ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/319456142

Biomass as Renewable Energy

Conference Paper · March 2015

CITATIONS
9

READS
24,860

4 authors, including:

Vijay Kumar
IMS Engineering College
20 PUBLICATIONS **34** CITATIONS

SEE PROFILE

All content following this page was uploaded by Vijay Kumar on 03 September 2017.

The user has requested enhancement of the downloaded file.

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology (IARJSET)

National Conference on Renewable Energy and Environment (NCREE-2015)

IMS Engineering College, Ghaziabad

Vol. 2, Special Issue 1, May 2015

Biomass as Renewable Energy

Sharukh Khan[1], Vivek Paliwal[2], Vikrant Vikram Pandey[3], Vijay Kumar[4]

Student, Department of Electrical & Electronics Engineering IMSEC Ghaziabad[1,2,3]

Assistant Professor Department of Electrical & Electronics Engineering IMSEC Ghaziabad[4]

Abstract: This paper discusses biomass as a renewable energy source. The paper defines the resources as well as the ways biomass energy is converted into electricity, technologies involved in extracting power from biomass as well as the advantages and the disadvantages of using of biomass as a source of energy. The paper also reviews a few biomass projects in the INDIA, STATES OF IT and some other parts of world and discusses the future of biomass.

Keywords*:* BIOMASS Energy, biomass policy and Renewable policy in India.

INTRODUCTION

First we discuss the most important question. Which arise in our mind that is "what is biomass"?
Bio-mass covers all kinds of organic matter from fuel wood to marine vegetable.there existing a wide range of options for conversion into more convinient and useful form of energy as Heat energy and electrical energy[1].

Biomass is a term used to describe all organic matter produced by photosynthesis, existing on the earth's surface. They include all water- and land-based vegetation and trees, and all waste biomass such as municipal solid waste (MSW), municipal biosolids (sewage), and animal wastes (manures), forestry and agricultural residues, and certain types of industrial wastes. The world's energy markets have relied heavily on the fossil fuels. Biomass is the only other naturally occurring energy-containing carbon resource that is large enough in quantity to be used as a substitute for fossil fuels

above block diagram show the actual working about boimass principal.In this solar energy is responsible to make a photosythesis working in plant then the complex process these organic componds are converted into biomass. Then those biomass makes the form into biofuel and utilisation for heat energy. According to operate working require. And heat are changes into electrical energy.
Through the process of photosynthesis, chlorophyll in plants captures the sun's energy by converting carbon dioxide from the air and water from the ground into carbohydrates, i.e., complex compounds composed of carbon, hydrogen, and oxygen.

When these carbohydrates are burned, they turn back into carbon dioxide and water and release the sun's energy they contain. In this way, biomass functions as a sort of natural battery for storing solar energy.

Source of bio-mass:-
It can be obtained from different sources comprising
Organic wates which accumulate at specific location such as municipal solid waste(MSW)

Residues left as plant materials in the field or forest during the post harvestation period of agricultural crops or timber.

Selective cultivation of energy efficient crop depending on their fuel content.

Biomass is provide us large amount energy. If we consider rural area in it then we founded , fuelwood
Production and marketing provides emploument to nearly 2.5 million people in the world. In the rural indian sector, 40% of the energy demand is met by the use of fuelwood and 28% by crop residues and other biomass sources.
About 370 million tonnes of agro wastes are generated 6000 MW. Its too much and it can be reduces about 400 Million rupees every year in india.(because in india agro wastes are available approximate production of 300 million ton/year).

