International Journal of Engineering Applied Sciences and Technology, 2019
Vol. 4, Issue 3, ISSN No. 2455-2143, Pages 94-98
Published Online July 2019 in IJEAST (http://www.ijeast.com)

A REVIEW ON THE EFFECT OF NANOPARTICLES AS AN ADDITIVE WITH BIODIESEL-DIESEL BLEND

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Abstract— **The increasing efficiency and reducing the emission from the diesel engine is the main objectives of many research. Many researchers have many disadvantages like higher viscosity and lower calorific value. In order to overcome these many additives are used in biodiesel-diesel blends. One such way of improving performance and reducing the emission is adding the Nano particles as an fuel additives. Using of Nano particles in the fuel shows dramatically increase in the combustion quality and hence in the overall performance of the engine. A review on the effect of Nano particles as on additive with fuels has been in this paper.**

Keywords— **Nano-particles, Bio-diesel, CI engine, emission, performance**

I. INTRODUCTION

The petroleum resources are decaling day by day, the increasing demand of fuels and stringiest regulations, create a challenge to science and technology. The commercialization of biofuels is a successful way to fight against the petroleum scare and the influence on the environment. Several researchers have tried to explore the performance, emission and combustion characteristics of the diesel-Engine fueled with biodiesel blend.

They found that the overall that the overall performance of the engine decreased slightly and emission was improved the NO_x and Particular matter (PM) emissions user slightly higher, because of higher oxygen –content in the biodiesel.
The combustion characteristics may be improved by adding Nano particles in the biodiesel-diesel blends. Fuel additives are included at a level from a few PPM to thousand PPM. It's important that, additives which improve some properties do not impair other properties.

Some of the Nano particles are antioxidants, corrosion resistance; others may help in easy and smooth flow of fuel. Some of the metal based Nano particles are cerium (Ce), Cerium-iron(Ce-Fe), Platinum(Pt), CuO, $CuCl_2$, $Cocl_2$, $Fecl_3$, Al_2O_3 and multiwall carbon nanotube (MWCNT), MgO, SiO_2 etc are used in biodiesel to improve viscosity, density and flow properties. Many researchers have used the above Nano particles and proved the effective results.

The objective of this paper is to provide the most comprehensive summary of the most result literature available on the Nano particles as on additive in biodiesel and its effect on the combustion, and overall performance of the diesel engines.

II. LITERATURE SURVEY

Table 1 shows various researchers and their findings with respect to effect of nano-particles on performance, emission and combustion characteristics. It also shows various nano-particles and their blends significance with proportions.

Table 1. Various researchers and their findings

Sl.No	Name of the Author	Title of the Paper	Name of the Nano particle and biodiesel with proportion	Findings

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1	Tayfun Ozgura et al (2015)	Investigation of Nanoparticle Additives to Biodiesel for Improvement of the Performance and Exhaust Emissions in a Compression Ignition Engine	Nano particles additives namely Mgo,SiO_2 Biodiesel at an addition of dosage from 25 to 50 PPM	From the fuel properties, we can know by adding the Nano particles to biodiesel. The performance of the engine and emission characteristics are analysed and gradual reduced in the emission values like NO_x and CO are decreased by adding the Nano particles.
2	A. Ghadimi, et al (2011)	A review of Nano fluid stability properties and characterization in stationary conditions	Nano fluids	A Nano fluid attracted a wide range of researches on many cooling processes in engineering applications, which are prepared by dispersing nanoparticles or nanotubes in a host fluid. In this paper, the stability of Nano fluids is discussed as it has a major role in heat transfer enhancement for further possible applications. It also represents general stabilization methods as well as various types of instruments for stability inspection. Characterization, analytical models and measurement techniques of Nano fluids after preparation by a single step or two-step method are studied.
3	Chockalingam Sundar Raj et al (2016)	Effect Of Additive On The Performance, Emission And Combustion Characteristics Of A Diesel Engine Run By Diesel-Papaya Methyl Ester Blends	papaya seed oil methyl ester (PSME) Biodiesel Blend, Additive	In this investigation, the effect of Di-tert butyl peroxide (DTBP) as additive on the performance, exhaust emissions and combustion characteristics of a single cylinder direct injection compression ignition engine fuelled with papaya seed oil methyl ester (PSME) has been studied.
4	M. Norhafana et al (2019)	A review of the performance and emissions of Nano additives in diesel fuelled compression ignition-engines	Nano particles additives in diesel, biodiesel and water emulsified fuels	According to analysis of research papers, it can be concluded that range of nano fluid additives can be used as additives in diesel and biodiesel due to increased surface area to volume ratio, increased in catalytic activity in nano size metal oxides and metals. Nano fluid increases better combustion due micro explosion phenomenon.
5	Shiva Kumar, et al (2017)	Experimental investigation of the effects of nanoparticles as an additive in diesel and biodiesel fuelled engines: a review	nanoparticles with liquid fuel diesel or biodiesel	The rising consumption and demand for fossil fuels have increased concern over its depletion rate and therefore stimulated the actions necessary to tackle the issue with an efficient and less polluting alternative fuel for diesel. The use of nanoparticles with liquid fuel (either diesel or biodiesel) has shown promising and challenging results. When biodiesel was used as fuel, engine performance was lower and NO_x emissions increased. Adding nanoparticles of metal and metal oxides to diesel/biodiesel resulted in an improvement in engine performance and reduced emissions of hydrocarbons, carbon monoxide, carbon dioxide and NO_x.
6	Gangadhara Rao, et al (2016)	Effects of Additives on Biodiesel/Diesel Performance, Emission Characteristics, Combustion Characteristics and	Different additives along with the diesel and biodiesel	It is found that use of additives improved the biodiesel/diesel properties like viscosity, flash and fire points and pour points etc. Use of additives reported no much improvement in engine performance except few cases who reported to the contrary. Combustion characteristics found to be improved with use of

