

# Utilization of Bio-fuel (Jatropha Bio-diesel and bio-ethanol) in Compression Ignition Engine

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**Abstract**—Bio-diesel is a fuel, made from natural (biological) renewable resources which can be used directly in conventional diesel engines. It can be produced from edible oils such as palm oil, soybean oil, rape seed oil, sunflower oil and some other vegetable oils; animal fats and non-edible oils like jatropha, castor beans by the process of transesterification of the vegetable oil or animal fat feedstock. The Jatropha plant can reach a height up to 5 m and its seed yield ranges from 7.5 to 12 tonnes per hectare per year. The oil content of whole Jatropha seed is 30-35% by weight basis. Preparation of bio diesel from jatropha requires a two-step approach; the extraction of the jatropha oils from the seed, and the conversion of the extracted oil to biodiesel. Biodiesel can be used in pure form (B100) or may be blended with petroleum diesel at any concentration in most modern diesel engines. The calorific value of bio diesel is about 37.27 MJ/L. The flash point of bio diesel ( $>130^{\circ}\text{C}$ ) is significantly higher than that of petroleum diesel ( $64^{\circ}\text{C}$ ) or gasoline ( $-45^{\circ}\text{C}$ ). Bio diesel has a density of  $\sim 0.88\text{ g/cm}^3$ , less than that of water. Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) has attracted a lot of attention as a transport fuel because it is relatively cheap non-petroleum-based fuel. Also, the emissions from the combustion of ethanol are much less than for fossil fuels. Ethanol production from sugarcane is one of the easiest and most efficient processes since sugarcane contains about 15% sucrose. The normal yield of ethanol is about 8.73 litres of alcohol per tonne of cane. Ethanol is a much more superior fuel for diesel engines as its cetane number is 8. Ethanol calorific value 26880 kJ/kg is considerably higher than methanol 19740 kJ/kg.