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Performance, Emissions and Combustion Characterization of Biodiesel in a Generator Engine

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Abstract

Alternative energy sources need to be developed in order to meet the increasing demand for fossil fuels. Furthermore, from environmental perspective, these new resources of energy must be environment friendly. Biomass, and particularly vegetable oils, fulfill these imperatives and is seen as a potential substitute for mineral diesel. Base catalysed transesterification is most acceptable process for biodiesel production. In this study, biodiesel produced from Neem oil with high free fatty acid content was characterised for its physical, chemical and thermal properties. Performance, emission and combustion characteristics of this biodiesel and its 20% blend (with mineral diesel) were compared with baseline data of mineral diesel in a direct injection (DI) engine. Brake specific fuel consumption for biodiesel was found to be marginally higher than mineral diesel however biodiesel also showed significant improvement in thermal efficiency at higher engine loads in comparison to mineral diesel. Brake specific CO and HC emissions for biodiesel were lower than mineral diesel at lower engine loads however NO emissions increased significantly in comparison to mineral diesel. Detailed combustion characterisation revealed that combustion starts earlier for biodiesel fuelled engine at all operating conditions but start of combustion was slightly delayed for 20% blend of biodiesel in comparison with mineral diesel. Combustion duration for biodiesel blends was shorter than mineral diesel.

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