waste Cooking Oil (WCO) in diesel engines are that it released a large amount of NO_x level, and it has a high viscosity, high pour point, and low volatility. Therefore, this study aims to scrutinize the impacts of adding gasoline as additives with WCO biodiesel on the combustion, emission, and exergy characteristics of a diesel engine run under various loads and a constant speed of 1500 rpm. The WCO biodiesel is produced employing the transesterification process with assisting of ultrasonic and mechanical dispersion devices, and it is characterized by applying GC-MS and FTIR analysis. The viscosity is diminished by approximately 5%, 11%, and 21% for BG2, BG4, and BG8, respectively. Three blending ratios of 2%, 4%, and 8% gasoline and 98%, 96%, and 92% WCO which are represented as BG2, BG4, and BG8, respectively. The results illustrate that the cylinder pressure and HRR are enlarged with the addition of gasoline with WCO. Fuel exergy rate and exergitic efficiency are heightened with adding gasoline. Engine emissions of CO, UHC, NO_x, and smoke opacity are pointedly diminished by 25%, 30%, 20%, and 30% for WCO-gasoline blends compared to that of pure WCO. It can be deduced that the recommended mixing ratio of gasoline-WCO biodiesel blend is BG8 which achieved a considerable heightening in emission formations, principally NO_x level and providing an acceptance value of fuel consumption.