International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org || PP. 01-03

Alternative Sources of Engine Fuel-Bio Diesel With Reference To Vegetable Oils

K.Ravi[1], V.Sandhya[2], R.Indira[3],K.S.V.Madhavi Rani[3], Ch.V.Mahalakshmi[4]
1. Dept of Telugu, Sir C.R.Reddy (A) College – Eluru, W.G.Dt
2. Dept of Zoology, S.CH.V.P.M.R Govt DegreeR college – Ganapavaram, West Godavari Dist
3. Dept of Zoology, St Theresa's(A) College For Women – Eluru,W.G.Dt
4. Dept of Hindi, St Theresa's(A) College For Women – Eluru,W.G.Dt
Corresponding Author: K.Ravi

Abstract: *Vegetable oil can be used as an alternative fuel in diesel engines and in heating oil burners. When vegetable oil is used directly as a fuel, it is referred to as straight vegetable oil (SVO) or pure plant oil (PPO). Conventional diesel engines can be modified to help ensure that the viscosity of the vegetable oil is low enough to allow proper atomization of the fuel. This prevents incomplete combustion, which would damage the engine by causing a build-up of carbon. Straight vegetable oil can also be blended with conventional diesel or processed into biodiesel or bio liquids for use under a wider range of conditions.Transportation industry is part and parcel of every nations economic growth. Motor fuel or diesel is the main ingredient which decides the transportation cost. Small Arab countries are able resources. Petroleum is a liquid gold for any country. But it is a non-renewable source, which takes hundred years to be replenished. Nation's like India do not have enough petroleum resources and have to spend a major part of its foreign exchange to import oil. The position is same for many other developing countries also. So search for renewable motor fuels gained importance.*

Keywords: *Preparation, Methods to reduce viscosity, Benefits, Physical properties.*

I. Introduction

Research for alternative renewable motor fuels like Bio-diesel started in scientific community way back in 1895. Doctor Rodolf diesel engine to run on vegetable oil (peanut oil). In 1911 he stated that "The diesel engine can be fed with vegetable oils and would help considerably in the development of agriculture of the countries which use it." This statement is very much true and apt in case of India whose economy is dependent mainly on agriculture. Preparation of Bio-diesel is a simple process. It can be produced in backyard of the house itself using cooked vegetable oil with some safety measures. The following are some of the methods of preparation of Bio-diesel. Vegetable oils are chosen for chosen for production of Bio-diesel because of their better lubricity, but its viscosity is higher than petrol-diesel. Hence following methods are adopted to reduce its viscosity.

Method 1: Esters of vegetable oils formed by trans-esterification process of vegetable oil with alcohol in the presence of a catalyst gives Bio-diesel. The vegetable oil may be fresh or used vegetable oil (WVO). The other processes are pyrolysis, micro-emulsion, and blending and thermal, polymerization. These processes decrease the high viscosity of vegetable oil to be used as diesel fuels. The viscosity of the Bio-diesel now matches the European standard EN 14214, American ASTM standards.

Method 2: SVO or straight vegetable oil can also be used as diesel fuel. SVO can be used in vehicles by fitting two fuel tanks, the first containing petro-based diesel and the second, vegetable oil. The engine starts on petro-oil and runs for a short time while the vegetable oil in the second tank is warmed up by hot fluid form the engines cooling system. When oil reaches a specific temperature, the engine switches from petro-oil to vegetable oil.

Method 3: In another system, there will be only one fuel tank and the vegetable oil is heated up to appropriate temperature by an electric coil so that its viscosity decreases before it enters the high pressure pump.

Method 4: In this method blends of bio-diesel and petro-diesel or SVO & petro-diesel in proportions of B-20, B-30 etc are used in the fuel tanks. It facilitates improvement in performance of the engine, enhanced lubricity and reduction in toxic emissions.

Benefits:

- The main benefit derived is reduction in emissions generated when using this Biodegradable low toxic fuel.
- It is fully renewable source manufactured with in the country.
- It reduces carbon-dioxide emission by 80% and sulphur dioxide by 100%, which is the cause of acid rains.
- It reduces exhaust smoke by 75% cause for black cloud associated with a diesel engine.
- Its exhaust is far more pleasant than petro-diesel and does't harm the mechanic's hands while handling and also protect their skin from cracking or redness.
- It is less dangerous to fill in vehicle fuel tank since its flash point is 150 degree centigrade as opposed to petroleum diesel which is 70 degree centigrade.
- During spillage, Bio-diesel degrades four times faster than petroleum diesel.
- It has significant lubricity than petroleum diesel enhancing the lifetime of engines and performance. ULSD (ultra low sulphur diesel) needs additives to improve its lubricity. But ULSD mandated by EPA (environmental protection agency) makes injector pumps to wear-out soon.
- Bio-diesel reduces classic diesel engine knocking noise.
- Bio-diesel doesn't require any changes to the existing storage infrastructure.

Use of Bio-diesel in conventional diesel engine results in substantial reduction in unburnt hydrocarbons, carbon monoxide and particulate matter. The carbon fraction of particulate matter is decreased due to the increased amount of oxygen present in Bio-diesel, which enables a more complete combustion process.

Bio-diesel exhaust has a less harmful impact on human health and reduces the levels of all largest polycyclic aromatic hydrocarbons (PAH) and nitrated PAH compounds to 75-85%.

Using Bio-diesel with some additives Non emissions can be reduced by 24000 tons per year from air, which is the main contributor of ozone pollution.