Available agro-wastes in india.
Rice-straw

Rice-husk

Jute stics

Wheat str

Cotton stalks

Bagaase

Molases

Coconut husk and shell

Silseed cakes saw dust

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology (IARJSET)

National Conference on Renewable Energy and Environment (NCREE-2015)

IMS Engineering College, Ghaziabad

Vol. 2, Special Issue 1, May 2015

2. METHODS OF EXTRACTING BIOMASS ENERGY [6].

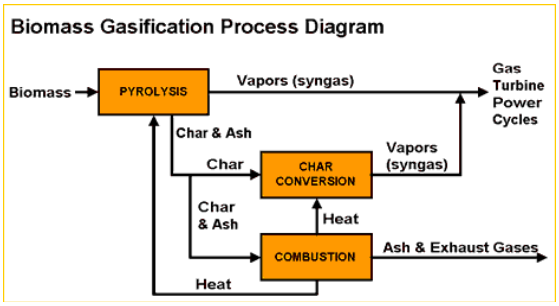
Biomass can be converted to thermal energy, liquid, solid or gaseous fuels and other chemical products through a variety of conversion processes. Biopower technologies are proven electricity-generation options in the United States, with 10GW of installed capacity. All of today's capacity is based on mature, direct-combustion technology. Future efficiency improvements will include co-firing of biomass in existing coal-fired boilers and the introduction of high-efficiency gasification, combined-cycle systems, fuel cell systems, and modular systems. Generally, the prominent biopower technologies are comprised of direct combustion, co-firing, gasification, pyrolysis, anaerobic digestion, and fermentation.

1. Direct Combustion

This is perhaps the simplest method of extracting energy from biomass. Industrial biomass combustion facilities can burn many types of biomass fuel, including wood, agricultural residues, wood pulping liquor, municipal solid waste (MSW) and refuse-derived fuel. Biomass is burned to produce steam, the steam turns a turbine and the turbine drives a generator, producing electricity. Because of potential ash build-up(which fouls boilers, reduces efficiency and increases costs), only certain types of biomass materials are used for direct combustion.

2. Gasification

Gasification is a process that exposes a solid fuel to high temperatures and limited oxygen, to produce a gaseous fuel. The gas produced by the process as is a mix of gases such as carbon monoxide, carbon dioxide, nitrogen, hydrogen, and methane. The gas is then used to drive a high efficiency, combined-cycle gas turbine. Gasification has several advantages over
burning solid fuel. One is convenience – one of the resultant gases, methane, can be treated in a similar way as natural gas, and used for the same way.

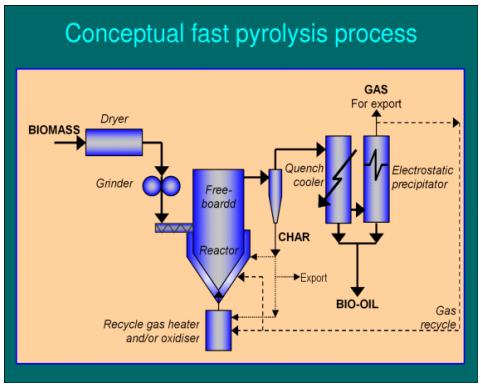


Another advantage of gasification is that it produces a fuel that has had many impurities removed and could therefore cause fewer pollution problems when burnt. Under suitable circumstances, it can also produce synthesis gas, a mixture of carbon monoxide and hydrogen which can be used to make Hydro-carbon (e.g., methane and methanol) for replacing fossil fuels. Hydrogen itself is a potential fuel without much pollution which can conceivably substitute oil and petroleum in a foreseeable

Pyrolysis

In its simplest form, pyrolysis represents heating the biomass to drive off the volatile matter and leaving behind the charcoal. This process has doubled the energy density of the original material because charcoal, which is half the weight of the original biomass, contains the same amount of energy, making the fuel more transportable [3]. The charcoal also burns at a much higher temperature than the original biomass, making it more useful for manufacturing processes. More sophisticated pyrolysis techniques are developed recently to collect volatiles that are otherwise lost to the system. The collected volatiles produce a gas which is rich in hydrogen (a potential fuel) and carbon monoxide. These compounds are synthesized into methane, methanol, and other hydrocarbons.

Flash pyrolysis is used to produce bio-crude, a combustible fuel. Heat is used to chemically convert biomass into pyrolysis oil. The oil, which is easier to store and transport than solid biomass material, is then burned like petroleum to generate electricity. Pyrolysis can also convert biomass into phenol oil, a chemical used to make wood adhesives, molded plastics, and foam insulation.



