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Investigate the performance analysis of karanja biodiesel in diesel engine

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ABSTRACT

The current work shows that the performance characterization of the blended fuel in diesel engines improves and lowers Hydrocarbon and Carbon monoxide. The karanja seeds oil used to mix the diesel with various percentage. The setup was created to investigate the performance function, combustion range, and emission characteristics of diesel engines using Pongamia methyl ester. Under various load circumstances, the combustion characteristics such as cylinder pressure and heat release rate, peak heat release rate, ignition delay, combustion duration, and exhaust gas emissions of NO_x, CO, CO_2, HC, smoke, and O_2 have been studied.

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1. Introduction

In the present situation, fuel consumption is slowly rising, creating a high demand for transportation and industries. The vegetable and animal fate oil has become the alternative one for the fuel requirement [1,2]. Long-term use of vegetable oils, on the other hand, has been shown to produce difficulties, including high viscosity and carbon deposition in different parts of the engine due to high viscosity and carbon residue [3]. The engine power is roughly the same when 100% vegetable oils are used in a diesel engine, but the thermal efficiency is somewhat lower [4]. Compared with diesel, Daily fried oil has poor solubility, which has been used to reduce the NOx emission range. So based on the existing report, the fried oil has blended with the diesel and used in the diesel engine can reduce the HC and CO [5].Fig. 1Fig. 2Fig. 3

Emission production level is maximum while using the coconut and neem oil in the diesel engine. They found that its thermal braking efficiency is lower because vegetable oil has a lower calorific value than diesel [6,7]. The waste cooking oil blended with diesel, which can reduce the emission of CO, HC [8,9]. For Analyzing the diesel engine performance, running on coconut oil under various operating circumstances. According to reports, coconut oil had a peak thermal efficiency of 28.67%, whereas diesel had 32.51% [10,11]. The performance of a diesel engine using clean Jatropha oil under various conditions such as injection 18 timing, injector opening pressure, and swirl level. They observed that advancing the injection time by three degrees increased the ignition delay, slowly increased the Brake Thermal efficiency, and reduced HC. Based on the above study, indirect fuel injection produces a better result than the direct injection of diesel oil.

2. Materials methodology

The fuel model's chosen compression ignition engine investigation was developed to assess performance, emission, and combustion characteristics under various operating circumstances [12,13]. The details of the equipment utilized, such as the engine, dynamometer, fuel, and airflow measurement systems, emission measuring devices, and cylinder pressure measuring systems, are discussed in this work [14,15]. The engine's braking power was measured using a swinging field electrical dynamometer. A 5 KVA AC Alternator is used in this electrical dynamometer (220 V, 1500 rpm). The engine's technical parameters are listed in Table 1.

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