		Properties		additives. HC and PM emissions reported to be reduced and NOX emission was found to increase in some cases. Special NO_x inhibitor additives found to be more effective in reducing the NO_x emission.
7	M. Ghafoori et al (2015)	Effect of Nano-particles on the performance and emission of a diesel engine using biodiesel-diesel blend	Multi Wall Carbon Nano Tubes waste vegetable oil methyl esters fuel	The CNTs were blended with the biodiesel with the aid of ultrasonicator. The whole investigation was conducted in the diesel engine using the following fuels: neat diesel fuel (D100), 20% biodiesel and 80% diesel by volume (B20), as well as B20 and CNT blended fuels accordingly. The experimental results revealed a considerable enhancement in the performance parameters for the CNT blended biodiesel fuels compared to the neat biodiesel and neat diesel fuel (power increased up to 17%, torque increased 18%, bsfc decreased 38.5%). Emission parameters for the CNT blended decreased compared to neat diesel and neat biodiesel fuels (HC decreased up to 22%, CO emission decreased 14%).
8	Meshack Hawi et al (2019)	Experimental Investigation on Performance of a Compression Ignition Engine Fueled with Waste Cooking Oil Biodiesel–Diesel Blend Enhanced with Iron-Doped Cerium Oxide Nanoparticles	iron-doped cerium oxide ($FeCeO_2$) waste cooking oil methyl ester	The effect of iron-doped cerium oxide ($FeCeO_2$) nanoparticles as a fuel additive was experimentally investigated with waste cooking oil methyl ester (WCOME) in a four-stroke, single cylinder, direct injection diesel engine. The study aimed at the reduction of harmful emissions of diesel engines including oxides of nitrogen (NO_x) and soot.
9	Prabu Arockiasamy, et al (2015)	Performance, Combustion and Emission Characteristics of a D.I. Diesel Engine Fuelled with Nanoparticle Blended Jatropha Biodiesel	Alumina and Cerium oxide Jatropha biodiesel at 30PPM	The effect of nanoparticle as additive in Jatropha biodiesel is experimentally investigated in a single cylinder DI diesel engine with the aim of diluting the level of pollutants in the exhaust and for the improvement of engine performance owing to its potential advantage of high surface area to volume ratio, acting as a catalyst for the better combustion.
10	Ajin C, et al (2013)	Diesel Engine Emission Reduction Using Catalytic Nanoparticles: An Experimental Investigation	Cerium oxide	Cerium oxide being a rare earth metal with dual valance state existence has exceptional catalytic activity due to its oxygen buffering capability, especially in the nano sized form. Hence when used as an additive in the diesel fuel it leads to simultaneous reduction and oxidation of nitrogen dioxide and hydrocarbon emissions, respectively, from diesel engine. The present work investigates the effect to cerium oxide nanoparticles on performance and emissions of diesel engine
11	Annamalai Asokan, et al (2018)	Performance and Emission Characteristics of C.I Engine with Composition of Cobalt Aluminium Oxide as Additive to Diesel	aluminium oxide cobalt oxide	The objective is to integrate nanoparticles with fuels such as diesel, biodiesel, a plastic fuels, etc. to increase the fuel efficiency. The metal oxide nanoparticles will reduce the carbon monoxide emissions by donating oxygen atoms from their lattices to catalyze the combustion reactions and to aid complete combustion; due to this, there will be an increase in the calorific value of the blend

