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Performance and emission characteristics of algae oil in diesel engine

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ABSTRACT

This paper aims to reduce the air pollution in diesel engine by various blending Biodiesel. The algae blooms collected from the lake and pond. The algae oil products extract from the algae bloom by an extraction process, then the algae oil mixed with the diesel at the range of B5, B15, B25. Blending oil performance is compared with the diesel aid of VCR engine. The mechanical efficiency and thermal efficiency analyzed on Biodiesel using engine setup. The emission characteristics like CO emission and CO₂ emission of Biodiesel investigated in the VCR engine at various testing conditions. Based on the results can able to justify the blended Biodiesel can reduce the environmental pollution and also provide better efficiency compared with the diesel product.

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1. Introduction

Today's world, the fuel cost is very high due to the oil demands. The emission levels of diesel and petroleum by-products are very high, like NO_x, HC, CO, and CO₂. Biodiesel products can be done by various sources like waste cooking oil, animal fat, vegetable oils, and algae oil. The main aim of the biodiesel production is to reduce the demand at least 50 percent of the petroleum product. Especially the petroleum product has reduced the more waste due to the incomplete fuel combustion. The transesterification process needs to produce the Biodiesel from the microalgae *Chlorella Vulgaris* done with potassium hydroxide and methanol Kirloskar single-cylinder engine used to analyze the total consumption brake thermal efficiency and emission characteristics [1–4]. The Biodiesel prepared from the microalgae *scenedesmus obliquus* by the Transesterification process. B10 and B20 compared to produce high-quality Biodiesel to emission reduction and increase thermal efficiency [2–4] Fig. 1.

This paper aims to replace the Biodiesel for the conventional petroleum and diesel with maintain good lubricates and clean burns ability B10 and B20 blends created by the process of Transesterification, the blends carried under the test like emission testing thermal efficiency [3–6]. Based on the above literature articles, different

blended materials used to producing Biodiesel and analyse the efficiency and emission characteristics. Most of the blended materials are very rare and difficult for collecting. Here we can collect enormous and easily collect the algae oil in lake and pond areas. So this paper was propose the algae oil used to produce the Biodiesel and analyze the mechanical, thermal, and emission characteristics.

2. Methodology

The analysis is carried out by the direct injection diesel engine - with various proportions of blending oil. The different proportions are 10%, 20%, and 30% biodiesel mixed with petroleum products. The results compared with the base fuel like petrol and diesel. Fig. 2 shows the step by step process of biodiesel production Fig. 3.

The unburned fuels make a high degree of exhaust gas temperature, which created a harmful effect on the ozone layer [5]. The transesterification procedure is not useful when the Free Fatty Acid (FFA) level is more than 3%. There is a drastic increase in smoke emission.

After the transesterification process, the blending of oils done in different ratios, such as (B5, B15, and B25). In B5, (1900 ml of diesel + 100 ml of Biodiesel) is mixed in the proportion. In B15, (1700 ml of diesel + 300 ml of Biodiesel) is mixed in the ratio. In B25, (1500 ml of diesel + 500 ml of Biodiesel) is mixed in the proportion. The properties of the diesel and blended oils listed in Table 1 and 2.

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