

## “A REVIEW ON INVESTIGATION AND EXPERIMENTAL ANALYSIS OF SUNFLOWER OIL AS BIODIESEL IN CIDI ENGINE”

Mr. Ambarish L. Anantwar<sup>1</sup>, Prof. A.A. Kanaskar<sup>2</sup>, Prof. S.S. Jaware<sup>3</sup>

<sup>1</sup>Department of Mechanical Engineering, S.P. Agnihotri College of Engineering, Wardha  
anantwar54@gmail.com

, <sup>2</sup>Asst. prof, Department of Mechanical Engineering, S.P. Agnihotri College of Engineering, Wardha,  
abijitkanaskar007@gmail.com

<sup>3</sup>Asst. prof, Department of Mechanical Engineering, S.P. Agnihotri College of Engineering, Wardha,  
jawresandip@gmail.com

### ABSTRACT

*Diesel has a mark as traditional hydrogen structure as conventional fuel. In the new trends of investigation of alternative fuel there immerge number of alternative fuels, in this experimental analysis there is a study of (sun flower oil) when blended with diesel fuel and its comparison with conventional diesel fuel. There is Comprehensive analysis on combustion characteristics such as cylinder pressure, heat release and performance characteristics, specific fuel consumption and break thermal efficiency are carried out in the analysis 5%, 10%, 15% sun flower oil was blended with the diesel which is compared with the conventional diesel and the result of performance and combustion are found to be satisfactory. The experimental results of this study can be summarized as follows. The blending of diesel fuel with sun flower oil gives same results as the conventional diesel fuel. The performance characteristics and combustion characteristics are more or less same as that of the conventional diesel fuel. So from this study we can predict that if diesel is blended with 5% or 10% of sun flower oil then it will not affects the C.I.D.I Engine adversely.*

**Key words:** Sun flower oil, Diesel fuel, Compression Ignition Direct Injection (C.I.D.I Engine).

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### 1. INTRODUCTION

Now a day's various incentives and regulations can be used to encourage the production, sale and use of alternative fuel vehicles, including diesel, LPG, methanol, ethanol, hydrogen, hydrogen-peroxide and electricity. These fuels reduce per-mile energy consumption and emissions, although net benefits are sometimes small when all impacts are evaluated on a lifecycle. Thus increasing focus on the environmental impacts of fossil fuel based power generation has led to increased research with the aim of reducing emissions and improving combustion efficiency. Much of this work is driven by the increasing interest into alternative fuels such as biodiesel, bio-alcohol, chemically stored electricity, hydrogen, non-fossil methane, non-fossil natural gas, oil, and other biomass sources.

Petroleum resources are finite and therefore search for alternative is continuing all over the world. Development of bio-fuels as an alternative and renewable source of energy for transportation has become critical in the national effort towards maximum self-reliance the corner stone of our energy security strategy. Bio- fuels like ethanol and bio-diesel being environment friendly, will help us to conform to the stricter emission norms. International experience has demonstrated the advantages of using ethanol and methanol as automotive fuel. Since blends below 10% of ethanol do not present any problem and reduce harmful emission, a decision has already been taken to blend 5% ethanol with motor spirit w.e.f. 1.1.2003 in a number of States. To achieve higher blending, a concerted program for use of bio mass for conversion to alcohol is essential including expansion of area under sugarcane cultivation.

High Speed Diesel (HSD) is the main transport fuel hence introduction of biodiesel both as a diesel substitute and for blending with Petroleum diesel both as a diesel substitute and for blending with Petroleum diesel is an imperative need. Bio-diesel commands crucial advantages such as technical feasibility of blending in any ratio with petroleum diesel fuel, use of existing storage facility and infrastructure, superiority from the environment and emission reduction angle, its capacity to provide energy security to remote and rural areas and employment generation. Moreover, crops like sunflower, rapeseed and tree borne oil seeds like *Jatropha curcas* provide rich bio mass and nutrients to the soil and check degradation of land -a major problem affecting nearly 65 million hectares of land.

Diesel engines are broadly used in medium and heavy duty application because of their lower fuel combustion, higher break thermal efficiency and lower emission (such as CO and HC) compared with gasoline engines. Depletion of petroleum derivatives increases the research interest in the area of alternative fuels. The addition of oxygen containing compounds to diesel fuel has been proposed as a method of carbonaceous particulate matter and associated hydrocarbons. In addition many oxygenates have high cetane number and their association with the diesel results in high cetane number and lower exhaust emissions. Due to this advantages, there is glowing interest in the introduction of oxygenates into diesel fuel.

