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A Review of Performance & Emission of C.I Engine Using Neem- Biodiesel With additives.

KEYWORDS

Vipul B Chaudhari
Mechanical Engineering Department, North Maharashtra University , Maharashtra, India

Satish U Patel
Professor Mech Dept, D.N.Patel COE , Maharashtra, India

ABSTRACT *Bio-diesel is widely accepted as comparable fuel to diesel in compression ignition engines. It offers many advantages including; higher cetane number, reduced emissions of particulates, CO, NOX, and hydrocarbons, reduced toxicity, improved safety and lower lifecycle CO2 emissions. The objective of this research is to determine the relationship between engine performance and emissions using diesel, volumetric blends of Neem bio-diesel and additives as a fuel in a multi cylinder, four stroke, water cooled, direct injection CI engine.*

Introduction
An enormous increase in the number of automobiles in recent years has resulted in greater demand for petroleum products. With crude oil reserves estimated to last only for a few decades, therefore efforts are made on way to research on alternative to diesel. Depletion of crude oil would cause a major impact on the transport sector. . . Energy conservation is important for most of the developing countries, including rest of world. The rapid depletion in petroleum reserves and uncertainty in petroleum supply due to political and economical reasons, as well as, the sharp escalations in the petroleum prices have stimulated in search for alternatives to petroleum fuels. The situation is very grave in developing countries like India which import 70% of the required fuel, spending 30% of her total foreign exchange on oil imports. In view of this, researcher found and analyze many energy sources like CNG, LNG, LPG, ethanol, methanol, hydrogen, bio-diesel and many more. Among these alternative fuels, India is having significant scope for development of bio fuel. Diesel engines are major source of transportation, power generation, marine application, agriculture vehicles etc. Bio-diesel is widely accepted as comparable fuel to diesel in compression ignition engine.

Bio-diesel
Bio-diesel is fatty acid methyl or ethyl ester made from virgin or used vegetable oils (both edible & non-edible) and animal fats. The main commodity sources for bio- diesel in India can be non-edible oils obtained from plant species such as Jatropha Curcas, Karanj, Neem, Mahua etc. Bio-diesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a bio-diesel blend or can be used in its pure form. Just like petroleum diesel, bio-diesel operates in compression ignition engine; which essentially require very little or no engine modifications because bio-diesel has properties similar to petroleum diesel fuels. It can be stored just like the petroleum diesel fuel and hence does not require separate infrastructure. The use of bio-diesel in conventional diesel engines results in substantial reduction of un-burnt hydrocarbons, carbon monoxide and particulate matters. Bio-diesel is considered clean fuel since it has almost no sulphur, no aromatics and has about 10% built-in oxygen, which helps it to burn fully. Its higher cetane number improves the ignition quality even when blended in the petroleum diesel. It provides significant lubricity improvement over petroleum diesel fuel. Lubricity results of bio-diesel and petroleum diesel using industry test methods indicate that there is a marked improvement in lubricity when bio-diesel is added to conventional diesel fuel. Even bio-diesel level as low as 1% can provide up to 65% increase in lubricity in distillate fuels.). HC and CO emissions were also reported to be lower. Non-regulated emissions were also found to be lower. Bio-diesel has been accepted as clean alternative fuel by US and its production presently is about 100 million Gallons.

Bio-diesel (NEEM)
A Neem tree can produce many thousands of flowers. In one flowering cycle, a mature tree may produce a large number of seeds. Neem trees start bearing harvestable seeds within 3-5 years, and full production may be started in 10 years, and this will continue up to 150-200 years of age.[7] A mature Neem tree may produce 30-50 kg of fruit each year.[7] By rough estimate India has nearly 20 million Neem trees. Indian Neem trees have a potentials to provide one million tonnes of fruits per year and 0.1 million tons of kernels per years (assuming 10% kernel yield). Neem seeds yield 40-60% oil.[7] Neem is a golden tree that has gained world-wide importance owing to its multiple uses. Besides agro forestry, it is used in pest control, toiletries, cosmetics, pharmaceuticals, plant and animal nutrition and energy generation. Neem trees are considered to be a divine tree in India because of their numerous valuable uses. The commercial value of Neem has been known since Vedic times. Every part of Neem tree viz.,leaf, flower, fruit, seed, kernel, seed oil, bark, wood, twig, root etc. has been in use and traded in various purpose.

