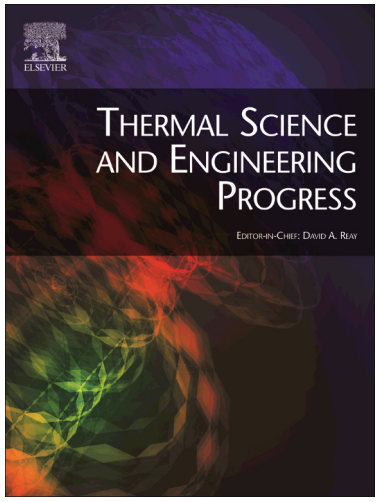

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Experimental Analysis on Performance of Diesel Engine using mixture of Diesel and Bio-Diesel as a Working Fuel with Aluminum Oxide Nanoparticle Additive

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Abstract: Petroleum products such as petrol and diesels are being used as a fuel to the running of Internal Combustion Engines. Day by day demands for the petroleum products is increasing since its rate of consumption is increasing. If the trend will continue the whole world may suffer from shortage of petroleum products. Therefore it is necessary to find different ways of reducing fuel consumption and at the same time to improve the performance of IC engine; it is necessary to find out some additives to mix it with the mixture of petroleum product and alternative fuel and one can formulate a new fuel.

So the project's focus is given to improve the performance of CI engine using diesel and bio-diesel by adding appropriate amount of nano-aluminum oxide (n-Al_2O_3). An experimental investigation was carried out to find out the performance of Single cylinder, 4 stroke diesel engine using Jatropha oil bio diesel and n-Al_2O_3 mixed diesel. The n-Al_2O_3 of size < 50 nm was mixed into the mixture of diesel and bio-diesel at the rate of 0.25g/l, 0.5g/l, 0.75g/l and 1.00 g/l for formulation of new fuels. Nano-Al_2O_3 posses better combustion characteristics and enhanced surface area to volume ratio which results in better oxidation of the fuel mixture and hence enhances the combustion sufficiency of the test fuel. The diesel fuel without and with Jatropha oil bio-diesel and n-Al_2O_3 additive were tested in a direct injection diesel engine at different load conditions and results shown a considerable enhancement in the brake thermal efficiency compared to mixture of diesel and bio-diesel without n-Al_2O_3 because the additive has improved degree of mixing with air and better combustion characteristics. By the project it had been found the better results while using n-Al_2O_3 nano particle as an additive.

Key words: Petroleum products; Diesel engine; diesel; bio-diesel; nano-aluminum oxide (n-Al_2O_3); brake thermal efficiency.

I. INTRODUCTION

The Automobile sector is one where no one alternative source of energy is there till now that can help to produce same amount of mechanical energy produced by petroleum product and therefore number of researches are going on now a days to find the alternative of the petroleum products. Bio-origin fuels have been found as a possible alternative energy source to fulfill the above demand in automobile sector. Using biodiesel as a fuel results in less pollution to environment according to different researches, but it is unable to give same brake power or thermal efficiency what we get with pure petroleum products because of increase in knocking. Yetter et al. have critically examined and reported that nano size metallic powder posses high specific surface area and and potential to accumulate energy which helps to high reactivity [13]. According to their article the ignition delay in CI engine can be reduced by adding nano catalyst to the diesel fuel and it also helps to reduce soot emission as per the article. Experimental analysis of fuel mixed with metal oxide revealed increased catalytic behavior since it causes better oxidation of hydrocarbons and against NO_x formation acts as an oxygen buffer. S.P. Venkatesan; in his article "Influence of Aluminum Oxide Nanoparticle Additive on Performance and Exhaust Emissions of Diesel Engine" he observed the performance of diesel engine using diesel as a fuel and n-Al_2O_3 mixed with it and he found that improved brake thermal efficiency as compared to diesel engine working with pure diesel and he found also reduced HC and NO_x emissions as per his article [1].

However use of biodiesel help us for lesser environment pollution but it increases knocking and results lower brake power and brake thermal efficiency as compared to diesel engine run with pure diesel, Indian railway has already faced such type of problems. From above discussion it is found that n-Al_2O_3 may help to improve the performance of the diesel engine using biodiesel blended diesel as a fuel. Hence the objective of the present work is to formulate a new fuel preparation using n-Al_2O_3 as an additive in different proportion to mix it with bio-diesel and diesel mixture (20% bio-diesel and 80% diesel) and using this fuel find out the performance of diesel engine under different load conditions and constant running speed and compare it with that of pure diesel and with B20. Jatropha bio diesel has taken for the project work.

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