

Experimental investigation of low-level water in waste-oil produced biodiesel-diesel fuel blend

ABSTRACT

Diminishing fuel resources and stringent emission mandates have demanded cleaner combustion and increased fuel efficiency. Three water addition rates, i.e., 2, 4, and 6 wt% in biodiesel-diesel blend (B5) was investigated herein. Combustion characteristics of the emulsified fuel blends were compared in a naturally-aspirated diesel engine at full load and different engine speeds. More specifically, biodiesel was produced from waste cooking oil (WCO) and to further increase waste utilization, recycled biodiesel wastewater was used as additive in B5. The result obtained showed that low-level water addition (i.e., 2 and 4 wt%) in B5 led to different results from those obtained using higher water addition rates (i.e., >5 wt%) reported by the previous studies. In more details, the findings of the present study revealed that low level water addition in B5 could considerably reduce CO, HC, CO₂, and NO_x emissions. Among water-containing B5 fuel emulsions, the optimal water addition level in terms of engine performance parameters and emissions was found at 4 wt%. In particular, the emitted CO₂, HC, and NO_x were decreased by over 8.5%, 28%, and 24%, respectively, at maximum speed of 2500 rpm.

Keyword: Biodiesel; Water additive; Emulsified fuel; Diesel engine; Combustion characteristics