



Performance and Emission Analysis of Jojoba Biodiesel on CRDI VCR Diesel Engine

Yash Raj¹, Abhishek Bhandari²

Research Scholar¹, Professor & Head²

Department of Mechanical Engineering,

NRI Institute of Research and Technology, Bhopal

¹myashraj28@gmail.com, ²abhishek.bhandari08@gmail.com

Abstract : Human beings are heavily dependent on crude oil for their various need of survival on this planet but the way humans use crude oil make scientists to think deeply about renewable sources. One of the substitutes for the crude oil is a biodiesel. Jojoba biodiesel can be surely used as an alternative or it can be used to decrease the use of specially diesel fuel. Jojoba biodiesel emerges as prime substitutes among various biodiesel with its unique properties. This review paper describes the performance and emission analyses of jojoba biodiesel which can be used in compression ignition engine along with further future scope. Finally various performance and emission output result is analysed with their reasons is summarized along with future scope.

IndexTerms – Crude Oil, Jojoba Biodiesel, Renewable Energy, Compression Engine.

I. INTRODUCTION

Crude oil is non-renewable; it will be exhausted in few decades. There are numerous biodiesels already been used in compression ignition engine or we can say that various research work has been already done on different biodiesel such as jatropha, linseed, soya bean oil, mustard oil, rapeseed oil etc. but this review article describes about jojoba biodiesel due to its distinct advantages over another biodiesel. This oil is extracted from developed seed of jojoba plant, mainly grows in desert area. This biodiesel has an amazing property to grow in hot, arid, dessert area without any proper care and attention. The wild nature of jojoba and the high oil content of jojoba seeds make it one of the best crops which can be utilised for biodiesel production. It has lower flashpoint means it ignites at higher temperature and it is less likely to ignite accidentally hence transport and storage easier and safe. Biodiesel is a type of diesel made from plants oil or animal fat. It consists of long chain hydrocarbon. Biodiesel is made up of biological ingredients rather than of fossil fuels which makes them the favourable substitute for diesel. Biodiesel is a renewable, non-toxic and biodegradable, similar to this biodiesel contains high cetane number, better ignition performance, and high combustion efficiency, contains more oxygen molecule. Besides this mixing of diesel with biodiesel reduces the emission.

II. PERFORMANCE ANALYSIS

Impact on brake thermal efficiency

All biodiesel blends have been determined to have lower BTEs than pure diesel. It is evident that jojoba blends cause BTE in diesel engines to decrease. This is due to the combined fuel's larger calorific value and viscosity than diesel, which eventually results in poor atomization and combustion.

Impact on brake specific fuel consumption

The brake specific fuel consumption of the engine rises as the jojoba biodiesel blend percentage in diesel fuel rises. One of the main disadvantages of raising the blend percentage of biodiesel in a diesel engine is that the fuel requires more gasoline per unit of power output due to its lower heating value, high viscosity, and high latent heat of vaporisation when compared to diesel engines.

Impact on brake power

As the blend of jojoba biodiesel increases the power output especially brake power and torque decreases this is because of the low energy content of jojoba biodiesel as compared to diesel fuel.

Impact on Exhaust gas temperature

Jojoba biodiesel has more oxygen molecules than diesel fuel; early fuel combustion occurs even though it has a lower heating value and is more viscous than pure diesel. The result shows an increase in the value of exhaust gas temperature. As the blend% increases fuel becomes more viscous and calorific value decreases, engine has to increase more power and burning of fuel does not takes place smoothly. Hence the value of EGT increases gradually.

III. EMISSION ANALYSIS

Effect on Carbon monoxide

Jojoba biodiesel contains more oxygen than conventional diesel fuel, there are fewer carbon monoxide emissions as a result of the increased use of biodiesel. Hence it can be concluded that the jojoba biodiesel used lower the emission of harmful carbon monoxide.

Effect on Hydrocarbon

The value of hydrocarbon continuously falls as the blend percentage rises. This is due to the higher oxygen molecule content in biodiesel, which enhances combustion quality and lowers the value of carbon atoms compared to diesel fuel. Blends of biodiesel are good in reducing the majority of hazardous emissions.

Effect on NOx

The oxides of nitrogen emission are quite different from all other emissions while using jojoba biodiesel. As the blend% increases, the value of NOx emission increases. This is the only drawback of using jojoba biodiesel. This is because jojoba biodiesel has a high cetane number and a high oxygenated molecule; as a result, a high inline cylinder temperature is achieved as high oxygen results in better fuel burning. However, due to the high inline cylinder, NOx is produced.

Effect on Smoke

As the blend of jojoba biodiesel increase the value of smoke decreases this is because of high oxygen molecule content in jojoba biodiesel this results in proper combustion of fuel so the by product of the emission reduces which results in low smoke opacity.

IV. CONCLUSION AND FUTURE DIRECTION

The use of jojoba biodiesel in diesel engine is quite effective as it reduces almost most of the harmful emission by not compromising much on performance parameters. NOx emission and viscous nature of this biodiesel can be also reduced by adding suitable additives in appropriate ratio. Jojoba biodiesel blend can be surely used with diesel engine with no modification in the engine. It needs some good planning of jojoba plant production, harness and its cultivation without affecting soil quality. Analysing performance and emission analysis only through blends of jojoba biodiesel is not enough. There is a decent scope of further research in jojoba biodiesel by taking various input variables at a time in order to describe the actual performance of jojoba biodiesel in real life condition.

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