Energy demand in India has increased rapidly in last decade due to improvement in overall living standards, high growth rate, increased usage of vehicles and gen-sets. India is one of the largest consumers of petroleum products in Asia-Pacific region. However, it depends on imports for major part of its total transport energy requirements. These imports are a burden on the economy, and adversely affect India's development. In this regard, oils non-edible oilseeds such as Karanja and Jatropha, and edible oil seeds such and Rapeseed and Soybean offer significant promise. Since these oils have considerably higher viscosity than conventional diesel, they are either converted into biodiesel via transesterification process and then used as biodiesel-diesel blends, or they are directly mixed with diesel and used as vegetable oil-diesel blends. Given the fact that these oil seeds are cultivated in India in large amounts, and also the fact that Karanja and Jatropha are suitable for cultivation in arid and hot areas, there is a need to evaluate the viability of using their oils as alternative fuels for gensets. From a technological standpoint, the analysis should evaluate the performance, emissions, noise, and vibrations characteristics of a CI genset engine run on biodiesel-diesel blends, and vegetable oil-diesel blends.

Initial investigations were carried out for the measurement of important fuel properties including density, viscosity, and calorific value for all test fuels. This was followed up by detailed investigations of spray characteristics for different test fuels. Finally, and most importantly, an exhaustive suite of experiments were conducted to understand performance, emissions, noise, and vibration characteristics for the test engine run on 12 different biofuel-diesel blends. Four of the fuels studied were 20% blends of different vegetable oils (Karanja (K20), Jatropha, Rapeseed, and Soybean) and diesel. These blends are named as K20, J20, R20, and S20, respectively. Then there were 20% blends of four different biodiesels derived from Karanja, Jatropha, Rapeseed, and Soybean. These blends are named as KB20, JB20, RB20, and SB20. Finally, we also tested pure biodiesels for Karanja, Jatropha, Rapeseed, and Soybean. These are named as KB100, JB100, RB100, and SB100.Characteristics of these test fuels were compared against that of mineral diesel. Biodiesel properties such as viscosity and density significantly affect spray characteristics, resulting in relatively inferior spray atomization compared to mineral diesel. Biodiesel showed slight improvement in noise and vibration characteristics due to reduction in HRR max because of higher SMD of spray droplets compared to mineral diesel. Biodiesel engine emitted lower HC and NO x emissions, while CO emission and smoke opacity were relatively higher compared to mineral diesel, along with slight reduction in BTE. Finally, it is recommended to use 20% biodiesel blend in a single cylinder genset engines because it improved most engine characteristics.