Additives
These help the fuel in meeting environmental emission control standards and improve engine or vehicle performance. Apart from these qualities, the fuel additives serve other purposes such as reduction of corrosive effects, enhance combustion properties, and develop various grades of fuel blends required for various commercial, automotive, industrial, and aerospace sectors. Fuel additives are designed to meet the increasingly stringent environment norms as various countries are implementing regulations to control emissions. Stringent environmental regulations, increasing demand for clean and efficient fuel, and depleting crude reserves are the main market drivers of the fuel additives market.

Literature Review
Pravin A. Manade et al.[10] utilized bio fuel from two different production process esterification called ethyl esters and transesterification called methyl ester. They found that fuel is rather viscous compared to diesel. Chemically is equivalent to fatty acid methyl esters or ethyl esters, produced out of triacylglycerol (triglycerides) via transesterification or out of fatty acids via esterification. Transesterification (alcoholysis) is a reversible reaction in which one ester is converted into another by interchange of ester groups. In the reaction one mole of triglyceride oils contained in vegetable oils, animal fats, or recycled greases, reacts with three moles of alcohol to form one mole of glycerol (glycerin) and three moles of the fatty acid alkyl ester (bio-diesel).

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Atul Dhar et al.[11] investigated performance of CI engine using non-edible oil and blend of oil with diesel produced from Neem. A wide range of engine loads and volumetric blends of 5% Neem bio-diesel and 95% diesel, 10% Neem bio-diesel and 90% diesel, 20% Neem bio-diesel and 80% diesel, 50% Neem bio-diesel and 50% diesel are used for performance measurement of vertical, four stroke, single cylinder, constant speed, direct injection, water cooled, compression ignition engine of Kirloskar oil engine model no. DM-10.

Nishant Tyagi et al[13] observed that break thermal efficiency of B10 is very close to break thermal efficiency of pure diesel. Researcher found 28% brake thermal efficiency by using pure diesel while 31% brake thermal efficiency by using 20% Neem bio-diesel and 80% diesel. Brake thermal efficiency of B20 is 14.2 % higher than break thermal efficiency of pure diesel due to the more oxygen content. Researcher attributed that an increase in break thermal efficiency may be attributed to the complete combustion of fuel because of oxygen present in blends perhaps also help in combustion of fuel.

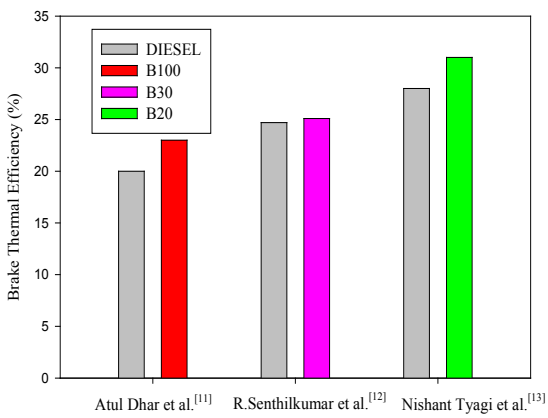

Figure1. Variation in Brake Thermal Efficiency for different Fuel

R.Senthilkumar et al[12] observed that the specific fuel consumption of blends 20% Neem bio-diesel and 80% diesel had 8.33 % lower than specific consumption of mineral diesel. Researcher found 0.6 kg/kWh BSFC with mineral diesel, 0.55 kg/kWh BSFC with blend 20% Neem bio-diesel and 80% diesel, Researcher attributed that this happened due to extra amount of oxygen present on the blend which is taking part in combustion process.

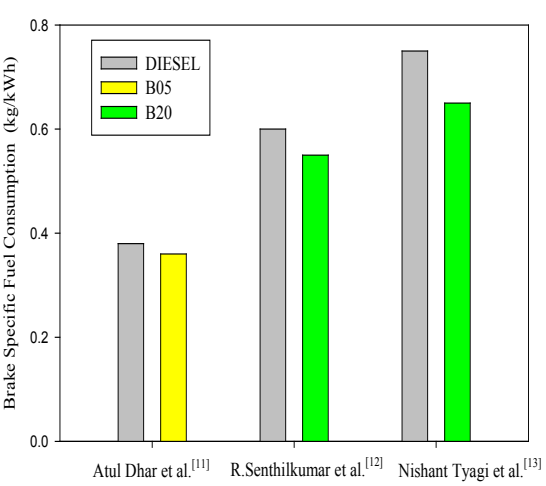

Figure 2.Variation in Brake Specific Fuel Consumption for different Fuel

Atul Dhar et al[11] evaluated that exhaust gas temperature for all bio-diesel blends is lower than mineral diesel. Researcher found 280 oC EGT with pure diesel, 225oC with blend 5% Neem bio-diesel and 95% diesel, 260 oC with blend 100% Neem bio-diesel. Researcher found that 20 % exhaust temperature decrease with 5% Neem bio-diesel and 95% diesel blend compare to mineral diesel. They attributed that combustion of higher bio-diesel blends start relatively earlier and their combustion ends earlier also compare to lower bio-diesel blends.

