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PERFORMANCE CHARACTERISTICS OF THE DIESEL ENGINE FUELLED WITH PALM OIL BIODIESEL

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ABSTRACT

In this research work the biodiesel used are palm oil methyl ester consists of a mixture of triglyceride and free fatty acids. The results show that better brake thermal efficiency is obtained as 28.82% for blend B100 at full load conditions. The increase in brake thermal efficiency is obtained by increasing the load conditions. Also higher brake thermal efficiency is obtained by increasing the blend proportions. The minimum specific fuel consumption is obtained at full load conditions for blend B100.Overall, the blend B100 shows better brake thermal efficiency and lower specific fuel consumption compared to conventional diesel fuel.

Keywords: Biodiesel, Palm oil, Brake thermal efficiency, Specific fuel consumption.

I. INTRODUCTION

Palm oil is the second most traded vegetable oil crop in the world, after soy , and over 90% of the world's palm oil exports are produced in Malaysia and Indonesia . Palm oil is still mostly used in the manufacture of food products and is found in one in ten products sold in UK supermarkets. However, palm oil is now starting to be used as an ingredient in bio-diesel and as a fuel to be burnt in power stations to produce electricity. This is a new market for palm oil which has the potential to dramatically increase global demand for this commodity. The development of the oil palm industry in Indonesia and Malaysia has brought economic benefits to both these countries. However it has also generated considerable environmental and social costs. The development of oil palm plantations is one of the biggest causes of rainforest clearance. The palm oil industry has already set up 6.5 million hectares of oil palm plantations across Sumatra and Borneo but it is estimated that it is probably responsible for the destruction of 10 million hectares of rainforest. By clearing the forest first, plantation companies can offset the start up costs of their plantations. The profits are so large that some oil palm companies clear the land and don't even bother to set up the plantation. There is therefore a strong incentive for oil palm companies to seek concessions and access to land that is heavily forested. Oil palm plantation development also poses the greatest threat to the survival of many species, including the orang-utan. Oil palm plantations could be responsible for at least half of the observed reduction in orang-utan habitat in the decade between 1992 and 2003. Tropical deforestation due to agricultural expansion, logging and infrastructure development already contributes between 10 and 30 per cent of greenhouse global emissions. The clearance of rainforest to make way for oil palm plantations is exacerbating this problem. In addition, oil palm plantation companies in Indonesia have been identified as one of the chief culprits in setting forest fires over the last 10 years. These occur every year in Indonesia and release huge quantities of carbon into the atmosphere. In one of the worst fire incidents between 1997 and 1998 it is estimated that the emissions from the forest fires in Indonesia were equivalent to 40% of all global emissions from burning fossil fuels that year.11 The development of oil palm plantations has also often benefited large companies at the expense of local communities who can lose their land and access to important forest resources and ecosystem services. 12 In Indonesia over 100 million people depend upon access to rainforest resources for their survival. The rapid expansion of the oil palm industry in Indonesia has all too often been associated with community exploitation and corporate greed rather than sustainable development.

II. MATERIALS & METHODS

Production of biodiesel

Transesterification (alcoholysis) is a reversible reaction in which one ester is converted into another by interchange of ester groups. In the reaction one mole of triglyceride oils contained in vegetable oils, animal fats, or recycled greases, reacts with three moles of alcohol to form one mole of glycerol (glycerin) and three moles of the fatty acid alkyl ester (biodiesel). In order to shift the equilibrium to the right, an alcohol, typically methanol is added in an excess over the stoichiometric amount, but ethanol can also be use. The two main products, glycerol and fatty acid methyl/ ethyl esters (FAME/FAEE), are hardly miscible and thus form separated phases: un upper ester phase and a lower glycerol phase. Glycerin is used in many household products such as: cosmetics, plastics, lubricants, and antifreeze

III. EXPERIMENTAL SETUP

The engine is run with various load conditions and the time taken for 10cc fuel consumption is measured. The engine set up is shown in Fig 1 and the loading is done by with electrical loading setup.

Fig 1 Experimental set up

The experiment was conducted at various load conditions and CRANK ANGLE - 20.36° BTDC and better results are obtained. The blends used are B20 to B100 at various load conditions

IV. RESULTS & DISCUSSION

Brake thermal efficiency

The BTE for various blend proportions for various load conditions are shown in figure 2.The BTE found increased with increase in blend proportions as well as increase in load. The BTE for B20, B40, B60, B80 and B100 are 12.8, 24.2, 26.5, 28.5 and 31.2% respectively at full load conditions. The more amount of fuel injected into cylinder due to lower calorific value of fuel is the reason for the increase in BTE.

