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PERFORMANCE AND EMISSION CHARACTERISTICS OF CERAMIC HEATER IGNITION ENGINE USING SUSTAINABLE BIODIESEL BLEND WITH AWSE AND RUBBER SEED OIL ADDITIVE

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Abstract

This study evaluates the performance and emission characteristics of diesel engines fueled with Agricultural Waste Sugarcane Ethanol (AWSE) blends, with and without a 5% rubber seed oil ignition improver additive. The Brake Specific Fuel Consumption (BSFC) was reduced when AWSE was used, particularly at higher engine loads, due to improved vaporization facilitated by a ceramic heater. Blends with the additive showed a 10.2% to 31.5% reduction in BSFC, while those without the additive exhibited an increase of 2.3% to 10.6%. Brake Thermal Efficiency (BTE) was highest at 27.9% with AWSE at specific engine loads, showing improved combustion efficiency compared to pure diesel. Internal Thermal Efficiency (ITE) also showed enhancement with AWSE blends, reaching up to 31.9% under certain conditions. Carbon Monoxide (CO) emissions decreased at higher loads for AWSE blends, with reductions of up to 17.1% compared to diesel. Hydrocarbon (HC) emissions were initially higher but significantly reduced at peak loads. Nitrogen Oxide (NOx) emissions varied but generally increased with engine load due to higher combustion temperatures. Notably, the inclusion of AWSE resulted in a significant reduction in smoke emissions, with the coefficient decreasing from 0.1 to 0.893 for different blend ratios. The results suggest that AWSE, especially with the rubber seed oil additive, offers promising engine performance and emissions improvements, particularly in reducing smoke and CO emissions, making it a viable alternative fuel for diesel engines.

Key words: agriculture waste sugarcane ethanol, ceramic heater, diesel blend, emission characteristics, engine performance, rubber seed oil

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