Experiment Investigation on Use of Vegetable Oils as I.C. Engine Fuels- A Review

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Abstract— The mounting industrialization and motorization of the planet has led to a vertical rise for the demand of petroleum products. Petroleum based fuels are obtained from limited reserves. These finite reserves are highly intense in certain regions of the planet. Therefore, those countries not having these resources are facing a foreign exchange crisis, mainly due to the import of crude oil. Hence, it is necessary to look for alternative fuels, which can be produced from materials available within the country. In addition, the use of vegetable oil as fuel is less polluting than petroleum fuels. This paper reviews the production and characterization of vegetable oil as well as the experimental work carried out in various countries in this field. In addition, the scope and challenge being faced in this area of research are clearly described.

Keywords: Vegetable Oils, I.C. Engine Fuels

I. INTRODUCTION

Bio-diesel, which can be used as an alternative diesel fuel, is made from renewable biological sources such as vegetable oil and animal fats. It is biodegradable, non-toxic and possesses low emission profiles. Also, the uses of bio-fuels are environmentally beneficial. The name bio-diesel was introduce in the United States during 1992 by the National Soy Diesel Development Board (presently National Bio-diesel Board) which has pioneered the commercialization of biodiesel in the US. Chemically, bio-diesel is referred to as the mono-alkyl-esters of long-chain-fatty acids derived from renewable lipid sources. Bio-diesel is the name for a variety of ester based oxygenated fuel from renewable biological sources. It can be used in compression ignition engines with little or no modification [1].

II. LITERATURE REVIEW

A great number of experiments were passed out with vegetable oils as a replacement of I.C. engine fuel by researchers from various parts of the planet. Most of these experiments were reported from US, Europe, India, Malaysia and Germany. A summary of these experimental grades is given below.

Tadashi et al. [2] evaluated the feasibility of rapeseed oil and palm oil for diesel fuel in a naturally aspirated direct injection diesel engine. It was found that vegetable oil fuels gave an acceptable engine performance and exhaust emission levels for short-term operation. However, they caused carbon deposit build ups and sticking of piston rings with extended operation.

Ghormade et al. [3] used soyabean oil as fuel to run a compression ignition engine. He found that there was only a slight variation in part load efficiency. And there was no improvement in brake specific fuel utilization by combination. Pangavhane et al.

Masjuki et al. [4] used preheated palm oil to run a compression ignition engine. Preheating reduced the viscosity of fuel and hence improved spray and atomization characteristics were obtained. Torque, brake power, specific fuel consumption, exhaust emission and brake thermal efficiency were found to be similar to that of diesel.

Prasad et al. [5] used the esterified jatropha oil to conduct experiments on I.C. engines. It has been reported that NOx and smoke decreased with an increase in engine speed. Abbas et al.

III. METHODOLOGY

A single cylinder engine with various types of vegetable oils. Some of the results obtained by them are presented here in the form of bar charts. These figures give a very good comparison of I.C. engine performance when various vegetable oils are used as fuel.

The engine was operated at 1300 rpm. Diesel fuel performance was used as refer- ence. The observed maximum torque differences between the reference value and peak values of the vegetable oil fuels were about 10% obtained with that of raw sunflower oil, raw soyabean oil and opium poppy oil fuels (Fig. 1). The maximum power differences between the reference value and peak values of the vegetable oil fuels were about 18% obtained with raw cottonseed oil and raw soyabean oil fuels (Fig. 2). The minimum torque and power difference was about 3% between refer- ence value and oils. These results may be due to the higher viscosity and lower heating values of vegetable oils.

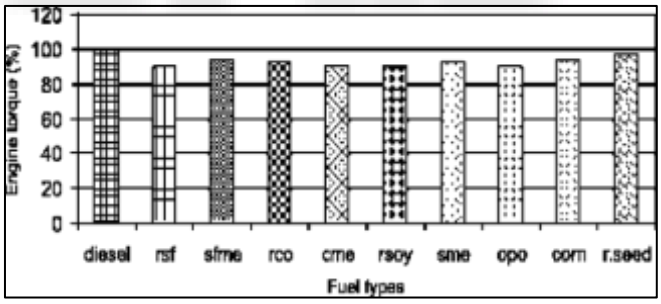

Fig. 1: Maximum engine torque o btained at 1300 rpm.

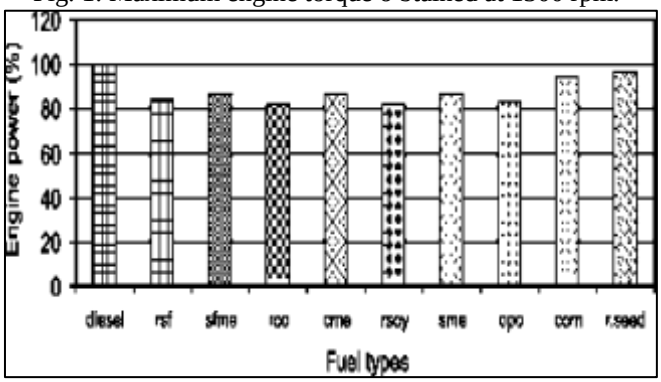

Fig. 2: Maximum engine power obtained at 1300 rpm.

IV. CONCLUSION

Researchers in a variety of countries approved out a lot of experimental works using vegetable oils as I.C. engine fuel substitutes. These results showed that thermal efficiency was similar to that of diesel with small amounts of power loss while using vegetable oils. The particulate emissions of vegetable oils are senior than that of diesel fuel with a reduction in NOx. Vegetable oil methyl esters gave performance and emission explanation comparable to that of diesel. Hence, they may be considered as diesel fuel substitutes. Raw vegetable oil can be used as fuel in diesel engines with some minor modifications. The use of vegetable oils as I.C. engine fuels can play a vital role in helping the developed planet to reduce the environmental impact of fossil fuels.

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