

# GREEN FUEL TECHNOLOGIES

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## **ABSTRACT**

Excessive usage of fossil fuels have led to the depletion of their reserves and also resulted in the degradation of the environment. Due to the boom in population and the standard of living in the present decade, the fuel demands are increasing. On the other hand rigorous use of the conventional sources of energy has introduced of critical environmental issues. While the under-developed countries are continuing to use the old ways, developed countries are investing tons of money for the discovery of alternative fuel sources. This has led the researchers to come up with renewable and ecofriendly fuel counterparts. This paper discusses the latest developments in green fuel technologies, as well as giving a brief about the history of green fuels. It also gives a brief description of some out of the box technologies.

**KEYWORDS:**Green fuel technology, bio fuels , global warming.

## **Introduction:**

Since the discovery of energy sources to the present day, mankind has been depending on fossil fuels as the major source of energy. Fossil fuels include fuels such as: petroleum, coal, diesel etc. These fuels take millions of years for their formation. So, once they are completely depleted, they cannot be renewed. This calls for their judicious usage, but the present scenario states the otherwise. A result of the ever rising population is the ever rising demand for fuel sources. On the other hand the fossil fuel reserves are limited and the ones existing can sustain

only for a few hundred years. In short, though the present generation can somehow meet the demands, the future generations will face a major fuel crisis.

Apart from the extinction of fuel sources, the unbounded use of fossil fuel has led to some critical environmental issues. A major usage of fossil fuel is as motor oil or gasoline. Air pollutants such as carbon monoxide, nitrogen oxides, particulate matter, volatile organic compounds and benzene are emitted into the environment due to the combustion of fossil fuel. Air pollutants can contribute to urban air quality problems, for example photochemical smog and adversely affect human health.

This calls for alternative sources of energy, which are renewable and are not hazardous to the environment.

Biofuel refers to many different types of alternative energy sources that could supplement or even replace fossil fuels. Although they only account for a few percent of the world's transport fuel to date, they are increasingly popular due to higher oil prices and an increasing concern with global warming and investments into them are therefore growing each year. Biofuels are normally divided into three categories: solid biomass, liquid fuel and biogases. Each group does not only effectively describe the form of the fuel, but also hints at the uses for which the fuel is intended.

The most common liquid biofuel is ethanol, which is made from fermentation of any sugar or starch from which alcohol may be made. It can also be produced from cellulosic combustion of bagasse and similarly inedible waste products or non-food energy crops.

One of the most common and widely accepted source of green fuel is bio-diesel. Bio-diesel is produced

from vegetable oils such as canola, jatropha etc. The process followed is generally the trans-esterification of tri-glycerides with alcohols to give alkyl ester (bio-diesel) and glycerol. The process uses various types of catalysts such as acids, bases and even enzymes. The bio-diesel produced is the cleaner and renewable counterpart of diesel produced from fossil fuels and is compatible with diesel engines.

Gaseous biofuels tends to be used either for electricity generation or, in the case of those that can be stored in liquid form, for vehicle propulsion. An example of the former type is biogas, which is essentially methane gas produced from biodegradable waste or energy crops. Syngas, which is mixture of carbon monoxide and hydrogen derived from partial combustion of biomass, is better representative of the latter group. Not only can it be used directly in combustion engines or turbines, but it can also be used to produce methanol and hydrogen or even be converted into diesel substitutes or gasoline.

### **GREEN FUELS:**

Green fuels are the future of the world's clean energy needs it's about the potential fuels and technologies that could replace the use of polluting fossil fuels. The basic idea is to replace the non-renewable resources of energy. These are the next generation fuels which are renewable and are eco-friendly. The main idea behind developing these types of energy sources is the ever depleting amount of exhaustible fossil fuels and to have a backup source which would reassure the replenishment of the demand of the earth's growing population.

Green fuels include biomass produced from algae, plants, mosses, garbage, landfills, alcohol fuels, crops and wood.

### **GLOBAL ENVIRONMENTAL PROBLEMS**

#### **Global warming**

Global warming is one of the threatening problems responsible for the presence of global warming. This is caused due to the presence of excessive amounts of greenhouse gases which are responsible for global warming scenario. Global warming is nothing but temperature rise of earth surface including water bodies due to which environmental degradation is taking place.

CO<sub>2</sub> is main green house pollutant responsible for global warming. This gas has the tendency to trap the heat in the surroundings making the terrestrial surface to get heated up which in turn results in various problems like melting of polar ice caps making the overall sea levels of the world to rise significantly.