12	M. Naveen Kumar, et al (2016)	Experimental investigation in the performance and emissions of the CI engine fueled with Waste vegetable oil and its titanium and aluminum nanoparticle blends	TiO_2, Al_2O_3	Different Nano-additives are used as fuel. Experiment is carried out to compare the effects in the performance and emission between Waste Vegetable oil blended with TiO_2, Al_20_3 Nano-additives at different injection pressures. It is observed that all the biodiesel blends on an average had lower emissions when compared to diesel and Al_2O_3 blends had least NO_X emissions

III. CONCLUSION

The objectives of this review paper was to determine the effect of Nano particle as an additives in biodiesel-diesel blend which can be used as an alternative fuel in diesel engine from the resent available literature.
The major findings of various researchers are summarized as follows:

1. The use of Nano particle increases the performance and also reduces the emission level.
2. Brake thermal efficiency and net heat release rate increase with the addition of Nano-particles
3. The efficiencies and heat release rates are increase with increase in the percentage of Nano-Particles in the biodiesel-diesel blend.
4. The combustion increases with the addition of Nano particles with the biodiesel-diesel blend.

IV. ACKNOWLEDGEMENT

Authors appreciate the respondents for the responses and providing the information necessary to effectively carry out this study.

V. REFERENCE

[1] Tayfun O, Mustafa O & Kadir A, (2015). "Investigation of Nanoparticle Additives to Biodiesel for Improvement of the Performance and Exhaust Emissions in a Compression Ignition Engine", *International Journal of Green Energy*, (pg 51-56)

[2] A Ghadimi, R Saidur, H.S.C. Metselaar, (2011), A review of Nano fluid stability properties and characterization in stationary conditions, *International journal of heat and mass transfer*. (pg 4051-4068)

[3] Chockalingam Sundar Raj and Muthukumarasamy K,(2016), Effect of additive on the performance, emission and combustion characteristics of a diesel engine run by diesel-papaya methyl ester blends, *int. j. chem. sci*.(pg 2823-2834)

[4] M. Norhafana, M.M Noor, Pshtiwan M Sharif , F.Y.Hagos, A.A.Hairuddin, K.Kadirgama, D.Ramasamy, M.M.Rahman, R.Alenezi, A.T.Hoang,(2019), A review of the performance and emissions of nano additives in diesel fuelled compression ignition-engines , *IOP Conference Series: Materials Science and Engineering 469 (2019) 012035*

[5] Shiva Kumar, P. Dinesha & Ijas Bran (2017): Experimental investigation of the effects of nanoparticles as an additive in diesel and biodiesel fuelled engines: a review, Biofuels, DOI: 10.1080/17597269.2017.1332294

[6] Gangadhara Rao, Kumar G N, Mervin Herbert, (2016), Effects of Additives on Biodiesel/Diesel Performance, Emission Characteristics, Combustion Characteristics and Properties, *NCAMES*,(pg 370-375)

[7] M. Ghafoori, (2015), Effect of nano-particles on the performance and emission of a diesel engine using biodiesel-diesel blend , International Journal of Automotive and Mechanical Engineering (IJAME) pp. 3097-3108.

[8] Meshack H , Ahmed E , Mohamed I and Mahmoud A, (2019), Experimental Investigation on Performance of a Compression Ignition Engine Fueled with Waste Cooking Oil Biodiesel–Diesel Blend Enhanced with Iron-Doped Cerium Oxide Nanoparticles, *energies*, 12, 798; doi:10.3390

[9] Prabu A, Ramachandran Bhagavathiammal Anand, (2015), Performance, Combustion and Emission Characteristics of a D.I. Diesel Engine Fuelled with Nanoparticle Blended Jatropha Biodiesel, *Periodica Polytechnica Mechanical Engineering*, 59(2), pp. 88-93,

[10] Ajin C, Sajeevanand V Sajith, (2013), Diesel Engine Emission Reduction Using Catalytic Nanoparticles: An Experimental Investigation, *Hindawi Publishing Corporation , Journal of Engineering*, Article ID 589382,9 pages.

[11] Annamalai Asokan, Channankaiah, Senthil Kumar Kandasamy,(2018), Performance and Emission Characteristics of C.I Engine with Composition of Cobalt Aluminium Oxide as Additive to Diesel, *International*

Journal of Chem Tech Research CODEN (USA): IJCRGG, pp 427-435, 2018

[12] M. Naveen Kumar, Dr. Sanjeev Tripathi, (2016), Experimental investigation in the performance and emissions of the CI engine fueled with Waste vegetable oil and its titanium and aluminum nanoparticle blends, IJESM Volume 5, pp 219-229