

Development in Ic Engine Using Alternative Fuel And Its Engine Performance And Emission (A Review)

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Abstract

In the present scenario, due to increase in population, over usage of vehicles and luxurious lifestyle, the rate of fuel consumption and its depletion rate has reached to the core. To overcome these problems, recently many research works has been conducted to use alternative fuel to reduce the dependence on fossil fuels. The main aim is to increase the performance of the engine and reduce emission. It also improvise the economy of the world because the most of the alternative fuels is comparably lower than fossil fuels. Engine performance and emission can be also enhanced by using alternate methods like catalytic convertor and some modification in the engine. Some research work suggest that engine emission can be reduced by using ethanol blend, vegetable oil blend, compressed natural gas, hydrogen and methane blends etc. The overall motive of usage of alternative fuel is for the better working of Internal combustion engines.

Keywords: *Alternative fuels like vegetable oil, mustard oil, ethanol blend, kerosene, hydrogen diesel blend, CNG, HCNG; fuel consumption, performance and emission of engine.*

INTRODUCTION

At present transportation is one of the main and fast changing sector. Since all the fossil fuels had become a great demand and it is depleting in a fast rate. To overcome this, alternative fuel like vegetable oil, ethanol biodiesel blend, mustard oil etc. has been used. The main focus of these fuels is to decrease emission rate and improve the performance and efficiency of the engine. The main attention of the alternative fuel is for sustainable development, energy conservation and environmental preservation. Using natural gas, electricity and ethanol are most suitable as an alternative for fossil fuel that can reduce global warming, fossil fuel consumption and exhaust emission. Even though there are limitations in biofuel, research work has been conducted to reduce these drawbacks for better performance of engine.

LITERATURE SURVEY

The Benz system, manufactured a model to conduct an experiment using a single four stroke cylinder combustion engine. The engine used mustard oil methyl ester (MOME) which was produced by transesterification process using mustard oil and methanol with sodium hydroxide as catalyst as fuel. In the experiment, exhaust emission analyser and smoke meter were used to determine the exhaust emission and smoke emission. Pressure variation was determined by U tube manometer. By all these factors the diesel was compared with the mustard oil blend like B20, B40 and B60. As mustard oil has the low saturated fat and rich monosaturated fatty acid proved that oil was suitable for production of biodiesel. The level of viscosity and density was lower than diesel fuel. Ignitability was used to determine the flash and fire point. Cetane number was found to be good for ignition quality.

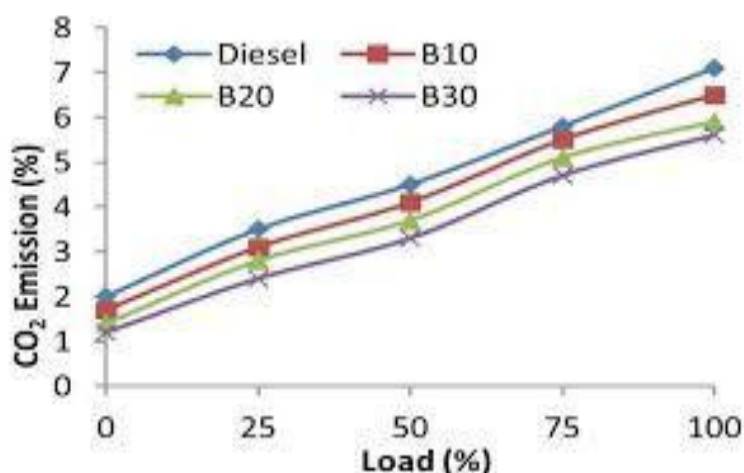


Fig: 1. The above graph shows the variation of carbon monoxide emission with different blends and diesel.

Many researchers all over the world conducted experiment of using ethanol blend with diesel and came out with the common conclusion. In specific, Hulwan and Joshil studied the performance and emission characteristics of using diesel-ethanol biodiesel blend and came up with the conclusion that the blended fuel will give higher brake specific fuel consumption and drastic decrease in emission of NOX. The test also resulted that at all the operating condition the emission of particulate matter and hydrocarbon was decreased when blended fuel was used. Ethanol blended fuel had lowest specific fuel consumption than biodiesel-diesel blend.

