Major Global Energy (Biomass)

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Abstract This research gives brief introduction about types of renewable energy mainly biomass energy methods of generation and its pros and cons.

Keywords Biomass · Heat · Energy · Bio fuels · Clean green environment · Energy harvesting

1 Introduction

The growing world population, industrialization, and progressive technological advancement and transportation had conveyed energy demand under an increased pressure nowadays. The world's energy markets trust blindly on the fossil-derived fuels whose reserves are finite. The possibility of the hereafter deficit of the conventional fossil oil reserve has generated a keen interest in digging an alternative sources of energy, one of which is biomass.

Although, content and efficiency of biomass energy use might be far incomparable to that of fossil fuel, coupled with the disadvantages of current higher costs of biofuels and the large land required for enough amounts of bioenergy and other pros and cons, generating methods will be discussed in this paper.

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2 Biomass as a Renewable Resource

The natural energy resources for biomass are mostly from plant and the most significantly is the wood and wood waste. "Biowaste" or simply biodegradable waste used in an industrial process. The natural energy resources from biomass are mostly from plant, fruit, fabric, food and the most significant is the wood and wood waste. As compare to other renewable energies usage of biomass is increasing day by day. There are mainly two forms of biomass

Primary biomass (Raw biomass): It includes product from forest such as wood, crops, animal waste, rubber, gums, etc.

Secondary biomass: Some raw biomass materials that have undergone some significant changes for example: paper, cardboard, cotton, natural rubber products, and used cooking oils are best example of secondary biomass (Fig. 1).

2.1 Biomass Energy –Bio Power

Bio-power can be defined as production of electricity or heat using biomass materials. Bios include waste from agriculture, forest, and industries. Also municipal solid wastes are considered as BIOS. Boilers, gasifiers, turbines, generator are the major components which are employed in technologies for the conversion process (Fig. 2).

Fig. 1 Source of bio

Fig. 2 Energy crops yield wood chips, hybrid willows (above left) 50-MW wood-fired power plant located in Burlington, Vermont., (above right)

The conversion technologies used in these plants are following:

A. **Thermochemical process**

- **Direct combustion:** At present, most preferable technique used for generation of electricity from biomass is combustion which is also called direct-firing. Fossil-fuel fired power plants are similar to combustion systems used for electricity and heat production. The biomass fuel is already present inside the boiler which is used to create high-pressure steam. Further the steam is pushed towards a turbine, which create a force on blades of turbine, i.e., connected in series as a result turbine starts rotating. For the generation of electricity this turbine is then connected to an electric generator. This is easily available, affordable, and a kind of commercial technology.
- **Gasification**: Biomass is a type of unmanageable fuel source (like coal) because it is a solid. By converting this energy into a gas, it is then used for devices which have large energy consumption For example, gas released from biomass are treated and can be used for menage purpose, converted into power, mechanical energy, a synthetic gas or chemical products. In gasifiers section heating of biomass in surroundings consists of hard biomass fragments down to a combustible gas. The cleansing and filtering process is executed in order to remove toxic chemicals. This gas is highly efficient therefore used in power production called combined cycle.
- **Pyrolysis**: The biomass raw material is accountable to extreme temperature at depressed oxygen content, therefore curbed to burning, and done at high pressure. Biomass is reduced to molecules of single carbon (CH_4 and CO) and H_2 which generates gassy inter-mixture called "producer gas." Under the pyrolytic conditions, carbon dioxide can be generated but of the reactor it is returned into CO and H_2O; which helps in further reaction purposes. The outcome of the temperature is liquid phase produces which are not sufficient to crack the long chains of molecules as a result oils, tars, etc. are produced. Now the residual biomass is in the form of char, i.e., pure carbon

- **Catalytic liquefaction**: The main reason of using this technology is that it produces products with higher energy density as well as with better quality then any other. To make such products salable the processing required is very low. This is a thermochemical conversion which is performed at low temperature but high pressure and carried out in a liquid phase. For attaining better efficiency of this process, one has to deal with technical problems which are difficult. This process is also named as hydrothermal liquefaction which requires a high hydrogen partial pressure.

