

Technological Review on Green Fuel

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Abstract- Nowadays demand of energy is increasing in the industry, farming and households. Excessive use of fossil fuel is leads to the depletion of their reserves and which result in the deterioration of environment. Thus clean green fuels are developed. Biomass is measure renewable resources of energy. Developed countries are investing money on a high scale for alternative fuel whereas under developed countries are still following the old ways due to which critical environmental issues has occurred. Today many people are of the view that fuel cell technology is going to create a new technological renaissance. Such development will have significant environmental and economical effect. This paper would be discussing the latest innovations in green fuel technologies. It would also be giving short history of green fuels and some different technologies.

Keywords- Green fuel technology, bio fuels, global warming

I. INTRODUCTION

Mankind relies mostly on fossil fuels as major energy source since the energy sources has been discovered. Petroleum, coal, diesel etc. are some of the fuels that are included under fossil fuel. This fuel takes many years say million years for their formation. Therefore if they would get diminished then it would be very difficult to renew it. That is why it should be used wisely and judiciously. As the population rises the requirement for fuel sources also rises. On the contrary the reserves of fossil fuel are very limited and those which exist can sustain only for few hundred years. Therefore the upcoming generation would definitely face the fuel crisis and the present generation would somehow manage to meet the demands of fuel.

Not only extinction of fuel sources but critical environmental issues of fossil fuels also being faced presently. Fossil fuel is widely is used as motor oil or gasoline. Air pollutants like carbon monoxide, nitrogen oxide, particulate matter, volatile organic compounds and benzene are discharged or emitted into the environment because of the combustion of fossil fuel. These air pollutants contribute problems to the urban cities like quality of air gets affect for example photo chemical smog and affects adversely on human health.

That is why because of these problems alternative sources of energy are required, which are renewable and are not hazardous to the environment.

Bio fuel generally refers to different types of alternate energy resources that could supplement and even can substitute fossil fuels. Normally there are three categories of bio fuels: solid biomass, liquid fuel and bio gases. Each

group not only describes the form of the fuel but also gives hint at uses for which the fuel is intended.

Ethanol is most common liquid bio fuel, which is extended by fermenting sugar or starch. This could also be generated by cellulosic combustion of bagasse and non-food energy crops.

The Potential in India for Biofuels

Strengths

- Alternate fuel source
- Energy security of the country
- Less GHG emissions, environment friendly
- Higher Cetane number and better lubricating effect for biodiesel

Weaknesses

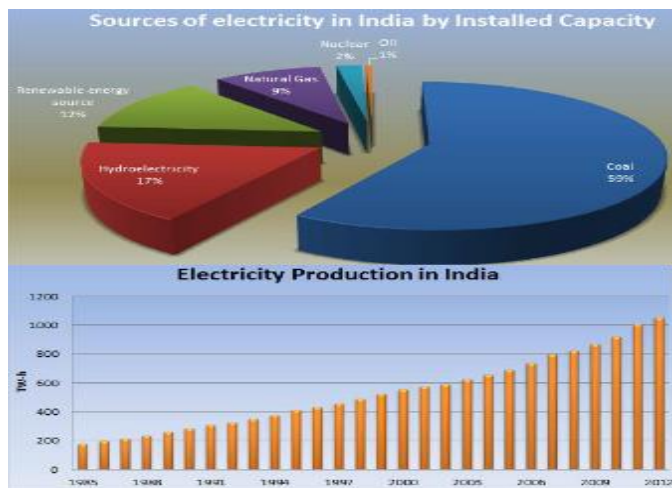
- Wasteland requirements
- Need for engine modifications in higher blends
- Market still in nascent stage
- Still in field trial stage in India

Opportunities

- National Biodiesel policy
- Keen interest of private players
- R&D across the sector
- Less dependency on depleting fossil fuels

Threats

- The discovery of huge gas reserves in India may push biofuels on the back foot
- Food vs. fuel debate
- Cost effectiveness of Biofuels
- Raw material



II. GREEN FUELS

Green fuels are the future of worlds clean energy needs. It is about the potential fuels and technologies that could replace the use of polluting fossil fuels. So the basic idea is to replace the non-renewable energy resources. These are renewable and are eco-friendly fuels or these are also known as next generation fuels. Green fuel comprises biomass produced from algae, plants, mosses, garbage, landfills, alcohol fuels, crops and woods. Crops are categorized into two types: sugar/ starch producing and oil producing. Sugar and starch producing crops, like sugar cane or corn, give ethanol on being fermented. Oil producing plants, are used like fossil fuels. They give diesel that can be burned in cars or further processed to become biodiesel. The whole idea behind development of these types of energy sources is to have a backup source as there is depletion of exhaustible fossil fuels and which would certainly reassure the replenishment of the demand of the growing population.

