



A report on comparison of biodiesel with petrodiesel

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Abstract

Biofuel is a general term that refers to fuel derived from biomass such as plants and organic waste. Recently, animal fats, vegetable oil waste stream, used cooking oil and agricultural waste are also used for the production of biofuels. Biofuel is made by transesterification of vegetable oils and is also called vegetable oil methyl ester or fatty acid methyl ester. In modern diesel engines, the transesterification process removes and breaks down larger, more viscous vegetable oil molecules that do not burn as quickly. India is one of the countries that use many traditional fuels like coal, oil, etc. About 85% of the country's demand for petroleum products is imported, so it consumes a large amount of foreign currency and is fatal to the economic development and stable development of the country. In Finland, there are restrictions on the use of solar and wind energy as an alternative to petroleum products. In this regard, biofuels are a ray of hope to reduce fuel imports by using them as an alternative to traditional fuels such as oil. Biodiesel has the potential to reduce pollution and global warming. Several countries, including India, have already begun to partially replace conventional diesel with biodiesel. Global biodiesel production is mainly based on edible oils such as soybean, sunflower, rapeseed, etc. This paper discusses the advantages and disadvantages of biodiesel compared to conventional diesel fuel.

Keywords: Biodiesel, India, petroleum products

Introduction

Biodiesel has the potential to reduce the level of pollution and global warming. Several countries including India have already begun substituting the conventional diesel partially by biodiesel. Worldwide biodiesel production is mainly from edible oils such as soybean, sunflower and canola oils etc. Since, India is not self sufficient in edible oil production, hence, non-edible oil seeds available in the country are being tapped for biodiesel production. With an abundance of forest and plant based non-edible oils being available in our country such as Karanja, Jatropa, Mahua, Sal, Neem and Rubber, attempt has been made to use esters of these non-edible oils as partial substitute for diesel ^[1-5]. In the present report advantages and disadvantages of biodiesel over normal diesel have been discussed.

Advantages of biodiesel

Biodiesel is a processed fuel that can be readily used in diesel-engine vehicles, which distinguishes biodiesel from the straight vegetable oils or waste vegetable oils used as fuels in some modified diesel vehicles. Biodiesel is a clear amber-yellow liquid with a viscosity similar to that of petrodiesel. Biodiesel is non-flammable and, in contrast to petrodiesel, is non-explosive, with a flash point of 423 K for biodiesel as compared to 337 K for petrodiesel. Unlike petrodiesel, biodiesel is biodegradable and non-toxic, and it significantly reduces toxic and other emissions when burned as a fuel ^[6-7]. Currently, biodiesel is more expensive to produce than petrodiesel, which appears to be the primary factor in preventing its more widespread use. Current worldwide production of vegetable oil and animal fat is not enough to replace liquid fossil fuel uses. Methyl esters of vegetable oils (biodiesels) have several outstanding

advantages among other new-renewable and clean-engine fuel alternatives. Several common vegetable oils such as sunflower, palm, rapeseed, soybean, cottonseed, and corn oils and their fatty acids can be used as the sample vegetable oil. Biodiesel is easier to produce and cleaner with equivalent amounts of processing when starting with clean vegetable oil ^[8-9]. Tallow, lard, and yellow grease biodiesels require additional processing at the end of the transesterification process due to the presence of high free fatty acids. Diesel derived from rapeseed oil is the most common biodiesel available in Europe, while soybean biodiesel predominates in the United States.

The advantages of biodiesel as diesel fuel are its portability, ready availability, renewability, higher combustion efficiency, and lower sulfur and aromatic content, higher cetane number, and higher biodegradability. The main advantages of biodiesel given in the literature include its domestic origin, which would help reduce a country's dependency on imported petroleum, its biodegradability, high flash point, and inherent lubricity in the neat form ^[10-11]. Some advantages have been summarized here as-

1. Derivation from a renewable domestic resource, thus reducing dependence on and preserving petroleum.
2. Biodegradability.
3. Reduction of most exhausts emissions (with the exception of nitrogen oxides, NO_x).
4. Excellent lubricity, a fact that is steadily gaining importance with the advent of low-sulfur petrodiesel fuels, which have greatly reduced lubricity. Adding biodiesel at low levels (1–2%) restores the lubricity.
5. Higher flash point, leading to safer handling and storage.

6. Biodiesel provides a fuel from renewable resources with lower environmental impact than petroleum diesel.
7. Biodiesel is biodegradable, non-edible non toxic and produce lower emissions of net greenhouse gases and sulphur to the atmosphere ^[12-13].

