REVIEW OF EFFECT OF BIODIESELPROPERTIES ON DIESEL ENGINE PERFORMANCE AND EMISSION

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ABSTRACT

Biodiesel is extracted from straight vegetable or animal oil, which has nearly similar properties to the petroleum diesel due to which it can be used as an alternative fuel to the petroleum diesel.Since, the biodiesel or the oil has higher viscosity, high flash point and lower calorific value than diesel, increases SFC, EGT and decrease the BTE. Several processes are followed to decrease the viscosity of the oil like transesterification, pyrolysis, dilution and preheating. Hence, properties of the oil or biodiesel mainly influence the engine output. The survey has been done for analysing the effect of the properties on the engine performance and emission

Keywords - Biodiesel,Efficiency, Fuel,Temperature, Property

I. INTRODUCTION

Biodiesel chemically called it as 'mono methyl ester' can be extracted from a wide variety of plant oils, both edible and non-edible biodiesel. Most of the developed countries produce biodiesel from sunflower, Jatropha, cottonseed, peanut, palm and several other feed stocks which are principally edible in Indian context. Hence, in the developing countries such as India, it is desirable to produce biodiesel from the non-edible oils which can be extensively grown in the waste lands of the country. Due to the depletion of fossil fuel worldwide and increasing demand of the fuel has made up to go with the alternative resources to cope up the demand of the fuel. The biodiesel serves the better performance characteristics in the sense of the BSFC, brake thermal efficiency, brake power, mean effective pressure, volumetric efficiency etc. The properties of the biodiesel such as cetane number, viscosity, calorific value are closer to the petroleum diesel which affects performance and emission of engine. The economic feasibility of biodiesel depends on the price of crude petroleum and the cost of transporting diesel over long distances to remote areas. It is a fact that the cost of diesel will increase in future owing to increase in its demand and limited supply [1]. The objective of current research work is to investigate the usage of biodiesel and reduce the emissions of all regulate pollutants from diesel engines.

Due to plodding depletion of world petroleum reserves and the influence of environmental pollution of increasing exhaust emissions, there is crucial necessity for suitable alternative fuels for use in diesel engines. In

view of this, vegetable oil is a promising alternative because it has several advantages. The problem of high viscosity of vegetable oils has been approached in several ways such as preheating the oils blending or dilution with other fuels, transesterification and thermal cracking / pyrolysis.

Recently, several researches have been made byutilizing vegetable oils like sunflower, cottonseed, peanut, soybean, rapeseed, palm, olive, linseed, jatropha, coconut, pongamia, rubber seed, and jojoba etc. for biodiesel preparation. Many of the vegetable oils are edible in nature, continuous use of them cause shortage for food supply and proves far expensiveto be used as fuel at present. Hence it offers lot of scope to work on non-edible oils for research. It is proved that vegetable oils offer acceptable engine performance and emissions for short-term operation while for long –term duration problems like filter clogging, carbon deposits on injector exterior, compression ring grooves, piston etc. have been reported. The high viscosity of vegetable oils is accountable for these glitches. Therefore, reduction in viscosity of vegetable oils is of the major importance to make them appropriate for diesel engines. Different methods are utilized to reduce the viscosity of non-edible oils. Testing of diesel engines with diesel and blending with preheating advances the performance and reduce the emissions compared with neat vegetable oil. It also decreases the filter clogging and certifies smooth flow of oil. From above specified factors it is evident that identification and testing of new non-edible vegetable oils on diesel engine is of great importance.

II. LITERATURE REVIEW ON EFFECT OF FUEL PROPERTIES ON ENGINE PERFORMANCE AND EMISSION

Table2.1 Effect of fuel property on engine output

Sr. no.	Name of investigator	Fuel used	Property improving parameter	Effect on properties	Effect on Engine output
1.	K. Pramanik[2] 2003	Jatropha oil	Temperature	Increase in temperature decreases the viscosity of oil.	SFC and Exhaust gas temperature is reduced due decrease in viscosity of the oil.
2.	Deepak Agarwal and Avinash Kumar Agarwal [3] 2007	Jatropha oil	Preheating and blending	1. Viscosity of oil is reduced by increasing oil temperature. 2. Viscosity of oil increases with increase in blend ratio.	BSFC and EGT for unheated Jatropha oil was found to be higher compared to diesel and heated Jatropha oil. Thermal efficiency was lower unheated Jatropha oil and diesel. CO, CO2,

