
Analysis of Emissions of a CI Engine at Varying Load Conditions with Diesel Blended Liquid Fuel Extracted from Waste Polypropylene

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An alternative fuel extracted from waste Polypropylene (PP) using a semi-batch type reactor system was analyzed for feasibility of using in a compression ignition (CI) engine based on engine performance and emissions. The liquid fuel extracted was blended with diesel (varied from 10% to 70% by volume) and used in the study. The variation of CO and CO₂ percentages, NO_x and NO amounts in the emissions at different engine loads (varied from 1000 W to 5000 W) for pure diesel and the blends were investigated. CO percentage was found to be 0.03% at the low load (1000 W load on the engine) and 0.01% at the high load (5000 W load on the engine) for pure diesel whereas for the blended fuel mixtures it was varied between 0.03% and 0.21% at the low load and between 0.01% and 0.06% at the high load. For pure diesel, CO₂ percentage was observed to be 2.6% at the low load and 4.0% at the high load, whereas for the blends it was varied between 2.4% and 2.8% at the low load and between 3.9% and 4.2% at the high load. The average NO_x amount was found to be 84 ppm at the low load and 170 ppm at the high load for pure diesel whereas for the blends it was varied between 33 ppm and 58 ppm at the low load and between 147 ppm and 173 ppm at the high load. Almost similar percentages of CO₂ emissions were observed for all blends and diesel. NO_x and NO emissions were decreased and CO emissions were slightly increased with increasing concentration of waste PP derived fuel in the blends. Performance of waste PP derived fuel in terms of NO_x and NO emissions is acceptable and further improvements of fuel quality is required to reduce CO emissions.

Keywords: Diesel engine, Emissions, Engine performane, Pyrolysis, Waste polypropylene derived fuel