

Generators are noisy, emit toxic fumes, accelerate global warming, and vibrate excessively. In the process, they impair human health, reduce the life of buildings and machines present in their vicinity, and warm up our planet. This study has been conducted to compare diesel with diesel-alcohol blends from standpoints of fuel's physical and chemical properties, stability of diesel-alcohol blends, engine combustion, engine performance, noise and vibrations, and engine emissions. This was for two reasons. One, diesel engines are noisier and vibrate more relative to gasoline engines. Two, there is little data present in open scientific literature in this context. This research work's comprehensiveness, and also its special focus on noise and vibration characteristics of alcohol-diesel blends, makes this investigation markedly different from earlier investigations. Towards this goal, 18 different diesel-alcohol blends were evaluated as potential candidates for partially replacing diesel using a single cylinder four stroke CI genset engine. Three different alcohols, methanol, ethanol, and n-butanol, were used for preparing these blends. For certain formulations, co-solvents like dodecanol, and butanol, were used to eliminate phase separation problem of the blends. The engine was run at a constant speed of 1500 rpm. However, investigations were conducted at six different loads. An elaborate experimental setup was developed to record data needed for calculating engine performance, combustion, noise, vibration, and emission characteristics from the engine fuelled by these 18 different diesel-alcohol blends. Prior to running tests on the engine, each test blend was characterized for its phase stability, density, calorific value, viscosity, oxidation stability, and corrosiveness. Experimental data were analyzed in detail and explained in terms of physical phenomena occurring in the engine. Detailed analyses were conducted to establish linkages between specific fuel behaviors from standpoints of noise, vibrations, performance, emissions, and combustion to its physical and chemical properties. Results showed strong correlations between trends related to noise, combustion, emissions, and engine performance parameters. Experimental data were also analyzed to understand the effect of inherent fuel oxygen content of alcohols on these parameters. In an overall sense, it was found that most of the test fuels could partially replace diesel for genset applications, if they are found to be economically viable as well.