Now a days the investigation are going on for complete combustion. Some oxygenates compounds have been tested as additives to improve the performance of diesel fuels. Particularly 1, 2-dimethoxypropane, butyl ether, 2-methoxyethyl ether, pentyl ether and di-butoxy-methane. Following the trend Bailey suggest SUN FLOWER OIL as a potential replacement fuel for C.I. engines. The molecular weight of SUN FLOWER OIL is low; the molecular have high hydrogen to carbon ratios and a low number of carbon-to-carbon bonds .All these properties during combustion. The molecules contain oxygen, which also suppress the formation of soot. The molecular bonds break up to radicals at reasonable activation energy, which leads to high cetane number.

In the same way di-methyl ether (DME) was considered as an ignition improving additive to methanol powered diesel engines. However DME is a gaseous fuel and therefore that vehicle be adopted for gaseous operation. In addition the fuel delivery infrastructure is not correctly suitable to distribute large quantities of gaseous fuel. Carrying forward this trend we are also trying the blend of ethers with diesel fuel objective of doing this study is to improve the combustion without effecting more the performance characteristics studied on C.I.D.I. engine with 5%, 10%, 15% ethers blend with diesel fuel on various load condition.

First ether engine was combine water ether steam engine. It was built in Marseilles in 1850 for marine application. From 1999-1923 in British Guiana an alcohol base Motor fuel named Alcolele was produces from Sugarcane Molasses which consists of 63% ethanol 35% Sun flower oil & 1% of gas oil and pyridine. Near the end of World War II, Blending Sun flower oil to ethanol was adopted as acceptable method to improve performance of ethanol in Japan Antonini (1981) reported Sun flower oil as option for diesel engine fuel by mixing it with vegetable oil and/ or diesel fuel.

## 2. LITERATURE SURVEY

Brent bailey. Mentioned, Producing and using renewable fuels for transportation is one approach for sustainable energy future for the united states, as well as the rest of the world. Renewable fuels may also be substantially reduce contributions to global climate change. In the transportation sector, ethanol produces from biomass shows promise as a future fuel for spark-ignited engines because of its high octane quality. Ethanol, however, is not a high quality compression ignition fuel. Ethanol can be easily converted through a dehydration process to produce diethyl ether (DEE), which is an excellent compression ignition fuel with the high energy density than ethanol. DEE long been known as a cold start aid for engines, but little is known about using DEE as a significant component in a blend or as a complete replacement for diesel fuel. Dimethyl ether, the methanol along to DEE, was recently reported to be a low emission, high quality diesel fuel replacement, but similar engine testing and process information on DEE is limited. To identify the potential of DEE as a transportation fuel, we conducted a comprehensive literature review of its utilization in engines and also conducted limited laboratory experiments. This paper presents the findings on fundamental engines and emissions performance of DEE, along with an estimated cost of producing cost of producing DEE from biomass ethanol.

S. Sudhakar. The authors have state that the Depletion of fossil fuel and threat from automobile pollution to environment drives the researchers to find out alternatives. Present work involves the fumigation effect of Diethyl ether with ethanol blended diesel has been experimentally evaluated for partial replacement of fossil fuel. The performance and combustion characteristics were evaluated and compared. This study also involves the effect of exhaust gas recirculation to reduce the emission caused by diethyl ether injection through fumigation. The increment of diethyl ether injection was 10 percent ranging from 0 to 30 percentages with respect to mass flow rate of pilot fuel. From the observations, increased amount of oxides of nitrogen emissions were noticed. In order to reduce the oxides of nitrogen emission while injecting the diethyl ether at higher volume into the inlet manifold, the exhaust gas recirculation (EGR) setup has installed with an existing experimental setup. The EGR percentages were varied from 0 to 20 percent with 5 percent increment. The results obtained from this experimental study with EGR clearly shows that 20 percent Diethyl ether injection through inlet manifold with 15 percent EGR performs better on decreasing the NO<sub>x</sub> emission and slight decrease in maximum cylinder pressure and heat release rate were recorded while compare with neat diesel and E-15.

Obed m. Ali. Diesel engines are widely used in almost all walks of life and cannot be dispensed with in the near future. As the fossil fuels now mainly used in diesel engine and continually depleting accompanied by increasing consumption and prices day by day, there is a need to find out an alternative fuel to fulfil the energy demand of the world. Alternative fuels like biodiesel, are being used as an effective alternative to diesel. The feasibility of biodiesel production from palm oil was investigated with respect to its fuel properties. Though biodiesel can replace diesel satisfactorily, problems related to fuel properties persist. In this study an oxygenated additive diethyl ether (DEE) was blended with palm oil biodiesel (POME) in the ratios of 2%, 4%, 6% and 8% and tested for their properties improvement. These blends were tested for energy content and various fuel properties according to ASTM standards. Qualifying of the effect of additive on palm biodiesel fuel properties can serve the researchers who work on biodiesel fuels to indicate the fuel suitability for diesel engines according to fuel standards. Blends of DEE in POME resulted in an improvement in acid value, viscosity, density and pour point with increasing content of DEE, accompanied by a slight decrease in energy content of biodiesel.

