International Journal of Innovative Research in Science and Engineering
Vol. No.2, Issue 04, April 2016
www.ijirse.com
ISSN: 2454-9665

STUDY OF BIODIESEL EFFECT CONSIDERING THE ADDITION OF ADDITIVES FOR IMPLEMENTING AS AN ALTERNATIVE FUELS IN DIESEL ENGINE

Minakshi Chouhan[1] , Akshay Malav[2] ,Dr.Ashish Mathew[3]

[1,2]B.Tech. Scholar, [3]Professor,Vedant College of Engineering and Technology, Bundi, Rajasthan (India)

ABSTRACT

Biodiesel offers a awfully hopeful various fuel to diesel that is outlined as methyl radical organic compound carboxylic acid from vegetable oils or animal fats. this paper investigates the performance and emission characteristic of internal-combustion engine running with karanja oil. the target of the paper is to scale back higher viscousness of karanja oil by transesterification and to assess the emission and performance characteristics of internal-combustion engine. the assorted proportions of biodiesel integrated with diesel area unit B10, B20, B30 with wood spirit and ethyl ether as additives at variable load conditions at constant speed. Parameters like brake specific fuel consumption, brake thermal potency, organic compound emission, smoke, monoxide emission area unit to be evaluated. Then, the results of biodiesel area unit compared with the diesel. CO, HC and exhaust smoke emissions scale back with increase in proportions of biodiesel blends. From the investigation it will be terminated that biodiesel will be used as an alternate to diesel in an exceedingly internal-combustion engine with none engine modifications.Keywords - Biodiesel, Transesterification, Combustion, Emissions.

I. INTRODUCTION

Biodiesel may be a renewable fuel created from vegetables and animal fats that may be utilized in ICE with slight or no modification. Biodiesel are often utilized in its healthful kind (B100), however it's going to would like engine modifications to avoid performance and maintenance troubles. Biodiesel is gaining a lot of significance as an alternate fuel owing to the reduction of fossil fuel resources and also the worth climb of fossil fuel merchandise. Most of the researchers applied performance and emission tests of biodiesel fuel on ICE. Biodiesel is renewable, protected and non polluting supply of energy to the setting.

Energy is that the most essential demand for human existence. Utilization of fossil fuels has extremely exaggerated and also the use of those energy resources has main environmental impact likewise. fuel is principally utilized in transport, commercial, agriculture, domestic and industrial fields for the invention of energy and electricity. Among all the choice fuels existing, bio-diesel earned from the vegetable oils and animal fatty acids guarantees to be a lot of eco-friendly once it's compared to fuel.

Finding applicable property fuel alternatives has change into a high precedence for several countries. Also, it'll play key role in an exceedingly style of industries within the close to future. Biodiesel is one in all the property fuels that's a non-petroleum based mostly fuel, consisting of alkyl group esters ensuing from either

transesterification of triglycerides arrived from the vegetable oils or esterification of free fatty acids from animal fats with tiny enchained alcohols. it's many benefits that embody low emissions, non-toxic, perishable and improved lubricity.

II. TRANSESTERIFICATION

Transesterification process is the effect of triglyceride (fat/oil) with an alcohol in the occurrence of acidic, alkaline or lipase as a medium to form monoalkyl ester, that is biodiesel and glycerol. The occurrence of strong acid or base accelerates the reaction. The major reason of transesterification is to decrease the high viscosity of oil which is appropriate for diesel engine. It is one of the reversible reactions proceeds successfully by mixing the reactants, though the occurrence of catalyst accelerates the conversion. It is essential to note that the acid or base are not inspired by the transesterification reaction. Thus they are mentioned as catalysts but not reactants.

