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Biofuels as an Alternate Energy Source- A survey
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Introduction:

The fossil fuels area unit largely used for the electricity generation and because the supply of power to transportation sector such as: cars, bikes, buses, trucks, etc, that are pioneer for the event of any country. The developed countries use a lot of energy than the developing countries. however the disadvantage of those fuels is that they are about to be finish once a while as a result of it's not renewable sources. As per R/P(reserve to production ratio) for India coal can stay virtually 114 years and oil can 22 and natural gases can 36 years stay..

Biofuels are renewable and fewer pollution making fuels that takes attention in recent years, among preferred being biomethanol and Bioethanol that is created from crop grains or sugarcane and biodiesel that is created from vegetable oils and animals fats. In 1897 German engineer Rudolf diesel prepared his engine which was ran by using peanut oil at a Paris exhibition and also Henry ford, automobile manufacturer design his equipment to run on ethanol. [1]

After 1970's so much attention is paid in the alternatives of fossil fuels as the usage of the fuel was increasing and the pollution rate was also increase. So that so much research done in the biofuels. There were other reasons too for finding the alternatives such as: increasing in rate of fuels because of increasing the consumption, limited supply, etc.

The most popular sources of the biofuels are as follows:

1. Cellulose
2. Algal oil
3. Corn
4. Soyabeans
5. Sugar Cane
6. Jatropha and Camelina
7. Rapeseed
8. Methane
9. Animal Fats
10. Paper waste
11. Biomass.

Types of biofuels:

Based on the feed used for production and the technologies used to convert that feedstock into fuel, biofuels technologies can be classified into two groups: first- and second-generation biofuels. [2]

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- Technologies that normally utilize the sugar or starch portion of plants as feed to produce ethanol and those utilizing oilseed crops to produce biodiesel are known as first-generation biofuels.
- Biofuels produced using technologies that convert agricultural and forest residues are called second-generation biofuels, as are biofuels produced from advanced feed like *Jatropha* and micro-algae

The most popular biofuels are Bioethanol, biomethanol, biodiesel and biogas.

[3][4]

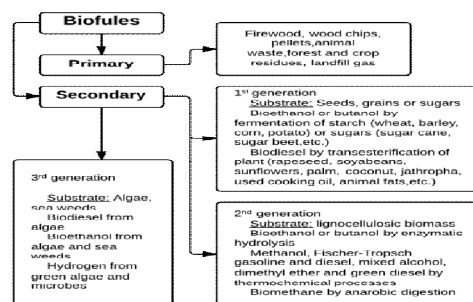


FIGURE 1: Classification of Biofuels based on technology [4]

➤ BIOETHANOL:

Earlier alcohol made from carbohydrates by fermentation. However now-a-days alcohol is made from wheat, sugar cane, corn, biomass, molasses, etc. Yeast is employed to ferment sugars into alcohol. The pretreatment step of changing carbohydrate into sugars is required. Currently, the corn alcohol trade uses either a dry-milling or a wet-milling method. When fermentation 100 percent alcohol is made when another method pure (95%) alcohol is made like distillation. [6][7][13]

Ethanol is the great alternative of the gasoline. So many countries are using ethanol as the replacement of gasoline. Brazil uses ethanol 25% as fuel of their fuel consumption. Ethanol is the renewable source as it is produce from the crop grains. Large production of sugar cane or corn or wheat is needed for the production of the ethanol to use it as a fuel such country India. But India has large barren places which can be utilized to reach somewhat amount of demand. [7][8]

Ethanol has own good characteristics as a fuel such as its emits less pollutant then the gasoline, and reduces the knocking of the engine as it boosts octane. Bioethanol can be used directly in cars designed to run on pure ethanol or blended with gasoline which gives "gasohol". Anhydrous ethanol is required for blending with gasoline. No engine modification is typically needed to use the blend. [11][13]

Ethanol from sugar cane, produced mainly in developing countries with warm climates, is generally much cheaper to produce than ethanol from grain or sugar beet in IEA countries. For this reason, in countries like Brazil and India, where sugar

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cane is produced in substantial volumes, sugar cane-based ethanol is becoming an increasingly cost-effective alternative to petroleum fuels. [6]

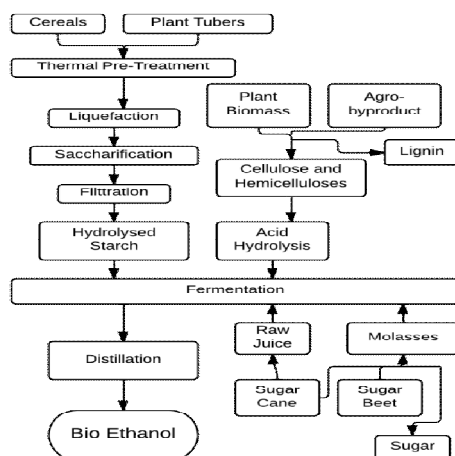


FIGURE 2: The detail flow sheet for production of Bioethanol [17]