B. **Biochemical Processes**

- **Anaerobic Fermentation**: Anaerobic Fermentation is a biological process that is used to carried out methane gas (rich biogas) from the organic waste such as human and animal excretion and food processing waste. This involves mixed methanogenic bacterial cultures which need different temperature ranges for the growth. This maximum temperature is not exceeded from 60 °C. Under this process about 90% of the energy content from bacteria is converted into biogas which consist of 55% methane and rest carbon dioxide, which can be used instantly for the household purposes like cooking lightning, etc. The slurry material generated after passing manure through the digestion process is the sludge generated after the manure has passed through the digester is nontoxic as well as in odorous. During this digestion process the nitrogen as well as its other nutrients are lost; thus it is considered as a best fertilizer. It is observed that compared to the left cattle waste to dry in the field the outcome of digester have high nitrogen content. The reason behind this is that many of the contents from the cattle manure become volatilized while drying in the sun whereas in the digested sludge very little amount of nitrogen is volatilized whereas other is converted in

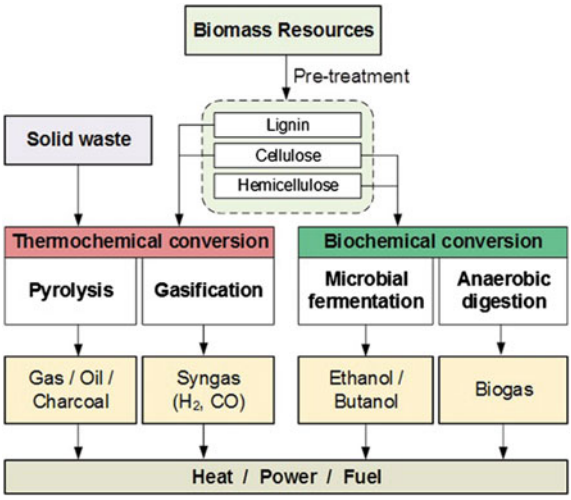

Fig. 3 Conversion process

urea. The value of fertilizing is digested sludge urea which is more readily accessible by plants than any other nitrogen compounds found in dung, therefore fertilizing value of the sludge may actually be higher than that of fresh dung (Fig. 3).

2.2 Environment Impact

If we use biomass as a fuel, the pollutants in the form of carbon and nitrogen are increased in air which may cause air pollution, particulates, and pollutants at levels high than from traditional fuel sources such as coal or natural gas in some cases (such as with indoor heating and cooking) by applying biomass as a fuel utilization of wood biomass, as a fuel can also produce fewer particulate and other pollutants than open burning as seen in wildfires or direct heat applications. According to a survey conducted, biomass is recorded as a second largest contributor to global warming. It is found that there is major concentration of which is linked with ^{14}C recent plant life rather than fossil fuels.

The size of biomass power plant is decided by the availability of the biomass in the nearby surrounding as the transportation plays a vital role in the economy of the plants. So it is found that railway and shipment via waterways can reduce the cost of transport which has led to a global biomass market, to build plants of 1 MW generation economically. Making small plants of 1 MW economically more productive than power plants need to have technology that can convert biomass to useful electricity with greater efficiency such as ORC technology, a cycle resembling to the water steam power process just with an organic working medium.

In the process of combustion, carbon from biomass is released as carbon dioxide in atmosphere. In the dry wood, the amount of carbon contents are approximately 50% due to its weight because of the seasonality of the supply and variability in the source supply chains plays a vital role as it helps in cost effective of bio-energy.

2.3 Working of Biomass Heating Plant

See Fig. 4.

2.4 Various Issue

Technical issues

- Inefficient conversion
- Storage problems because of seasonal availability

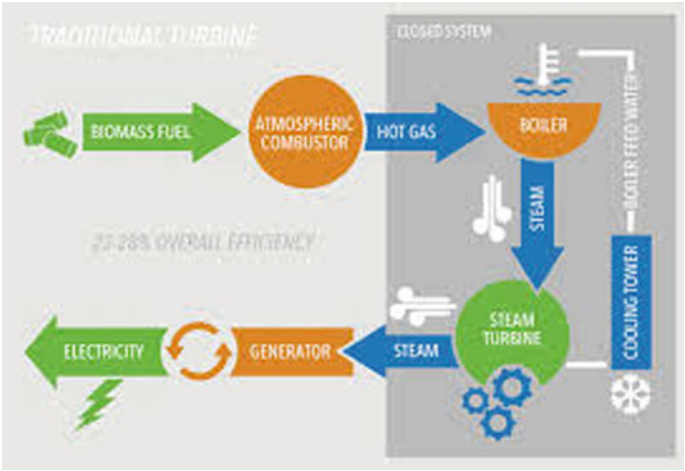

Fig. 4 Working process

- Difficult to obtain maximum efficiency of single purpose use
- Presence of high water content
- Technologies, locations, and routes are difficult to handle in terms of decisions.
- Difficult position synthesis source points, armory facilities, and yield plants.
- Limited productiveness as per area and time contradictory with traditional draw near to economic system of scale focused on maximizing facility size.