III. LITERATURE REVIEW

Biodiesel is gaining more significance as an alternative fuel due to the reduction of petroleum resources and the price climb of petroleum goods. Most of the researchers carried out performance and emission tests of biodiesel fuel on diesel engine. The efficiency and quality of Biodiesel fuel was found to be more important than petro diesel. For predicting the properties of Biodiesel, a variety of models were developed using various feed oils and blends. The quality of Biodiesel depends on the type of feed oils [17]. Some of the biodiesel surveyed are listed below P.L.Naik et al. [1] Combustion and emission characteristics of diesel engine running with karanja biodiesel and its blends with diesel were analyzed and compared to standard diesel. Transesterification process is used for the preparation of biodiesel, which reduces the viscosity of the oil. Various proportions of biodiesel analyzed are B10, B20, B30 and these results are compared with diesel. The results of B10 and B20 are similar to diesel. So, B20 and less than B20 can be used as a fuel to improve the performance and emission of the CI engine. Carbon monoxide and Hydrocarbon emissions decrease with increase in blend proportion of the biodiesel. Biodiesel use could preserve the environmental air quality by reducing harmful emissions released by regular diesel fuel. C.V.Teixeria et al. [5] The biodiesel and diesel/biodiesel blends became alternatives to the diesel fuel. Though, pure biodiesels cannot be used in diesel engines due to technical problems, diesel/biodiesel blends have been employed in diesel engines. The experimental apparatus used an electric generator instead of a dynamometer to control the load on the engine. Engine is equipped with electric generator at 1500W, 3000W, 4500W. Various proportions of biodiesel used in the engine is from B10 to B100. B100 NO_x emissions are greater than diesel at 4500W of electric load. Specific fuel consumption increases with the amount of the palm oil on the blended fuel. S.Imtenan et al. [14] This experimental evaluates the improvement of palm biodiesel-diesel blends with help of ethanol, n-butanol and diethyl ether. The use of additives improves the brake power, brake thermal efficiency and decrease in brake specific fuel consumption. To improve the 20% blend of palm biodiesel with diesel fuel (DP20) with help of three additives ethanol, n-butanol, diethyl ether. B.De et al. [20] The fitness of raw palm oil using preheated in the temperature series of 90º C as a fuel has been offered in this study. The experiments were carried out at constant speed of 1500 rpm with full load and at compression ratios of 16:1, 17:1, 18:1, 19:1 and 20:1. Emission parameters such as CO, CO_2, HC and EGT are discussed with dissimilar compression ratio (16:1 to 20:1) of different blends at full load conditions. The experimental result

proves that lower percentages of preheated palm oil can be used as diesel fuel. Significant reduction in CO and HC for all blends at high compression ratio at full loads. S.Naga Sarada et al. [6] To improve the combustion characteristics of cotton seed oil in an unmodified engine and the effect of increase in injection pressure was studied.Tests were conducted with cotton seed oil and compared with diesel. Quieter operation of the engine is observed during the usage of cotton seed oil. Increased injection pressure has a significant effect on enhancing engine performance and reducing the emissions. Performance of engine with cotton seed oil is approximately similar to the engine running with diesel. S.Ganesan et al. [7] Combination of diesel, castor oil and ethanol to analysis the performance of CI engine. Castor oil has the potential to reduce the height of pollution and the height of global warming. The exhaust gas temperature and brake thermal efficiency for castor oil with ethanol is very low. It has lower value of NO and un burnt hydrocarbon. It is observed that the fuel consumption for castor oil with ethanol is lesser at no load state and almost similar at other brake power when it is compared to pure diesel. Niraj S.Topare et al. [9] Algae are usually microscopic organisms thought of as simple aquatic plants which do not have stems, roots or leaves and have primitive methods of reproduction. Aquatic algae are found in both clean and sea waters. To investigate the fuel properties of algae oil & production of biodiesel from algae oil. Biodiesel production is done by transesterification process. Various proportions used in the analysis are 20% biodiesel & 80 % diesel and 50 % biodiesel & 50% diesel. Percentage of oxygen present in the biodiesel is very higher than the diesel. S.Murugan et al. [10] It is used to reprocess the tyres into fuel, gas, solid residue, oil which cannot be used in tyre manufacturing. Engine running with low & high concentration blends were studied and compared with diesel fuel. Aimed to modify the fuel to decrease viscosity and sulphur content of the crude pyrolysis oil. Distilled tyre pyrolysis oil [DTPO] results in higher hydrocarbon emission compared to the diesel. Brake thermal efficiency increases with increase in proportion of DTPO blends but lesser than diesel fuel. In order to prevent waste rubber and unnecessary automobile tyres from damaging the environment and it is highly attractive to recycle this material in a useful manner [11]. Syarifah Yunus et al. [15] The engine emissions of CO, CO2 & NO_x of diesel and biodiesel blended were evaluated at varying load conditions which were 0.13, 0.15, 0.17, 0.19, 0.21 KW. Five fuel samples designation of different composition are diesel fuel, 5%, 10%, 15%, 20% of blended jatropha-palm biodiesel with diesel fuel. The emissions parameters CO, CO2, NO_x of transesterificated jatropha-palm blended biodiesel are compared to diesel fuel. The emission formed by biodiesel blends is much superior than the diesel fuel, due to higher oxygen content in the biodiesel composition. Gaurav Paul et al. [18] The numerical and experimental analysis on the performance and emission characteristics of a diesel engine mixed with various blends of biodiesel. Jatropha oil used in the conventional diesel engine decreases its brake thermal efficiency and torque and the brake specific fuel consumption increases with the increase in percentage of biodiesel. NO_x emission increases while compared to diesel. This is due to increase in temperature and higher oxygen substance obtained due to total combustion of biodiesel. S.Nagaraja et al. [19] Experimental study is carried out on an I.C engine, single cylinder four stroke VCR direct injection diesel engine to examine the emission and performance characteristics of diesel, jatropha oil and jatropha oil-diesel blended fuels with different blended rates. The results are recorded for the compression ratio of 16, 17 and 18 changing the load from