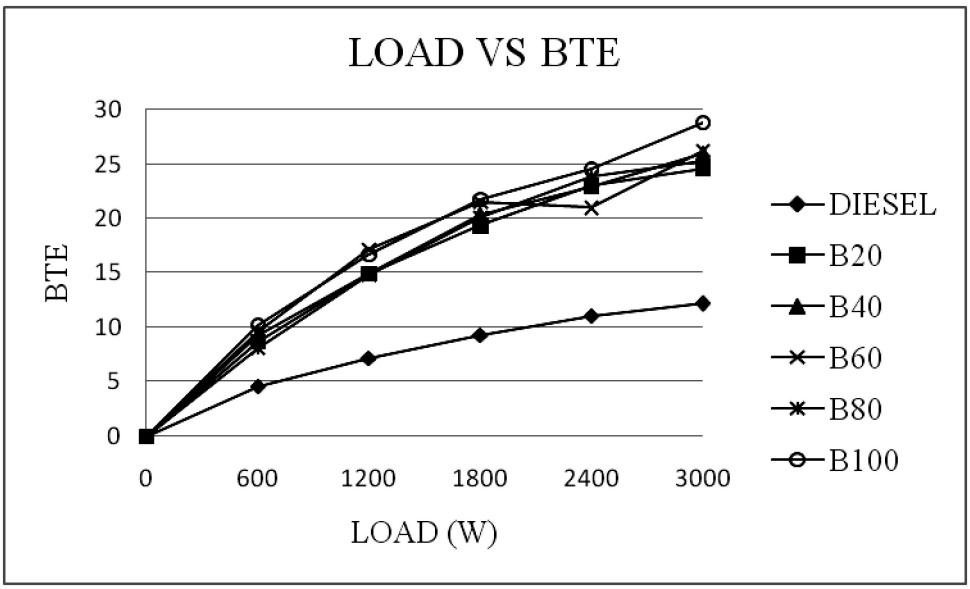

Fig 2 Brake thermal efficiency for various load conditions at CA 20.36° BTDC

Specific fuel consumption

The specific fuel consumption for various blend proportions for various load conditions are shown in figure 3. The specific fuel consumption found decreased with increase in blend proportions as well as increase in load. The decrement in specific fuel consumption is found by increasing the blends at full load conditions.

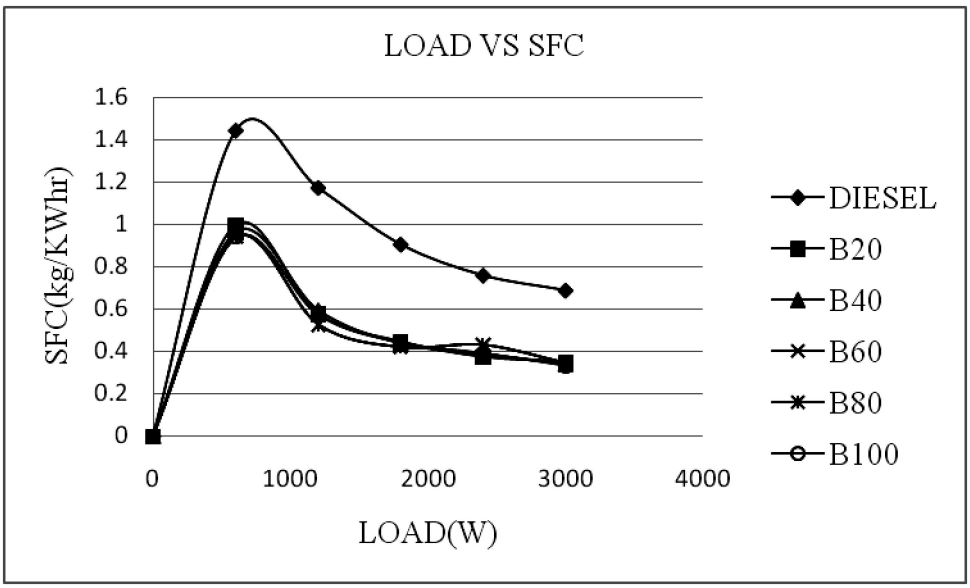

Fig 2 Specific fuel consumption for various load conditions at CA 20.36° BTDC

V. CONCLUSION

In this research work the biodiesel used are palm oil methyl ester at various load conditions and for various blend proportions. The results show that increase in brake thermal efficiency is obtained as 29.92% for blend B100 at full load conditions. The increase in brake thermal efficiency is obtained by increasing the load conditions, the higher oxygen content in biodiesel results better brake thermal efficiency. The minimum specific fuel consumption is obtained at full load conditions for blend B100 as compared to diesel. Overall, the biodiesel blends shows better brake thermal efficiency and lower specific fuel consumption compared to diesel fuel.

VI. REFERENCES

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