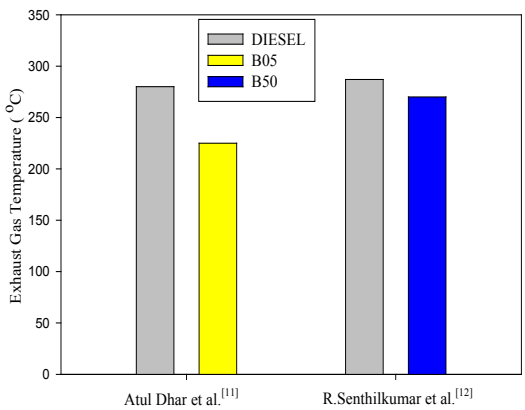

Figure 3 Variation in Exhaust Temperature for different Fuel

R.Senthilkumar et al.[12] investigated that emission of CO for blends 20% Neem bio-diesel and 80% diesel is 16.67% lower than emission of CO for mineral diesel. They found 60 gm/kWh with pure diesel, 50 gm/kWh with blend 20% Neem bio-diesel and 80% diesel Researcher concluded that these lower emissions of CO may be due to their more complete oxidation as compared to mineral diesel.

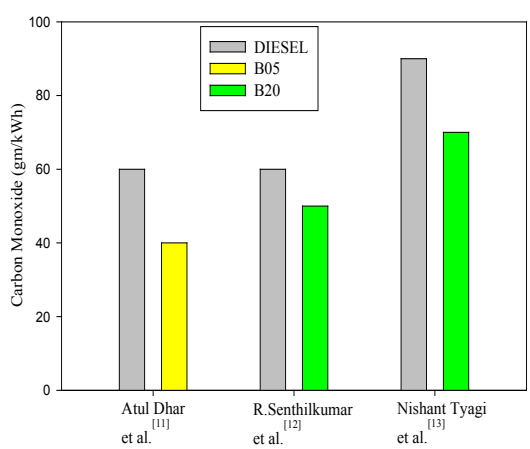

Figure 4.Variation in Carbon Monoxide for different Fuel

Nishant Tyagi et al.[13] observed that emission of NOx for blends 20% Neem bio-diesel and 80% diesel is 21% lower than emission of NOX for mineral diesel. They found 9 gm/kWh with pure diesel, 7.10 gm/kWh with blend 20% Neem bio-diesel and 80% diesel. They attributed that one of blend of bio-diesel increases NOx increases because oxygen present in the blend perhaps also helped in complete combustion of fuel.

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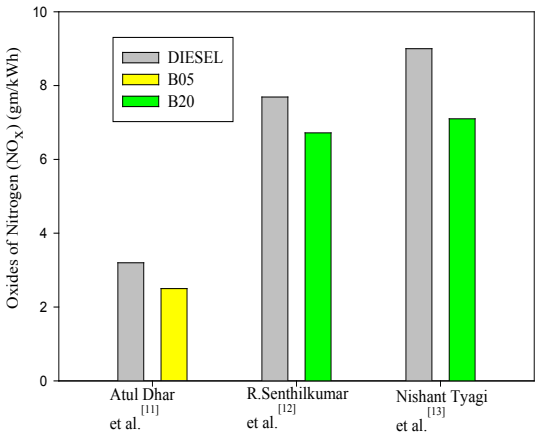

Figure 5.Variation in oxides of Nitrogen for different Fuel

Conclusion

These paper overview Recent Investigation which shows that additives also plays important along Neem Bio-diesel. Biodiesel has distinct advantage as an automotive fuel. Initial cost may be higher but feedstock diversity and multi-feedstock production technologies will play a critical role in reductions in production cost and making the fuel economically viable, in order to increase the brake thermal efficiency ,to reduce BSFC and to reduce emission (NOx, CO) of C.I engine.

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