EXPERIMENTAL INVESTIGATION OF BIO-DIESEL FROM PAPAYA SEED OIL AS A FUEL IN DIESEL ENGINE

Umapathi D

Dr.A.P.J. Abdul kalam centre for advanced research, Adhi College of Engineering and Technology, Kanchipuram, Tamil Nadu, India
umapathi.mech@adhi.edu.in

Abstract

The continuous use of petroleum sourced fuels is now widely recognized as unsustainable because of depleting supplies and the contribution of these fuels to the accumulation of carbon dioxide and carbon monoxide in the environment. The papaya seed oil is used to extract the bio-diesel. The extracted bio diesel is blended with sole fuel and B25% blend has been selected. The reason is that with B25% blend the engine can run without any modification in the operational parameters such as injection timing and injection parameters. In order to enhance the performance of the engine with bio-diesel. The blends tested in this study are B25%, B50%, B75% and B100%.

The investigation was carried out in the single cylinder water cooled diesel engine with the sole fuel blended with papaya seed oil and the engine performance and emission characteristics will be analyzed. From the experimental investigation it is observed that the brake thermal efficiency increased for B25% blend by 3.31% when compared to that of sole fuel. The CO, HC, Smoke are found to decrease with the B25% blend with increase in NO_x emission.

Keywords — Bio diesel, Papaya seed oil, Thermal efficiency, Diesel engine.

I. INTRODUCTION

Biodiesel is an alternative fuel for diesel engines that is produced by chemically reacting a vegetable oil or animal fat with an alcohol such as methanol. The reaction requires a catalyst, usually a strong base, such as sodium or potassium hydroxide, and produces new chemical compounds called methyl esters. It is this esters that have come to be known as biodiesel.

Because its primary feedstock is a vegetable oil or animal fat, bio diesel is generally considered to be renewable. Since the carbon in the oil or fat originated mostly from carbon dioxide in the air, biodiesel is considered to contribute much less to global warming than fossil fuels. Diesel engines operated on biodiesel have lower emissions of carbon monoxide, unburned hydrocarbons, particulate matter, and air toxics than when operated on petroleum-based diesel fuel.

The objective of this work is to describe the processing and production of biodiesel by transesterification and pyrolysis process.

A. History of Biodiesel

The diesel engine came into its existence in the year 1893 when the paper titled "The theory and construction of a rational heat engine" was published by a great German inventor Dr. Rudolph Diesel. The use of vegetable oil was first started by Rudolph Diesel. He developed the first diesel engine working on peanut oil at the World's Exhibition in Paris, 1900. The main focal points for biodiesel production to expand were the oil seed crops. Until 1920s vegetable oils were utilized as the source of energy in the diesel engine. The factors like profitability, availability, low sulfur content, low aromatic content, biodegradability and renewability makes vegetable oils more advantageous over diesel fuel. At present higher market values for challenging uses restricted the utilization of crops for biodiesel production.

B. BACK GROUND

At current production levels, biodiesel requires a subsidy to compete directly with petroleum-based fuels. However, federal and state governments are providing incentives that encourage the rapid growth of the biodiesel industry. Current production levels are 20-25 million gallons/year, but achieving current European levels of 500 million to 1 billion gallons/year should be feasible.

The combined vegetable oil and animal fat production in the United States totals about 35.3 billion pounds per year. This production could provide 4.6 billion gallons of biodiesel. However, the annual consumption of on-highway diesel fuel in the United States is about 33 billion gallons. If all of the vegetable oil and animal fat produced in the U.S. were available to produce biodiesel, it would only displace about 14% of the current demand for on-highway diesel fuel.

II. LITERATURE REVIEW

Knothe (2005) have investigated how ethyl esters were proposed as diesel fuel substitutes as early as 1937 in the Belgian Congo. Widespread investigation of these esters did not occur until the late 1970s and early 1980s when high petroleum prices inspired extensive research into alternative fuels. Vegetable oils were proposed as diesel fuels but were found to be problematic due mostly to their greater viscosity. Problems were found with piston and injector deposits and crankcase oil dilution and resultant oil thickening. Conversion of the oils to their alkyl esters reduced the viscosity to near diesel fuel levels and produced a fuel with properties that were similar to petroleum based diesel fuel and which could be used in existing engines without modifications.