STUDY ON PERFORMANCE AND EMISSIONS CHARACTERISTICS OF DIESEL ENGINE FUELLED WITH DIFFERENT BLENDS OF BIODIESEL ALONG WITH DIFFERENT NANO ADDITIVES- A REVIEW

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Abstract: This paper describes about the effect of different nano additives on performance and emission characteristics of diesel engine fuelled with different blends of biodiesel. This study is based on the previous published research articles. It was reviewed that by using nano additives with blend of biodiesel the performance characteristics were improved significantly but the exhaust emissions were more reduced compare to the blend of biodiesel. The nano additives act like a catalysts for combustion of Biodiesel in diesel Engine. It was reported that the Mechanical efficiency and Brake thermal efficiency were improved significantly by using nano additives with blend of biodiesel compare with the blend of biodiesel. The Brake specific fuel consumption was reduced by using nano additives with blend of biodiesel compare with blend of biodiesel. It was reviewed that the HC, CO, NOx emissions were reduced by using nano additives with blend of biodiesel compare with blend of biodiesel, not only that the smoke levels from exhaust are also reduced.

Keywords- Blend of Biodiesel, Exhaust Emissions, Nano additives, Performance

I-INTRODUCTION

The consumption and demand of petroleum products are increasing day to day with increase of vehicles and urbanization. By using the petroleum products the emissions are also enormously increased. So to decrease the consumption and emission of petroleum products we are replacing the petroleum products with the alternative fuels. The alternative fuels are renewable and eco-friendly. One of the drawbacks of alternative fuels is the heating value of fuel. The alternative fuel has lower heating values compare to diesel. To overcome this problem in alternative fuels we are doing blending process with the petroleum products. Another drawback in the biodiesel is the oxygen content; the biodiesel has less oxygen content with this we cannot get complete Combustion. The efficiency of Diesel Engine is also depend up on the rate of combustion take place in the Engine. Not only are that if the fuel in the Engine does not burnt completely the exhaust emissions also more. To overcome this draw back we are adding nano additives for biodiesel to enhance the combustion characteristics compare with the biodiesel. The nano additives acts as a catalyst in the combustion process because the nano additives has 12-15% of oxygen content with them which helps in increasing the rate of combustion in the engine. Not only that by using nano additives in the biodiesel we are going to reduce the exhaust emissions compare with the biodiesel which is very important aspect for eco system. The performance and emission characteristic of diesel engine depends upon the blending proportions of biodiesel and also the concentration of nano additives added with the biodiesel. The nano additives shows a surprisingly large effect on performance and emission characteristics even when they used in parts per million (PPM) range with the biodiesel.

Biodiesel, a renewable source is able to cater the needs of people at the same time it is helping towards clean and green environment. This has been possible by extensive investigations on renewable energy sources especially on the concept of biodiesel. Many researchers have carried out many investigations on usage of biodiesel in compression ignition engines. Problems encountered in usage of biodiesel were identified; many possible solutions have been suggested and published in many research papers. This proved to be valuable source for many researchers, laying path for further research. A thorough reading has been done on sources of biodiesel especially on non-edible sources, production methods and usage of it as fuel in diesel engines. Trans esterification process and catalytic cracking methods are implemented based on the literature survey and the biodiesel thus obtained is tested in diesel engine and results are reported. Out of many journal papers that have been gone through, few journal papers are quoted

II. EFFECT ON THE PERFORMANCE AND EMISSION CHARACTERISTICS OF THE DIESEL ENGINE FUELLED WITH DIFFERENT BLENDS OF BIODIESEL WITH DIFFERENT NANO ADDITIVES

S.Savariraj et al [1] studied the "experimental investigation on DI Diesel engine powered with Raw Mango seed bio-diesel (MSO) and Mango seed bio diesel (MSBD)". The objective of the present work is on replacing the conventional diesel fuel with raw mango seed bio-diesel with diesel (B25,B50,B75 and B100) and methyl ester of mango seed bio-diesel (MSBD)with diesel (BD25,BD50,BD75, and BD100).The bio diesel of MSO was prepared by trans esterification process. The experimental results proved that SFC is less for MSBD than raw MSO and brake thermal efficiency is more for MSBD than raw MSO.