IV. CONCLUSION AND FUTURE SCOPE

- From this survey, it is found that various fuels extracted from bio oils like karanja oil, palm oil, cotton seed oil, castor oil, algae oil, tyre pyrolysis oil, jatropha oil and coconut oil are used in the diesel engine.
- Biodiesel use could preserve the environmental air quality by decreasing harmful emissions released by regular diesel fuel.
- Smoke capacity was lower for lower karanja oil blends compared to diesel.
- Increase in compression ratio, improves the performance of the engine (Brake thermal efficiency) with karanja oil as biodiesel.
- If the biodiesel blends increases, then it will results in increase of emission parameters like NO_x, CO and exhaust gas temperature.
- Brake thermal efficiency increases with increase in additive percentage of the biodiesel compared with pure diesel.
- Brake specific fuel consumption is found highest for pure biodiesel at all varying loads because of high volatility, low heat content and high viscosity.

Further investigations have to be made, based on the effect of compression ratio over the emission and performance characteristics of variable compression ratio engine fueled with karanja oil. By increasing the compression ratio, the engine performances are varied and it is compared with standard diesel. While increasing the compression ratio of the engine the mechanical efficiency was improved at full load condition. This may lead to better thermal efficiency of the engine. The karanja oil blends when used as fuel, results in reduction of carbon monoxide & hydrocarbon emissions and increase in nitrogen oxides emissions.

REFERENCES

[1] P.L. Naik, D.C.Katpatal "Performance Analysis of CI Engine using Pongamia Pinnata (Karanja) Biodiesel as an Alternative Fuel". International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064 (2013).

[2] AR.Manickam, K.Rajan, N.Manoharan and KR. Senthil Kumar "Experimental analysis of a Diesel Engine fuelled with Biodiesel Blend using Di-ethyl ether as fuel additives" ISSN : 0975-4024, Vol 6, No.5, Oct-Nov (2014).

[3] R.SenthilKumar, M.Prabu , M.Sukumar "Performance, Emission and Combustion Characteristics of a CI engine using Karanja oil Methyl Ester as a biodiesel with Tyre Pyrolysis Blends" International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 3, Issue 4, July (2014).

[4] Siddalingappa R. Hotti, Omprakash Hebbal "Performance and Combustion Characteristics of Single Cylinder Diesel Engine Running on Karanja Oil/Diesel Fuel Blends" Published Online April (2011).

[5] C.V.Teixeira, A.B.Caldeira and M.J.Colaço "Analysis of NOx emissions and specific fuel consumption of a diesel engine operating with diesel/biodiesel blends" Engenharia Térmica (Thermal Engineering), Vol. 12, No.1, June (2013).