					HC and smoke opacity were found to have increased with increasing proportion of Jatropha oil.
3.	G. Lakshami Narayan Rao et. Al. [4] 2008	Waste cooking oil			The high viscosity of vegetable oils and low volatility affects the atomization and spray pattern fuel leading to incomplete combustion and serve carbon deposits, injectors choking and piston ring sticking.
4.	D. Ramesh et. Al. [5] 2008	Jatropha biodiesel	Blending	Specific gravity, Kinematic viscosity, calorific value and flash point increases with increase in blend ratio.	EGT, SFC, CO2 and NOx increases with the increase in mentioned properties w.r.t. blend ratio.
5.	Haying Tang et. Al. [6] 2008	Soyabeen, cottonseed and Poultry fat based biodiesel	Saturation of biodiesel	The saturation and unsaturation composition influence the cold flow properties such as cloud point and pour point.	Due to higher unsaturated components in Soya been oil methyl ester, it has better cloud and pour point.
6.	A. Siva Kumar et. Al. [7] 2009	Cottonseed biodiesel	Temperature	Viscosity of cottonseed biodiesel is decreased by increasing the temperature.and increase with increase in biodiesel percentage.	Thermal efficiency of biodiesel is lower due to volatility, higher viscosity and density.
7.	Samir J. Deshmukh	Cottonseed,	Transterification	Transterification	A slight power loss,

	et. Al. [8] 2009	Hingana, Soyabeen, Jatropha biodiesel		process is done to decrease viscosity of the oil.	combined with the increased fuel consumption due to lower heating value.
8.	Hanumantharao et. Al. [9] 2009	Jatropha oil biodiesel	Blending	Blending of biodiesel is done to reduce viscosity.	Thermal efficiency is increased due to complete combustion and excess availability of oxygen.
9.	Hanumantharaoet. Al. [10] 2009	Jatropha oil biodiesel		Presence of oxygen in fuel improves combustion properties and emission but decreases calorific value.	Lower calorific value increases SFC.
10.	KonstantinosKalgoras et. Al. [11] 2010		1. Blend fraction,	1. Density, Cetane number, flash point and viscosity increases with increase in blend ratio.	Cetane number improves auto ignition ability, Viscosity improves the lubricity in engine, lower calorific value decreases power, and increase in fuel consumption.
11.	B. Tesfa et. Al. [12] 2010	Rapseed oil, Corn oil, Waste oil	1. Blend fraction 2. Temperature	1. The biodiesel kinematic viscosity increases with increasing biodiesel blend fraction for all blends. 2. Density and viscosity of each blend decreases with increase in temperature.	1. Higher kinematic viscosity causes poor fuel atomization. 2. The variation of the density affects the power and the fuel spray characteristics during fuel injection and combustion in cylinder.
12.	Praveen K. S. Yadav	Palm fatty	Blending	With increase in	SFC increases with

	et. Al. [13] 2010	acid biodiesel		blend ratio the calorific value decreases.	decrease in calorific value.
13.	M. Pugazvadivu et. Al. [14] 2010	Mahua oil	Preheating of oil	With the increase in heating temperature of oil, kinematic viscosity decreases.	Smoke density is decreased due decrease in viscosity and improvement in spray and fuel air mixing.
14.	P. B. Ingle et. Al. [15] 2011	Neat and preheated Cottonseed oil biodiesel	Preheating of biodiesel	Preheating of biodiesel decreases viscosity and increases volatility.	It enhances the air fuel mixing. Oxygenated fuel gives better consumption delivering improved thermal efficiency.

Biodiesel is prepared from various oils like Jatropha oil [2, 3, 5, 8, 9, 10], cottonseed oil [6, 7, 8, 15], Palm oil [13], Poultry based oil [6, 13], mahua oil [14] etc. has higher viscosity, flash point and lower calorific value[1-15]. Higher kinematic viscositycauses poor fuel atomization [12]. The variation of the density affects the power and the fuel spray characteristics during fuel injection and combustion in cylinder [12]. Lower calorific value increases specific fuel consumption [8, 10, 11, 13]. Biodiesel has lower cloud point and pour point which may raise the trouble in coldatmosphere [6].

These properties are improved by various methods like preheating, pyrolysis, blending with diesel and transesterification process. Preheating decreases viscosity which ultimately increases thermal efficiency, decreases BSFC and EGT [2, 3, 7, 15]. Blending of oil increases emission of CO, CO2, HC and smoke opacity [3, 5]. On the contrary, thermal efficiency isfound increased due to complete combustion and excess availability of oxygen [9].

III. CONCLUSION

The biodiesel properties like Cetane number, Viscosity, Calorific value, Density and flash point affect engine performance and emission characteristics. Calorific value

a) Higher kinematic viscosity, higher flash point, lower calorific value of straight vegetable heated or unheated oil, ultimately affect the engine performance like brake thermal efficiency, BSFC, EGT etc. and emission parameters like NOx, CO, CO2, HC etc.

b) Hence, the oil should be treated or blended with diesel or heated before utilisation or transesterified to improve fuel/ oil properties and improve the engine performance and lower emission.

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