S.Savariraj et al [2] Reported on "characterization of the DI diesel engine powered by mango seed bio-diesel methyl ester with fuel additive" In his work approach to reduce the viscosity of the bio diesel and in order to improve the calorific value of bio diesel extracted from the mango seed bio-diesel 1,4 dioxide has been used as a fuel additive. The methyl ester mango seed bio-diesel is prepared by employing trans esterification process and blended with 2.5%,5%,7%,10% of fuel additives blended with bio diesel. The brake thermal efficiency for 10% additive fuel is slightly increased and significantly reduced NOx emission about 200PPM.

Musa umaru et al [3] studied on" production and characterization of bio diesel from Nigerian Mango seed bio-diesel" The bio diesel produced was characterized to ascertain its suitability for use as fuel. Results obtained showed that increase in temperature result in corresponding increase in the bio diesel yield .A yield of 83% wt was obtained at an optimum temperature of 60^0c.The result of biodiesel characterization shows that the fuel fulfills most of the ASTM and EN Standard so can be used as a possible candidate for replacement for petroleum diesel.

E.Muthamizhselvan et al [4] Reported on "prediction and reduction of NOx Emission Using bio fuel in multi cylinder diesel engine by injecting ammonia with SCR" injection of aqueous solutions of ammonia in the tail pipe of a diesel engine for the decrease of oxides of nitrogen (NOx) has been carried out in a four stroke multi cylinder, water cooled, constant speed diesel engine, four observation has been made for the exhaust emission NOx analysis of concentration of ammonia solution B25,B50,B75 and B100 by weight with different pressure of ammonia solution as reductant by fitting Marine ferromanganese nodule as SCR catalyst.

C.Syed Aalam et al[5]; studied on experimental investigation on a CRDI system assisted diesel engine fuel with aluminium oxdie nanoparticles blended with biodiesel. Experiments were conducted to determine engine performance, exhaust emissions and combustion characteristics of a single cylinder, common rail direct injection system with 25% of zizipus jujube methyl ester blended fuel (ZJME25).The results also showed a considerable enhancement in brake thermal efficiency and heat release due to the influence of aluminum oxide nanoparticles addition in biodiesel –diesel blend.

V.sajith et al[6] Reported on experimental investigation on the effect of cerium oxide nanoparticle fuel additives on biodiesel .comparisons of the performance of the fuel with and without the additive are also presented engine test modified bio diesel at different dosing levels (22 -80PPM) of the additive showed on improvement in the efficiency of the engine. emission levels of hydrocarbon and NO_x are appreciably reduced with the addition of cerium oxide nanoparticles.

HE Liying et al [7] studied on Recent advances of cerium oxide nanoparticles in synthesis luminescence and biomedical studies a review . the CeO_2 nano particles can be synthesized by solution based methods including co –precipitation, hydrothermal , micro emulsion process, sol-gel techniques combustion reaction and so on. Nanostructured cerium oxide (CeO2) commonly known as Nano ceria is a rare earth metal oxide, which plays a technologically important role due to its versatile applications as automobile exhaust catalysts.

Dhiraj s. patil et al [8] Studied on "the effect of cerium oxide nanoparticle as fuel additives in diesel and bio diesel blends" the main objective paper is the need to reduce the emission which is major impulse to the development of alternative fuel.it is found that the cerium oxide additive perform well in diesel ,diesel- bio diesel blends and improves the performance characteristics of CI Engine with improved brake thermal efficiency ,brake specific fuel consumption and reduce the engine emission without any physical modification in an engine.