Bio-diesel is most widely accepted green fuel which is derived from vegetable oils like canola, jatropha etc. In this process catalysts are used like acids, bases or enzymes are used. The bio-diesel is mixed into diesel and is compatible with all types of diesel engines and that's why it is widely accepted.

These gaseous bio fuels are used for electricity generation or for the vehicle propulsion. Bio-gas, which is methane gas, is derived from bio degradable waste. In later group syngas, which is the mixture of carbon monoxide and hydrogen is produced by partial combustion of biomass. It could be used directly in combustion engines or turbines and could also be used to produced methanol and hydrogen.

GLOBAL ENVIRONMENTAL PROBLEMS

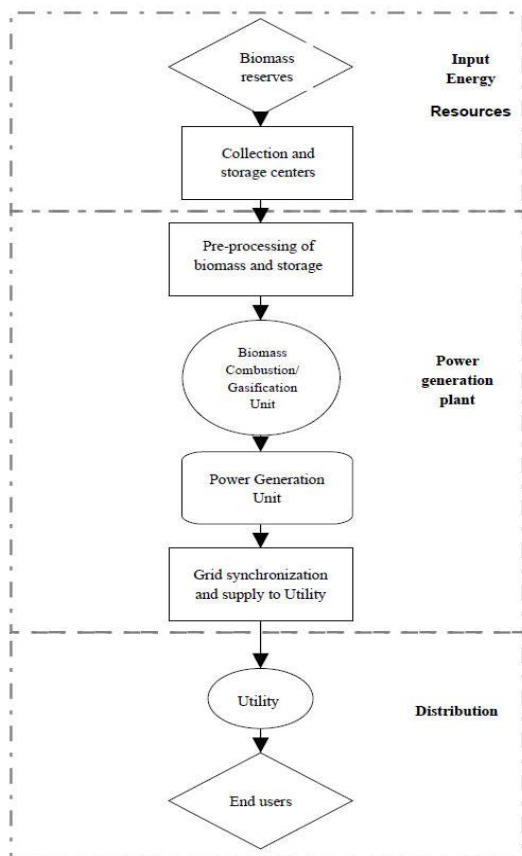
GLOBAL WARMING

Global warming is one of the major alarming problem which is responsible for the presence of global warming. The reason behind global warming is due to the presence of excessive amounts of green-house gases. It is basically nothing but the rise in the temperature of earth surface including water bodies which results in environmental degradation. CO₂ gas is main greenhouse pollutant which is responsible for global warming. Carbon dioxide traps the heat in the surroundings making the terrestrial surface to get heated up. Because of which various problems like melting of polar ice caps due to which overall sea levels of the world rises.

The environmental benefits of biofuels appear when they are burned inside in the engine. The use of biofuels results in a closed carbon cycle, since the emitted amount of CO₂ is as much as the plant (rapeseed, corn, etc.) absorbed during its vegetation. Due to low sulfur percentage in biofuels, the pollutant (SO₂etc.), emission of biofuels is much lower than conventional fuels. The raw materials of biofuels are plants produced by the agriculture having some negative impacts on the environment.

According to surveys the level of sea is drastically rising. It is 2.6 mm to 2.9 mm since 1993 and there is additional increase of 0.7 mm since 2004. In past five decades almost hundreds of small islands have been submerged into deep oceans.

Flow diagram for biomass based power generation projects:



III. RELEVANCE OF BIOFUELS

Besides wind and water power the use of biomass has a tremendous future, especially the so-called biofuels. Their advantages are the following:

- They represent a CO₂-cycle in combustion, most of them have better emissions, and they are biodegradable and contribute to sustainability.
- They have a considerable environmentally friendly potential.

Biodiesel is made by using vegetable oils, animal fats, algae, or even recycled cooking greases. It can be used as a diesel additive or in its pure form to fuel a vehicle. Ethanol is made by fermenting any biomass that is rich in carbohydrates. It is mostly used as a fuel additive. Beyond energy benefits, development of biofuels leads to booming rural economy because of production of crops needed for biofuels.