➤ BIOMETHANOL:

Methanol has attracted attention as an alternative transport fuel blended in various proportions and is Methanol has attracted attention as another transport fuel mixed in numerous proportions and is presently into consideration for wider use. Methyl alcohol is employed as a transport fuel in several countries. Some analysis counsel that utilization of methyl alcohol in burning engines might bring some blessings as a rise in power and in energy potency, and conjointly reduces the emission of pollutants. Methyl alcohol may be made from the biomass. Biomass is taken into account because the renewable supply so biomethanol is additionally the vital in biofuels. Biomass containing any waste like agricultural waste, domestic waste, etc. per the 2001 report by the International Energy Agency (EIA), biomass presently contributes 10.8% of the globe energy. [10] The production of methanol from the biomass is shown in the figure.

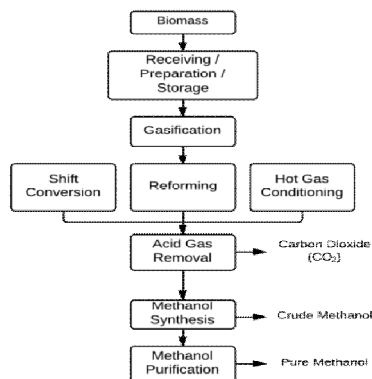


FIGURE 3: The detail flow sheet for production of biomethanol [10]

➤ BIODIESEL:

Biodiesel is the direct alternative of the diesel itself. Diesel is mostly the primary fuel for the transportation sector. So it is needed to find the alternatives for the diesel. There are so many sources for the biodiesel production which are mostly vegetable oils such as Jatropha oil, algal oil, soybeans, palm oil, etc. Pinari tree, etc and also from the animal fats. Biodiesel can be produced from the free fatty acid (FFA) of these vegetable oils. The main source of biodiesel in India is Jatropha seeds, soybeans because their production suits the Indian weather. There are some issues in production of palm oil and other options.

Biodiesel is produced by the transesterification process. Transesterification is the process of converting the oil produced from vegetables into biodiesel. The process is less complex and it is quite easy. Transesterification is a chemical based production of biodiesel from Jatropha oil. In this process a complex fatty acids like triglyceride molecule is taken and it is neutralized. The glycerin is removed and an alcohol ester is created. This process is completed when methanol is mixed with sodium hydroxide. This result in the production of sodium methoxide which is then mixed with oil produced from the Jatropha seeds. When the mixture settles glycerin is left at the bottom and the biodiesel (methyl esters) remains on the top.

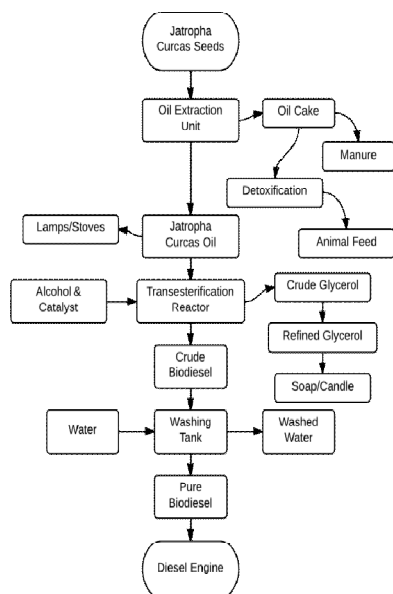


Figure 4: Flowsheet for the production of the biodiesel [18]

This methyl ester is washed and then filtered.

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The produced biodiesel has good characteristics as the burning fuels. It is more viscous than the regular diesel but it is compatible with the diesel engines. Engine runs smoothly with biodiesel and it shows less vibration and sound because of better lubricity and combustion characteristics and also gives high cetane number compared to diesel.

➤ **BIOGAS:**

Biogas is the alternatives for the natural gases. Biogas technology is being seriously promoted as a very important choice to meet the growing energy demand of rural areas in developing countries. It provides a clean and economical fuel for many uses like cookery, lighting, water pumping and different mobility applications. It also ensures the recycling of nutrients in the cow and buffalo dung and other biodegradable feedstocks to the soil.