M. Thirumarimurugan, et al[9] Biodiesel is gaining more and more importance as an attractive fuel due to the depleting fossil fuel resources. Chemically biodiesel is monoalkyl esters of long chain fatty acids derived from renewable feed stock like vegetable oils and animal fats.

K.Vijayaraj et al [10],Many researches are focused on non-edible oils which are not suitable for human consumption due to the presence of toxic components present in the oil. Moreover, the non-edible oil crops grow in waste lands which are not suitable to use as food. The increase in brake thermal efficiency and lower in specific fuel consumption.

K.Basavaraju et al [11], Experiment has been conducted a compression ratios of 14:1, 16:1and 18:1 The impact of compression ratio on fuel consumption, and exhaust gas emissions has been investigated and presented. Optimum compression

ratio which gives best performance has been identified. The blends when used as fuel results in reduction of carbon monoxide, hydrocarbon and nitrogen oxides emissions.

Silvia Mironeasa et al.[12] studied physic-chemical, structural characteristics, content and quality of grape seed oil. Concluded that higher oil concentrations were obtained from the grapes that are grown in warmer climatic conditions. Oil content varies largely from 6.26 to 9.01% accordingly to grape variety and cultivation area.

M. Vijay Kumar et al [13] Additives can be considered toward to improve combustion, fuel economy and to decrease the emissions. Many different types of additives are applied in biodiesel to meet the specification standards and to recover the quality of biodiesel. The metal based additives, cetane number additives, antioxidant additives and oxygenated additives help in improving the quality of the biodiesel

S. Nagaraja et. al. [14] investigated about the effect of compression ratio and injection pressure on mango seed bio-diesel methyl ester fuelled diesel engine characteristics. Tests were conducted with varying compression ratios combined with varying injection pressure to find out best combination of the two parameters. When compression ratio and injection pressure were increased brake specific fuel consumption decreased and brake thermal efficiency of engine increased. Optimum compression ratio of 18 and injection pressure of 250 bar gave better performance and reduced emissions in small sized diesel engines used for agricultural applications.

S. Saravanan et. al. [15] investigated the usage of crude rice bran methyl ester in small duty diesel engine to analyze its combustion characteristics. Compared to diesel, delay period and rate of maximum pressure rise for blend of crude rice bran methyl ester was lower. It also required more crank angle duration to release heat and brake specific fuel consumption was slightly different from that of diesel. Based on result analysis authors concluded that blend of crude rice bran methyl ester can be used to fuel diesel engines as the measured parameters were slightly varied from that of diesel though its cost was high.

Jiafeng Sun et. al. [16] reviewed about nitrogen oxide emissions from diesel engines fuelled with biodiesel. Various parameters such as ignition delay, adiabatic flame temperature and radiation heat transfer were found to be strongly influencing and were the cause for difference in NOx emissions. Ignition delay of biodiesel was affected by differences in heating value, vapour pressure and atomization. Amount of fuel-bound oxygen and number of double bonded species in biodiesel were found to be affecting parameters regarding adiabatic flame temperature. They also made comparative study on different size engines, different fuel systems, air systems and control systems for identification of the difference in NOx emissions between biodiesel and diesel.

S.Karthikeyan[1], P.Karuppuswamy et. al. [17] This paper emphasis on overview of biodiesel and its production technique followed by its performance and emission characteristics on diesel engine. From this attempt the result states that based on performance vice using biodiesel tends to drop in efficiency meanwhile as of considering the environmental concern the biodiesel pushes itself forward with reduction harmful emissions like un burnt hydro carbon, particulate matter and Carbon monoxide.

CONCLUSION

From the study of the above articles published by the Researches/Scientists, We are concluded that the Brake thermal efficiency of the Diesel engine was increased significantly by adding nano additives with the biodiesel compare with only biodiesel and also the Brake specific energy consumption is decreased by adding nano additives with the biodiesel compare with only biodiesel. The exhaust emissions like HC,CO ,NO_x and Smoke levels of the Diesel engine was majorly reduced by adding nano additives with the biodiesel compare with only biodiesel

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