In addition to the main use of Biodiesel in Diesel Engine, various other uses of Biodiesel are as follows:

Lubricant

Biodiesel is an excellent lubricant rather very slippery. Due to it being non-toxic it is better than household lubricating oils. It doesn't show hazardous effects if swallowed in little quantity by the kids by mistake. It is of great use for gardeners, especially organic gardeners. Biodiesel is used as a lubricating additive for low-sulphur fuels. With diesels, engine parts are lubricated by the fuel itself. There are ready indications that diesel motors do not last long as they did because of the lack of lubrication with low-sulphur fuel (500ppm), except the new ultra-low-sulphur fuel (15 ppm), and biodiesel can change it. Adding just 1% biodiesel improves the lubricity up to 65%. Research suggests that just 0.4% to 0.5% biodiesel is sufficient.

Wood Treatment

Biodiesel is very useful to treat wood, floors etc. The smell soon goes away, leaving behind a pleasing odour. Biodiesel can be used as two-stroke oil in two wheelers, at a mix of 20 % with petrol. Biodiesel does not travel up a wick very well, unlike kerosene oil, so it cannot be used for ordinary wick lamps or stoves. However, tests have found that it does travel about 7 cm up a wick and not more, and the wick should preferably be thick (about 1 cm) and loosely wound, tightly-woven commercial wicks will not work well. Biodiesel may not work in certain heating furnaces or stoves, while other models work just fine, and some can be adjusted. Biodiesel is also used in Petromax multi-fuel lantern. There is no need to re-pressurize the lantern as in other fuel-types. The performance is up to the mark, and the lantern is just as bright, without any pungent smell.

Better than detergent

The soap / water suspension pulls a good bit of the surface oil off first, with the biodiesel removing the balance of the oil embedded and is soaked by the fibers. The suspension also seems to keep the oily effect of the biodiesel from getting locked into the fiber, which can give the look of wet spots (oil soaked spots) even when the garment is dry ^[14].

Disadvantages of biodiesel

Although Biodiesel has so many advantages over the conventional diesel fuel but there are also some disadvantages of using Biodiesel. The major disadvantages of biodiesel are its higher viscosity, lower energy content, higher cloud point and pour point, higher nitrogen oxide (NOx) emissions, lower engine speed and power, injector coking, engine compatibility, high price, and greater engine wear. The technical disadvantages of biodiesel/fossil diesel blends include problems with fuel freezing in cold weather, reduced energy density, and degradation of fuel under storage for prolonged periods. One additional problem is encountered when blends are first introduced into equipment that has a long history of pure hydrocarbon usage. Hydrocarbon fuels typically form a layer of deposits on the inside of tanks, hoses, etc. Biodiesel blends loosen these

deposits, causing them to block fuel filters. However, this is a minor problem, easily remedied by proper filter maintenance during the period following introduction of the biodiesel blend.

Biodiesel does gel in very cold weather, but so does conventional petrodiesel. The temperature at which Biodiesel starts to gel will depend on what product is used to make the biodiesel with. For example Biodiesel made from Canola Oil will gel at around -10°C and Biodiesel made from Tallow gels at around +16°C.

Biodiesel, just like petrodiesel, cannot sit the shelf forever. Most petroleum diesel manufacturers recommend using the diesel within six months from date of purchase. Biodiesel has about the same life expectancy and when it gets a bit old it will start to grow mold.

Biodiesel can be made from a wide variety of feedstock including some of which are used as food. As the When you use a food crop to create biodiesel it is possible to create competition between food in poor countries and Biodiesel fuel in rich countries. For example a rich country can go and buy all the coconuts in Mozambique, a poor country, and use that to make biodiesel. By doing this the rich country take away the only form of food and nutrition that a lot of people in that country depend on. On the other side farmers may stop planting food crops and rather plant crops that can be used to make Biodiesel because they can get more money for that kind of crop.

The most alarming disadvantage of biodiesel as compared to conventional petrodiesel is Nitrogen Oxide emissions, which is almost 10% higher than that of conventional petrodiesel. Although, if we use 20 % blended i.e., B20 Biodiesel, then the difference in Nitrogen Oxide emissions is between 2% increase and 2% decrease depending on the testing conditions and the engine ^[15]. Recently in India and particularly in Rajasthan various policies has influenced positively on the production and blending of biodiesel. Rajasthan is one of the fastest developing states in the country and have privileged to become first state to develop Bio-fuel Policy in the year 2006. 12 districts of Rajasthan namely Baran, Banswara, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jhalawar, Kota, Rajsamand, Sirohi, Udaipur & Pratapgarh are found suitable for plantation of Jatropha. Rajasthan Wasteland Development Board was constituted in 2009 to decide the policy & strategies for development of wasteland through soil & water conservation, Agro-forestry, Pasture development & bio-fuel activities under the chairmanship of Hon'ble Rural Dev. & Panchayati Raj Minister. Hon'ble Agriculture, Revenue, Forest & Cooperative ministers and chief secretary are among the members of the board.

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