Financial issues

- Limited conventional draw near to economy which goes on to increasing unit installation size
- Inaccessibility and complexness of overall costing.
- Deficient transportation facility.
- Restricted inflexibility to ask energy.
- Dangers with latest technologies availability performance with in terms of rate of return.
- Optional biomass markets are conflicts.
- Dodge methods to limit cost biomass

Social issues

- Lack of knowledge
- Local supply chain impacts versus global benefits
- Wellness and safety chances
- Transportation facility deficient
- Terminating artistic of rural areas

Policy and regulatory issues

- Tax on fossil fuel on biomass transport.
- Bonus lacking among the biomass producers
- Limited focus on selection of biomass material
- Lack of back up for sustainable supply chain resolutions.

2.5 Benefits of Biomass Heating

The uppermost advantage of such heating is that it uses agricultural, forest, urban, and industrial residues and waste to produce heat and electricity with less effect on the environment than fossil fuels. This way of energy production have very short-term effect on environment because the carbon released by biomass contemporary carbon which is part of the natural carbon cycle while the carbon released by fossil fuels is fossilized carbon which is not part of it, and as we know this contemporary carbon is taken by plant which is used for replacement growth and also before the use of fossil fuels biomass provide us most of humanity's heating.

2.6 Disadvantage

As there is no harmful impact of biomass in comparison to fossil fuels, they also have some disadvantages mentioned below

- Bio-power plants have high generation cost as compare to fossil fuel generation.
- These contain less concentrated energy
- Less economic to transport for long distance
- Such power plants need more preparation and handling skills which contribute to higher the cost of power plant

2.7 Application

According to the survey conducted in U.S Biopower plants can generate electricity up to 7,000 MW. The usage of fuel, i.e., biomass (wood, industrial waste, etc.) is approximately 60 million tones for the generation of 37 billion kWh of electricity per year. Compared to power from fossil fuels, accessibility of biomass is more easier, and its is affordable as well. The smaller bio-power systems (5 MW) the small bio-power system need not to have any grid system for the supply of the electricity in the different areas. They can also attribute the power to areas by waste called biomass resources. The best use of this system is in the area where there are

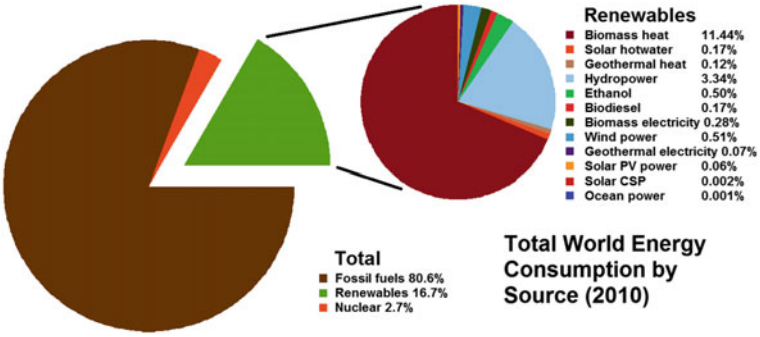

Fig. 5 World energy consumption (2)

limited central power grids as long as the biomass is easily available for the generation of the electricity. These power plants can power the small areas, power communities, and local industries.

This system is widely used in village areas, farms, and ranches, etc. This system can also be employed in the transmission arrangement and for distributing the generated power as they also improves the power quality of weak transmission lines which is located far. The consumers that may install such systems are paper companies, farming work, food processing plants, pellet mills, bio-diesel plants, ethanol mills, etc. (Fig. 5).

3 Conclusion

Biomass industry is renewable and harmless to living things. A biomass industry is able to produce a lot of energy with a small amount of biomass material. Although biomass industry will be expensive it can be a very big step in protecting the resources in the world and reducing greenhouse gases that affect the environment greatly. Even though biomass industry will be releasing emissions into the atmosphere it will be much less than any other industry as the innovation will be using the emissions also to produce energy.

I think by building biomass industries, it will overcome the challenge of the depletion in energy resources because the electricity generated will be with a renewable resource and will be able to power the homes. The issue of depleting fossil fuels will surely be controlled and electricity problem can be resolved if more people are inspired and more eco-friendly.

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