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EFFECT OF 1, 4 DIOXANE- ETHANOL DIESEL BLENDS ON DIESEL ENGINE

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Abstract

Ethanol is a bio-based renewable and oxygenated fuel, thereby providing potential to reduce the PM emission in diesel engines and to provide reduction in life cycle CO_2. Although ethanol has been used as fuels oxygenate to reduce tail-pipe emissions in gasoline, its use in diesel has been limited due to technical limitations (i.e., blending). Commercially viable e-diesel is now possible due to the development of a new additive system. 1, 4 dioxane, a new additive allows the splash blending of ethanol in diesel in a clear solution. The objective of this investigation is to first create a stable ethanol-diesel blended fuel with 10% 1,4 dioxane additive, and then to generate transient performance, combustion and emissions data for evaluation of different ethanol content on a diesel engine with and without thermal barrier coating. A single-cylinder, air-cooled, direct injection diesel engine developing a power output of 5.2 kW at 1500 rev/min was used. Base data was generated with standard diesel fuel. Subsequently three fuel blends, namely 70D: 20E:10Dy, 65D: 25E:10Dy and 60D: 30E:10Dy percentage by volume were prepared and tested. Engine performance and emission data were used to optimize the blends for reducing emission and improving performance. Results show improved performance with blends compared to neat fuel for all conditions of the engine. However, 70D: 20E:10Dy blends recorded a maximum brake thermal efficiency of 36.4%. Drastic reduction in smoke density was observed with the blends as compared to neat diesel. Peak pressure and rate of pressure rise were increased with increase in ethanol ratio due to improved combustion rate. Heat release pattern show higher premixed combustion rate with the blends. Higher ignition delay and lower combustion duration were found with all blends than neat diesel fuel.

Keywords: Oxygenated fuel, additive, alternate fuels, performance, emission and combustion characteristics