Bio-diesel will clear injectors and fuel lines extremely well, as it is an excellent solvent. It will not create sludge as in the case of petro-based diesel engines. We need to reduce the amount of fossil fuel we burn, if we have any hope of cleaning up the air. Bio-diesel allows us to do this today without stopping the trucks running that keeps our economy moving.

II. Problems with Bio-diesel

compounds mainly aromatics, sulphur, oxygen, nitrogen where as vegetable oils are mixtures of tri glycerides of fatty acids It will soften and degrade certain types of elastomers and natural rubber compounds used in older fuel hoses and pump seal systems. But new vehicles (after 1994) are fitted with synthetic fuel lines and seals which suffer no problem with Bio-diesel.

Need of a physicist in bio-diesel scene: When SVO or Bio-diesel is to be used as alternative fuel, it is the work of a physicist to study the physical properties and standards prescribed for petro-diesel as motor fuels. These are basically homogenous mixtures of paraffin, naphthenes and unsaturated cyclic.

The physical properties of SVO's and Bio-diesel to be studied are:

API gravity: Inverse of specific gravity.

Pour point: It is the lowest temperature at which the lubricant will flow under specified conditions and is related to viscosity-temperature phenomena.

Flash point: Indication of combustibility of vapours of oil. It is the lowest temperature at which the vapor of oil can be ignited under specific conditions.

Specific heat: It is the function of fluid structure and density. It is used in the calculation of heat transfer and other thermal factors in oil filling.

Heat of combustion: It is measured in terms of Wobble number.

Latent heat of vaporization & Latent heat of fusion: Quantities related to molecular weight, API and boiling point.

Thermal expansion coefficient: It is required to find out the volume of the container (fuel tank) which is exposed to frequent changes of temperature.

Viscosity & Viscosity index: It is an important property of lube oils in removing the frictional forces between two moving bodies or engine parts.

Thermal conductivity: It is the controlling factor for overheating when oil is transferred from hot spot to a cooler area in a bearing.

Compressibility: It express the resistance of a fluid to a decrease in volume due to compression.

Electrical conductivity: This property is important for insulating oils. It is important in lubricated components subjected to stray or self-generated electric currents.

Surface tension: It is the ability of oil to wet a surface.

Interfacial tension: It exists between two liquid layers.
By studying above properties for vegetable oils we can predict which type of oils can be used as SVO or Bio-diesel. Bio-diesel is also utilized in generators for electric power production and as insulators in transfolrmer coils.

Advantages of biodiesel fuel:

- Biodiesel fuel is a renewable energy source unlike petroleum-based diesel**.**
- An excessive production of soy beans in the world makes it an economic way to utilize this surplus for manufacturing the biodiesel fuel.
- One of the main biodiesel fuel advantage is that it is less polluting than petroleum diesel.
- The lack of sulfur in 100% biodiesel extends the life of catalytic converters.
- Another advantage of biodiesel is that it can also be blended with other energy resources and oil.
- Biodiesel fuel can also be used in existing oil heating systems and diesel engines without making any alterations.
- It can also be distributed through existing diesel fuel pumps, which is another biodiesel fuel advantage over other alternative fuels.
- The lubricating property of the biodiesel may lengthen the lifetime of engines.

Disadvantages of biodiesel fuel:

- At present, biodiesel fuel is about one and a half times more expensive than petroleum diesel.
- It requires energy to produce biodiesel fuel from soy crops, plaus there is the energy of sowing, fertilizing and harvesting.
- As biodiesel cleans the dirt from the engine, this dirt can then get collected in the fuel filter, thus clogging it. So, filters have to be changed after the first several hours of biodiesel use.
- Biodiesel fuel distribution infrastructure needs improvement, which is another of the biodiesel fuel disadvantage.

In India, jatropha oil is used as main ingredient in production of Bio-diesel and Indian government subsidizes farming of Jatropha. In A.P, Palmolein oil is the cheapest oil produced. So we as researchers can study about the cheapest bio-diesel possible in our conditions.

References

[1] Akers, M.S. et al, "Determination of the Heat of Combustion of Biodiesel Using Bomb Calorimetry", Journal of Chemical Education, Vol. 83, No 2, February 2016
[2] Biodiesel – Handling and use guidelines, Third Edition, September 2006, US Department of Energy
[3] Booth, E., et al, "Economic Evaluation of Biodiesel Production from Oilseed Rape grown in North and East Scotland", October 2005
[4] Costa R. E. & Lora, E.E.S., "The energy balance in the production of palm oil biodiesel - two case studies: Brazil and
[5] Colombia"Demirbas, A., "Progress and recent trends in biofuels", Progress in Energy and Combustion Science 33 (2007), pp. 1–18
[6] Fernando, S., Hal, C. and Jha S., "NOx Reduction from Biodiesel Fuels", Energy & Fuels 2016, 20, pp. 376-382
[7] Friedrich, S., "A world wide review of the commercial production of biodiesel - A technological, economic and ecological
[8] investigation based on case studies", Des Institutes für Technologie und Nachhaltiges Produktmanagement, Vienna, 2004
Frondel , M., Peters, J., "Biodiesel: A new Oildorado?", Energy Policy 35, pp. 1675–1684
[9] Hancock, N., "Global Biodiesel Market", Oilseeds WA, Biodiesel Workshop, August 2015
[10] Mourad A.N., "Principais Culturas para Obtenção de Óleos Vegetais Combustíveis no Brasil", AGRENER 2006, São Paulo, Brazil, June 2