According to recent surveys the global sea level is rising drastically. It is about 2.6mm to 2.9mm since 1993. There is an additional increase of 0.7mm since 2004. In past five decades almost hundreds of tiny islands have been inundated into the deep oceans.

#### **Plastic Fuel:**

All around the globe, over 500 billion pounds of plastic are generated every year. Out of this, 33% of the plastics produced are under the use and throw category. Of the total amount of plastic is produced, very little quantity is actually recycled. In developed countries like USA and Western Europe, 8-15% of the plastics is recycled. The numbers further decreases when it comes to developing and under developed countries.

Recently a method has been developed which can act as a counter measure to deal with the waste plastic and also overcome the problem of fuel shortage to some extent. This technology uses plastics to manufacture fuel.

The technology is not overly complicated, plastics are shredded and then heated in an oxygen-free chamber (known as pyrolysis) to about 400 degrees Celsius. As the plastics boil, gas is separated out and often reused to fuel the machine itself. The fuel is then distilled and filtered. Because the entire process takes place inside a vacuum and the plastic is melted - not burned, minimal to no resultant toxins are released into the air, as all the gases and or sludge are reused to fuel the machine.

#### **Algae fuel:**

Algae fuel or algal biofuel is an alternative to liquid fossil fuels that uses algae as its source of energy-rich oils. Like fossil fuel, algae fuel releases CO<sub>2</sub> when burnt, but unlike fossil fuel, algae fuel and other biofuels only release CO<sub>2</sub> recently removed from the atmosphere via photosynthesis as the algae or plant grew.

Green fuels use algae as the raw material for the production of fuels in this the substrate for algae on which it feeds is the carbon emission or smoke. The alga feed on CO<sub>2</sub> and the pollutants in the smoke and

grows. Which is then harvested and various products like ethanol, bio plastics, biodiesel and methane are produced.

The advantage of using algae as a raw material is it takes in the already emitted carbon emission there by reducing the pollutants in the environment. Other benefit is the products so formed are eco-friendly and clean.

Among algal fuels' attractive characteristics are that they can be grown with minimal impact on fresh water resources, can be produced using saline and wastewater, have a high flash point, and are biodegradable and relatively harmless to the environment if spilled.

After harvesting the algae, the biomass is typically processed in a series of steps, which can differ based on the species and desired product; this is an active area of research and also is the bottleneck of this technology: the cost of extraction is higher than those obtained. One of the solutions is to use filter feeders to "eat" them. Improved animals can provide both foods and fuels. There are two major processes to manufacture bio-diesel.

#### Dehydration:

Often, the algae is dehydrated, and then a solvent such as hexane is used to extract energy-rich compounds like triglycerides from the dried material. Then, the extracted compounds can be processed into fuel using standard industrial procedures. For example, the extracted triglycerides are reacted with methanol to create biodiesel via trans-esterification. The unique composition of fatty acids of each species influences the quality of the resulting biodiesel and thus must be taken into account when selecting algal species for feedstock.

#### Hydrothermal Liquefaction:

An alternative approach called Hydrothermal liquefaction employs a continuous process that

subjects harvested wet algae to high temperatures and pressures—350 °C (662 °F) and 3,000 pounds per square inch (21,000 kPa).

Products include crude oil, which can be further refined into aviation fuel, gasoline, or diesel fuel. The test process converted between 50 and 70 percent of the algae's carbon into fuel. Other outputs include clean water, fuel gas and nutrients such as nitrogen, phosphorus, and potassium.

### **BIOFUELS FROM PLANTS**

This method involves the use of plant products or plants itself. Plants used as biofuels are rapeseed oil(canola), jatropha, sugar molasses, and soybean oil.

Biodiesel from Jatropha. Seeds of the Jatropha nut is crushed and oil is extracted .The oil is processed and refined to form bio-diesel.

### **USES**

Industrial process heat and steam, Electrical power generation, Transportation fuels (ethanol and biodiesel) and other products.

#### Reduction of waste

Extremely low emission of greenhouse gases compared to fossil fuels.Ethanol is Carbon neutral and forms a part of the carbon cycle.Growing variety of crops increases bio-diversity. Fertilizers as by-product.

### **CONCLUSION:**

These alternative sources of energy, if adopted helps in decreasing the environmental pollutants emitted by fossil fuels and chemical industries. On the other hand some techniques of green fuels utilize the pollutants and produces biofuels. This way already existing pollution is decreased and the new products are eco-friendly and cause no harm to the environment.

Thus with green fuel technologies it's always a win-win situation.

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