Górsnikrzysztof. He presents in his paper is focused on a comparative experimental study for determining the effect of fuel properties of oxygenated fuels on selected work parameters of direct injection (DI) diesel engine. The engine was operated on fossil diesel oil (DO), biodiesel (BD also known as FAME) and biodiesel with 10% and 20% ethanol addition, accordingly (ET10) and (ET20). Each of the fuels was tested at steady state running conditions. In such conditions the high-speed parameters of the engine work were recorded. In particular the variations of in-cylinder pressure as well as the fuel injector needle lift signals were analysed. It allowed calculating and comparing the values of selected combustion parameters of the AD3.152 engine fuelled with biodiesel-ethanol blends. The experimental work was done with an AD3.152 diesel engine installed in the laboratory of the Vehicle Technical Exploitation Department at Technical University of Radom (Poland).

M. Loganathan. In this study, Biodiesel -Dimethyl Ether (BDE ) was tested in a 4-cylinder direct-injection diesel engine to investigate the performance and emission characteristics of the engine under five engine loads at the maximum torque .The engine speed was maintained at 1500 rpm. Here the jatropha oil is used as a non-edible oil to produce the biodiesel. The dimethyl ether is used as an additive to enhance the engine combustion. The BDE 5 (biodiesel 95% and dimethyl ether 5%), BDE 10 (biodiesel 90% and dimethyl ether 10%) and BDE 15(biodiesel 85% and dimethyl ether 15%) were tested in the engine. The results indicate that when compared with neat jatropha, the engine performance increased and emission level decreased with adding the diethyl ether with methyl ester of jatropha oil. In comparison with neat jatropha, the BDE10 blends have 10% higher brake thermal efficiency (BTE) .The experimental results showed that the CO, HC and NO<sub>x</sub> emission is decreased for all BDE blends. The brakes specific fuel consumption (BSFC) decreased for all BDE blends compared to neat jatropha oil.

Nilamkumar S. Patel. Producing and using renewable fuels for transportation is one approach for sustainable energy future for the India, as well as the rest of the world. Renewable fuels may also substantially reduce contribution to global climate change. There are various techniques and methods are used to solve the problems resulting from high viscosity. One of the techniques is fuel blending .Also day by day the fuel consumption increased as well as the luxuries life style and population also increased. In this study blend of Diesel, Sesame oil and Diethyl ether at various proportion is used as a fuel in a direct injection diesel engine. Hence, it is seen that blend of sesame oil, diethyl ether and diesel fuel can be used as an alternative fuel successfully in diesel engine without any modification. Also by using this blend the fuel consumption is reduced at a full load condition

also thermal efficiency increased as a compared to the diesel fuel. The fuel consumption of blend D69S25DEE6 is less as compared to the diesel fuel It is concluded that it is possible to use Sesame oil in diesel engines as an alternate fuel in the future.

Sandip s. Jawre. The fossil fuels are widely used in diesel engine and continually depleting with increasing consumption and prices day by day. The fatty acid methyl ester has become an effective alternative to diesel. Various types of vegetable oil such as Jatropa, karanja, cottonseed, neem, sunflower, palm, mahuva, coconut etc. can be used as fuel in diesel engine. Kusum oil is one of the fuels used in present work. The viscosity of Kusum oil is very high, so it was reduced by Trans-esterification process.

## REFERENCES

- [1] Brent bailey. Et. Al. "sun flower oil as a renewable diesel fuel", SAE No. 972978
- [2] S. Sudhakar. Et.al. "Evolutionary Algorithm as a Tool for Advanced Designing of Diesel Engines." Research India Publications Vol.2, 169-180,2006.
- [3] Obed m. Ali., et.al "Effect of Diethyl ether on Diesel Fuel Performance", Faculty of Chemical and Natural Resources Engineering, University Malaysia Pahang, Oppapers, 2009.
- [4] Górskikrzysztof. et.al "study of Combustion Characteristics of an CI Engine fuelled with Ethnol and Oxygenated fuel Additives", "Journal of Sustainable Energy and Environment", vol. 1 (2010)85-91.
- [5] M. Loganathan, et.al "In-Cylinder Pressure Characteristics of a CI Engine Using Blends of Diesel Fuel and Methyl Esters of Beef Tallow", Journal Series Number 11072 of the University of Nebraska Agricultural Research Division.
- [6] Nilamkumar S. Patel, et.al "Prediction models for density and viscosity of biodiesel and their effects on fuel supply system in CI engines," International conference on Renewable Energy, vol. 35, no. 12, pp. 2752-2760, Dec. 2010.
- [7] Sandip S. Jawre et.al. "Experimental Analysis of Performance of Diesel Engine Using Kusum Methyl Ester With Diethyl Ether as Additive"International Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 5( Version 7), May 2014, pp.106-111.