As an alternative to diesel fuel, diesel-hydrogen duel fuel was used to improve the performance of IC engine. The main advantage of using diesel hydrogen fuel was that, the production of hydrogen by electrolysis of water was cheap and there was no hardware modification in engine was required for the supply of hydrogen, only a inlet was given for the entry of gas into the combustion chamber. This experiment resulted in increase in the combustion efficiency. The by-products got by the fuel consumption had variety of uses.

Sapinza University, Rome, conducted an experiment of vegetable oil and waste cooking oil as an alternative to diesel using turbo-charge, four-cylinder, four- stroke, water cooled diesel engine.

At present biodiesel has almost taken its role as an alternative to diesel. But even it has its own drawbacks such as, biodiesel has more viscosity than diesel. In order to overcome this drawback vegetable oil diesel blend is used as it has lower viscosity than biodiesel. Another advantage of vegetable oil is that it has lower ignition temperature than diesel due to the presence of oxygen. The test also resulted that using biofuel reduce the formation of soot and particulate emission than that of diesel and emission was also comparably less.

Nowadays hydrogen compound natural gas has also been an alternative for petrol and diesel fuel. Usage of natural gas as fuel runs the engine at higher compression ratio than petrol and diesel engine. It strongly reduces the emission of NOX, SOX, particulate matter etc. In particular compressed natural gas reduces the emission of hydrogen and carbon dioxide to give clean fuel. By using natural gas as fuel in engine has advantages like lower

heat loss and high brake thermal efficiency. Comparing with natural gas engine and hydrogen enriched natural gas engine (HCNG) has minimum modification.

It improves the economy as the cost of HCNG is comparatively less than diesel and petrol fuel. Bysveen (15) analysed efficiency and emission having HCNG as fuel and found that brake thermal efficiency was high in HCNG than compressed natural gas (CNG).

Oxy hydrogen gas commonly called as brown gas obtained from the electrolysis of water has created a great impact as fuel in IC engine. The igniting capacity of brown gas with air fuel mixture happens in a fraction of second earlier than the fuel. In mixture of brown gas and air fuel the combustion rate is very high as it ensures smoother performance and complete combustion of fuel. This results in the decrease in the hydrocarbon level in the exhaust. As brown gas is the product after the combustion of steam it does not cause any pollution.

Use of ammonia as alternative has come into role only in recent years. As ammonia is a substantial hydrogen carrier, it has a potential to reduce emission. Recently, ammonia-gasoline fuel blend, ammonia-gasoline dual fuel blend and ammonia metal ion complex has come into picture as different types of blends used as fuel.

The Texas technology University research team used ammonia gasoline blend and found that it has many useful effects in automotive industry as transportation fuel. The ammonia gasoline blend has higher specific heat capacity which helps in the reduction of combustion temperature and hence cooling power. These factors increase the power and decrease exhaust temperature and better compression ratio. The ammonia gasoline blend system

requires minimum equipment modification and new mechanism.

Butanol gasoline blend can be used as the better alternative for bioethanol. Because it has more oxygen content than ethanol gasoline blend. Ignition rate will be high and hence better performance and efficiency. With increase in butanol content there is a decrease in emission of carbon monoxide and particulate matter. The formation of soot will also be very low.

CONCLUSION

The paper critically reviews the performance, emission and efficiency by using alternative fuel rather than petrol or diesel fuel. The overall result concluded that alternate fuel higher brake thermal efficiency, reduced emission of particulate matter and less soot formation. Many of the alternative fuels do not require much of engine modification and it was obtained at low cost. Combustion efficiency and ignition capacity of biofuel blends was much higher than diesel and petrol fuel. The by-product obtained from the combustion of alternative fuel had lots of uses in other aspects.

The result of all the literature survey gives hope that many improvements can be done in the engine by using alternative fuel for better environmental behaviour of the engine and economy.

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