Performance Measurement of CI Engine using blends of Diesel and Bio-diesel with Additive

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Abstract

Bio-diesel is widely accepted as comparable fuel to diesel in compression ignition engines. It offers many advantages including; higher cetane number, reduced emissions of particulates, CO, NO_X, and hydrocarbons, reduced toxicity, improved safety and lower lifecycle CO_2 emissions. A characteristic of bio-diesel limiting its application is its relatively poor low-temperature flow properties. Improvement of its low-temperature flow characteristic still remains one of the major challenges when using bio-diesel as an alternative fuel for compression ignition engines. The bio-diesel fuels derived from fats or oils compounds display higher cloud points and pour points thus limiting their application. The cold flow properties of different bio-diesel were evaluated with various additives towards the objectives of improving the viscosity, pour point and cloud point. The objective of this research is to determine the relationship between engine performance and emissions using diesel, volumetric blends of Neem bio-diesel and diesel and pure Neem bio-diesel as a fuel in a multi cylinder, four stroke, water cooled, direct injection CI engine. Maximum brake thermal efficiency using diesel, B20, B20X1, B20X2 and B20X3 fuels are 34.67%, 35.58%, 41.6%, 40.47% and 40.96% respectively. B20X1, B20X2 and B20X3 fuel with different additives show improvement in brake thermal efficiency by 1.9%, 1.6% and 1.75% respectively compared to diesel fuel. Maximum brake thermal efficiency using diesel, B40, B40X1, B40X2 and B40X3 fuels are 34.67%, 34.84, 38.95%, 38.048 and 39.96% respectively. B40X1, B40X2 and B40X3 fuel with different additives show improvement in brake thermal efficiency by 1.9%, 1.6% and 1.75%

respectively compared to diesel fuel. Higher brake thermal efficiency are contributed towards oxygen content of bio-diesel helps in complete combustion of fuel. Among all compared fuels, CO emission for B20 is lowest followed by B40, diesel and B100. B20X1, B20X2 and B20X3 fuel with different additives show decrease in CO emission by 7%, 6% and 6.6% respectively compared to diesel fuel. CO emission with B40X1, B40X2 and B40X3 fuel with different additives are lower by 7%, 6% and 6.6% respectively compared to diesel fuel. HC emission is decreased by 5%, 4.5% and 4.8% for B20X1, B20X2 and B20X3 fuels respectively compared to diesel fuel at no load. HC emission is decreased by 17%, 17% and 17.3% for B40X1, B40X2 and B40X3 fuels respectively compared to diesel fuel at no load. It is concluded that B20 fuel shows better engine performance and lower pollutant emission compared to diesel fuel. Fuel additive improves engine performance and lowers pollutant emission of Neem bio-diesel blends.