



An Investigation on Performance and Emission characteristics of DI Diesel Engine Fueled with Lemon Peel Oil and its Emulsions

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Abstract : Emulsions of fuels with water are effective in reducing NO_x and particulate matter from diesel engines without any modifications in engine. So considering this as an objective emulsions of water in oil (W/O) type were prepared by taking pure lemon oil which is a non-edible bio-oil as base fuel and water with varying percentages in range of 5-10% with two different emulsifiers span 80 and a new emulsifier Methyl-dihydroxypropylimidazolium chloride having HLB value around 8 with varying quantities by volume. Then the investigations on their stability was done. Electromagnetic stirrer and ultrasonic technique of emulsification was used to prepare the emulsions. Totally eight samples were prepared out of which four samples were prepared with 5% water and remaining four were prepared with 10% water with varying emulsifier & its percentages. The sample with 1.5% of span 80 with 5% water by volume showed good stability with emulsified layer retaining up to approx. 65% and the sample with combined emulsifiers span 80 and Methyl-dihydroxypropylimidazoliumchloride for 5 % water also showed good emulsion stability up to 60% even after 7 days & from the 10% water the sample with combined surfactants span 80 2% and Methyl-dihydroxypropylimidazolium chloride 2% by volume retained its stability up to 60%. The emulsion stability was evaluated based on gravitational or stand still method where the emulsions were kept stand still for 7 days and the separation of layers was measured using measuring cylinders. The sample which exhibited less separation was considered as stable. To assist or validate our stand still method viscosity measurement of test samples was done at interval of each day for seven days using capillary viscometer. Then only stable emulsions samples with 5% water were tested for performance and emissions on single cylinder four stroke water cooled diesel engine in terms of brake power, brake thermal efficiency, brake specific fuel consumption and emissions of CO, HC, NO_x. The results indicated that compared to pure lemon oil the brake thermal efficiency increased because of micro-explosion phenomenon of water and brake specific fuel consumption was increased. NO_x emissions reduced but the HC & CO emission increased due to decreased calorific value of fuel because of addition of water.

Keywords : Emulsions, Methyl-dihydroxypropylimidazolium chloride, Stability, Ultrasonification, Engine performance and emissions HLB.

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