IV. ALTERNATIVES

• PLASTIC FUELS

Five hundred billion pounds of plastic are generated every year in the world out of this, only 33% of the plastic produced are under the use and through category. From the total quantity produced only very little quantity is actually recycled. In developed countrified like USA and Western Europe 8-15% of plastic is being recycled and this number further decreases in developing and under developed countries. Recently a method has been developed to tackle the waste plastic and also overcome the problem of shortage of fuel to some extent. This technology uses plastics to manufacture fuel.

Plastics are shredded and then heated in a furnace at a temperature about 40 degree Celsius in an inert atmosphere. As plastic boils, the gas is separated and mostly reused to fuel the machine itself. This fuel is then distilled and is filtered. The plastic is melted not burned and no toxic elements are released due to vacuum.

• ALGAE FUEL

Algae fuel is an alternative to liquid fossil fuel which uses algae as its source of energy -rich oils. Algae fuel releases CO₂ like fossil fuels when burnt but unlike fossil fuel, algae fuel and other bio fuels only release CO₂ recently removed from the atmosphere through photosynthesis.

For production of fuels algae is used as the raw material by green fuels in this substrate for algae on which it feeds in carbon emission or smoke.

The advantage of algae fuel is that it takes already emitted carbon emission which reduce pollutants in the environment. Other advantage is that the product which is formed is eco-friendly and clean.

It can be grown with minimum impact on fresh water

resources. And could be produced using saline and waste water, have a high flash point and our bio degradable and are not harmful to the environment. The biomass is processed in series of steps, which could differ on bases of species and desired product ; this is an active area where research could be done and is also the bottleneck of this technology, the cost of extraction is high than those obtained. For these problems filter feeders to eat them is one of the solution.

There are two major processes to manufacture bio-diesel:

1. DEHYDRATION

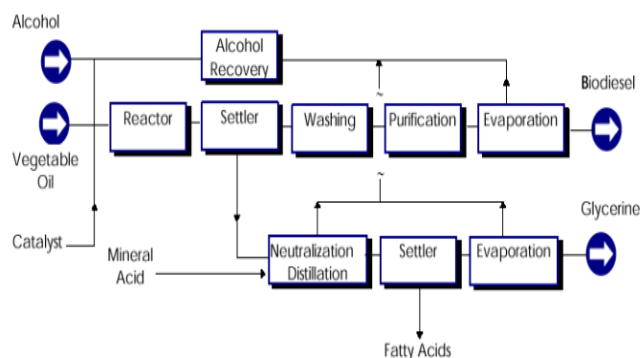
Mostly, algae are dehydrated and hexane solvent is used in order to extract energy – rich compounds such as triglycerides from the dried material. The composition of fatty acids of each species influences the quality of the resulting bio-diesel and accordingly algal species is selected.

2. HYDROTHERMAL LIQUEFACTION

An alternative known as hydrothermal liquefaction make use of a continuous process that subjects harvested wet algae to high temperatures and pressures – 3500 Celsius and 3000 lbs/in. It includes crude oil which would be further refined into aviation fuel, gasoline or diesel fuel. The test process converts between 50 and 70 % of the algae’s carbon into fuel and by product like water, nitrogen, phosphorus, potassium.

V. BIOFUELS FROM PLANTS

Soon after having transesterificated rapeseed oil (Rapeseed-oil-Methyl-Ester, RME) established in the market place the search began for additional and alternative feed-stocks. The selection of biofuels is restricted by stability of oil, winter operability, Conradson Carbon residue. On the one hand but with the multiple choices offer to select out of a rather broad scope of oils and fats a Multi-Feed-Stock (M-F-S) blend on the other hand. Thus a clever blend the cheapest feedstocks available is the key factor for a low cost biodiesel, of course always with a guaranteed high quality for the fuel at the end of the pipeline.



Source: National Biodiesel Board, 2001

Figure (i). Biodiesel process technology.

In this method there is use of plants or plant product. The plants which are used as biofuels are rapeseed oil, jatropha,

sugar molasses and soybean oil. *Jatropha* is used for bio-diesel. The seed of *jatropha* nut is crushed and from it oil is extracted. The oil is processed and refined in order to form bio-diesel.

VI. USES

This is widely used in industrial manufacturing process like heat and steam, electrical power generation, transportation of fuel and other product.

VII. CONCLUSION

These alternative sources of energy if would adopted then it would held in lowering the environmental pollutants which are emitted by fossil fuels and chemical industries. On other hand few techniques of green fuels utilize the pollutants and produces biofuels. In this way the pollution which is already existing decreases and the new products are eco-friendly which will cause no ill-effects to the environment. Therefore technologies of green fuel would be successful in every situation.

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