For the production of the biogas the biomass is used which contain waste of agriculture, domestic waste, etc. [14] [15] by the degradation of biomass in anaerobic condition the mixture of gases is produced in which the methane is the main component. The other components of biogas are ethane, propane, butane, which are used for the domestic purpose. The most popular production plant for the Biogas is: Janata, Deenbandhu, Deenbandhu II (modified Deenbandhu) and Himshakti biogas plants. [16]

CONCLUSION:

Biofuels are the best alternatives for the fossil fuels. It is necessary to do so many research in this field as the fossil fuels going to be ended and the prices of the fuels is going higher and higher. So to meet the future demands biofuels should be produced on the commercial level. The main drawback of production of biofuels is it requires the large land to produce the crop grains, Jatropha, soybean etc. but it can be possible to overcome this problem. In India there is 60 millions hector land is barren, so it can be utilized for the production of this crops. It will also promote the agriculture sector. Government is also giving the subsidy for it. Also this biofuels generate so less pollutant so if see the air pollution aspects then they are good to use. They show good characteristics for burning. In India the production on commercial level is on so small scale so government should promote the new technology for it.

REFERENCES:

1. Paula-Bianca MARICA. Universitatea „Ștefan cel Mare”. Suceava, România.; “A Review of the Advances in Biofuels Production.”
2. G.R. Timilsina, A. Shrestha, “How much hope should we have for biofuels?”, Energy, Volume 36, Issue 4, April 2011, pp 2055–2069, 5th Dubrovnik

Saarth

E-Journal of Research

ISSN NO: 2395-339X

- Conference on Sustainable Development of Energy, Water & Environment Systems
3. A.L. Smith, N. Klenk, S. Wood, N. Hewitt, I. Henriques, N. Yan, D.R. Bazely, "Second generation biofuels and bioinvasions: An evaluation of invasive risks and policy responses in the United States and Canada", Renewable and Sustainable Energy Reviews, Volume 27, November 2013, pp 30–42
 4. P. Singh Nigam, A. Singh, "Production of liquid biofuels from renewable resources", Progress in Energy and Combustion Science, Volume 37, Issue 1, February 2011, pp 52–68
 5. "Creating Markets for Renewable Energy Technologies. EU. RES Technology Marketing Campaign". Supported by the European Commission - FP6.
 6. A. Demirbas, "Competitive liquid biofuels from biomass", Applied Energy, Volume 88, Issue 1, January 2011, pp 17–28
 7. Energy Conversion and Management, Volume 50, Issue 9, September 2009, pp 2239–2249
 8. Ayhan Demirbas, "Biofuels sources, biofuel policy, biofuel economy and global biofuel projections", Energy Conversion and Management, Volume 49, Issue 8, August 2008, pp 2106–2116
 9. N. Ouellette, H. H. Rogner, D.S. Scott.; "Hydrogen-based industry from remote excess hydroelectricity", International Journal of Hydrogen Energy, Volume 22, Issue 4, April 1997, pp 397–403
 10. B. Amigun, J. Gorgens, H. Knoetze, "Biomethanol production from gasification of non-woody plant in South Africa: Optimum scale and economic performance", Energy Policy, Volume 38, Issue 1, January 2010, pp 312–322
 11. C. N. Hamelinck, G. Hooijdonk, A. Faaij, "Ethanol from lignocellulosic biomass: techno-economic performance in short- middle- and long-term", Biomass and Bioenergy, Volume 28, Issue 4, April 2005, pp 384–410
 12. R.D. Misra, M.S. Murthy, "Jatropha—The future fuel of India", Renewable and Sustainable Energy Reviews, Volume 15, Issue 2, February 2011, pp 1350–135
 13. A. Demirbas, "Biofuels securing the planet's future energy needs", Energy Conversion and Management, Volume 50, Issue 9, September 2009, pp 2239–2249
 14. P. Purohit, T. C. Kandpal, "Techno-economics of biogas-based water pumping in India: An attempt to internalize CO₂ emissions mitigation and other economic benefits", Renewable and Sustainable Energy Reviews, Volume 11, Issue 6, August 2007, pp 1208–1226
 15. V.K. Vijay, R. Prasad, J.P. Singh, V.P.S. Sorayan, "A case for biogas energy application for rural industries in India", Renewable Energy, Volume 9, Issues 1–4, September–December 1996, pp 993–996, World Renewable Energy Congress Renewable Energy, Energy Efficiency and the Environment
 16. R.S Khoiyangbam, S. Kumar, M.C Jain, N. Gupta, A. Kumar, V. Kumar, "Methane emission from fixed dome biogas plants in hilly and plain regions of

Saarth

E-Journal of Research

ISSN NO: 2395-339X

- northern India", Bioresource Technology, Volume 95, Issue 1, October 2004, pp 35–39
17. G. Najafi, B. Ghobadian, T. Tavakoli, T. Yusaf, "Potential of bioethanol production from agricultural wastes in Iran", Renewable and Sustainable Energy Reviews, Volume 13, Issues 6–7, August–September 2009, pp 1418–1427