Emissions and Performance of Straight Vegetable Oils (Jatropha and Neem) Fuelled Direct Injection Compression Ignition Engine

By

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The world energy demand has, for the last two decades, witnessed uncertainties in two dimensions. First, the price of conventional fossil fuels is increasing too fast and has led to additional burden on the economy of the importing nations. Secondly, combustion of fossil fuels has led to increase in the global CO_2 level, leading to global warming. The scarcity and depletion of conventional petroleum sources are also cause of great concern worldwide and have prompted research into alternative energy sources for internal combustion engines. Efforts are under way in several countries, including India, to search for suitable alternative diesel fuels that are environment friendly. Among the different possible sources, diesel fuels derived from triglycerides (vegetable oil/ animal fats) present promising "greener" energy substitutes for fossil fuels. The problem of using straight vegetable oils in diesel engines relates to their higher viscosity compared to conventional diesel.

In present research, experiments are designed to study the effect of reducing vegetable oil's (Jatropha and Neem) viscosity by increasing the fuel temperature on combustion and emission characteristics. Experiments are also conducted using blends of vegetable oils with diesel to study the effect of reduced blend viscosity on emissions and performance of diesel engine. Constant speed, single cylinder, four stroke, water cooled, direct injection diesel engine typically used in agricultural sector of India are used for the experiments. Smoke opacity, CO, CO_2, HC, and O_2 were measured at dufferent load condition along with engine performance parameters such as BSFC, thermal efficiency, BSEC, and exhaust gas temperature.

The test results showed that BSFC, BSEC, exhaust gas temperature, smoke opacity, CO_2, CO, and HC emissions were higher for unheated vegetable oil fuels compared to diesel and preheated vegetable oil fuels whereas thermal efficiency and oxygen were lower for vegetable oils compared to diesel and preheated vegetable oils. While running the engine

on different vegetable oil blends, performance and emissions parameters were very close to diesel for lower concentration blends. But for higher concentration blends, performance and emissions deteriorates.