[6] S. Naga Sarada, M.Shailaja, A.V. Sita Rama Raju, K. Kalyani Radha "Optimization of injection pressure for a compression ignition engine with cotton seed oil as an alternate fuel" International Journal of Engineering, Science and Technology Vol. 2, No. 6 (2010).

[7] S.Ganesan, Dr. A. Elango "Performance Analysis of CI Engine using blends of Castor Oil and Ethanol" International Journal of Mining, Metallurgy & Mechanical Engineering (IJMMME) Volume 1, Issue 1 (2013).

[8] N. Stalin and H. J. Prabhu "Performance Test of IC Engine using Karanja Biodiesel Blending With Diesel" ARPN Journal of Engineering and Applied Sciences Vol. 2, No. 5, October (2007).

[9] Niraj S. Topare, V.C. Renge, Satish V. Khedkar, Y.P. Chavan and S.L. Bhagat "Biodiesel from Algae Oil as an Alternative Fuel for Diesel Engine" ijCEPr Vol. 2, No.2-3, 116-120 May-December (2011).

[10] S. Murugan , M.C. Ramaswamy and G. Nagarajan "A comparative study on the performance, emission and combustion studies of a DI diesel engine using distilled tyre pyrolysis oil–diesel blends" Fuel, Volume 87, Issues 10-11, August (2008).

[11] Bhatt Prathmesh M, Patel Paresh D "Suitability of tyre pyrolysis oil (tpo) as an alternative fuel for internal combustion engine" IJAERS Vol. I.Issue IV July-Sept (2012).

[12] Avinash Kumar Agarwal, Atul Dhar "Experimental investigations of performance, emission and combustion characteristics of Karanja oil blends fuelled DICI engine". Renewable energy 52 (2013).

[13] K. Nantha Gopal *, R. Thundil Karupparaj "Effect of pongamia biodiesel on emission and combustion characteristics of DI compression ignition engine" Ain Shams Engineering Journal (2015).

[14] S.Imtenan, H.H. Masjuki, M. Varman, M.I. Arbab, H. Sajjad, I.M. Rizwanul Fattah, M.J. Abedin, Abu Saeed Md. Hasib "Emission and performance improvement analysis of biodiesel-diesel blends with additives" 10th International Conference on Mechanical Engineering, ICME (2013).

[15] Syarifah Yunus, Amirul Abd Rashid, Nik Rosli Abdullah, Rizalman Mamat, Syazuan Abdul Latip "Emissions Of Transesterification Jatropha-Palm Blended Biodiesel" The Malaysian International Tribology Conference, MITC (2013).

[16] A.M.Liaquat, H.H.Masjuki, M.A.Kalam, I.M.Rizwanul Fattah, M.A.Hazrat, M.Varman, M.Mofijur, M.Shahabuddin "Effect of coconut biodiesel blended fuels on engine performance and emission characteristics" 5th BSME International Conference on Thermal Engineering. Procedia Engineering 56 (2013).

[17] Parag Saxena, Sayali Jawale, Milind H Joshipura "A review on prediction of properties of biodiesel and blends of biodiesel". Chemical, Civil and Mechanical Engineering Tracks of 3rd Nirma University International Conference on Engineering (NUiCONE 2012). Procedia Engineering 51 (2013).

[18] Gaurav Paul, Ambarish Datta, Bijan Kumar Mandal "An Experimental and Numerical Investigation of the Performance, Combustion and Emission Characteristics of a Diesel Engine fueled with Jatropha Biodiesel". 4th International Conference on Advances in Energy Research 2013, ICAER 2013. Energy Procedia 54 (2014).

[19] S. Nagaraja, K. Sooryaprakash, R. Sudhakaran "Investigate the Effect of Compression Ratio over the Performance and Emission Characteristics of Variable Compression Ratio Engine Fueled with Preheated Palm Oil - Diesel Blends". Global Challenges, Policy Framework & Sustainable Development for Mining of Mineral and Fossil Energy Resources (GCPF2015). Procedia Earth and Planetary Science 11 (2015).

[20] B. De, R. S. Panua "An experimental study on performance and emission characteristics of vegetable oil blends with diesel in a direct injection variable compression ignition engine". 10th International Conference on Mechanical Engineering, ICME 2013. Procedia Engineering 90 (2014).