4. Digestion

Biomass digestion works by utilizing anaerobic bacteria. These microorganisms usually live at the bottom of swamps or in other places where there is no air, consuming dead organic matter to produce methane and hydrogen. We put these bacteria to work for us. By feeding organic matter such as
animal dung or human sewage into tanks, called digesters, and adding bacteria, we collect the emitted gas to use as an energy source. This process is a very efficient means of extracting usable energy from such biomass. Usually, up to two thirds of
the fuel energy of the animal dung could be recovered. Another related technique is to collect methane gas from landfill sites. A large proportion of household biomass waste, such as kitchen scraps, lawn clipping and pruning, ends up at the local tip. Over a period of several decades, anaerobic bacteria at the bottom of such tips could steadily decompose the organic matter and emit methane. The gas

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology (IARJSET)

National Conference on Renewable Energy and Environment (NCREE-2015)

IMS Engineering College, Ghaziabad

Vol. 2, Special Issue 1, May 2015

can be extracted and used by capping a landfill site with an impervious layer of clay and then inserting perforated pipes that would collect the gas and bring it to the surface .

5. Fermentation

For centuries, people have used yeasts and other
Micro-organisms to ferment the sugar of various plants into ethanol. Producing fuel from biomass by fermentation is just an extension of this process, although a wider range of plant material from sugar cane to wood fiber can be used. For instance, the waste from a wheat mill in New South Wales is used to produce ethanol through fermentation. Ethanol is then mixed with diesel to produce diesehol.Technological advances will inevitably improve the method. For example, scientists in Australia and the U.S. have substituted a genetically engineered bacterium for yeast in the fermentation process. The process has vastly increased the efficiency by which waste paper and other forms of wood fiber are fermented into ethanol.

Bio-fuels: Biomass is converted into transportation fuels such as ethanol, methanol, biodiesel and additives for reformulated gasoline. Bio-fuels are used in pure form or blended with gasoline.

Ethanol: Ethanol, the most widely used Bio-fuel, is made by fermenting biomass in a process similar to brewing beer. Currently, most of the 1.5 billion gallons of ethanol used in the U.S. each year is made from corn and blended with gasoline to improve vehicle performance and reduce air pollution.

Methanol: Biomass-derived methanol is produced through gasification. The biomass is converted into a synthesis gas (syngas) that is processed into methanol. Most of the 1.2 billion gallons of methanol annually produced in the U.S. are made from natural gas and used as solvent, antifreeze, or to synthesize other chemicals.

About 38 percent is used for transportation as a blend or in reformulated gasoline.

States	Power potential (Mwe)	Installed capacity (by 2011)	Tariif
U.P	1594.2	592.5	@ Rs 4.7
Haryana	1120.3	35.8	@ Rs 5.24
Rajasthan	1093.8	73.3	@ Rs 4.7
Maharashtra	1014.2	403	@ Rs4.98
Madhya Pradesh	841.7	1.0	@ Rs 3.33
Gujarat	457.7	0.5	@ Rs 3.93
Kerala	195.9	-	@ Rs 2.80

Biodiesel: Biodiesel fuel, made from oils and fats found in micro-algae and other plants is substituted for or blended with diesel fuel.

BIOMASS SECTOR IN INDIA: PROBLEMS AND CHALLENGES [10].

Biomass power plants in India are based mostly on agricultural wastes. Gasifier-based power plants are providing a great solution for off-grid decentralized power and are lighting homes in several Indian states. While for providing grid based power 8-15 MW thermal biomass power plants are suitable for Indian conditions, they stand nowhere when compared to power plants being set up in Europe which are at least 20 times larger. Energy from biomass is reliable as it is free of fluctuation unlike wind power and does not need storage to be used in times of non-availability as is the case with solar. Still it is not the preferred renewable energy source till now, the primary reason that may be cited is the biomass supply chain. Biomass availability is not certain for whole year. Biomass from agriculture is available only after harvesting period which can stretch only for 2-3 months in a year. So there is a need to procure and then store required quantity of biomass within this stipulated time. Some of the Indian states leading the pack in establishing biomass-based power supply are Karnataka, Andhra Pradesh, and Maharashtra. Ironically, states having agricultural-based economy have not properly been able to utilize the opportunity and figure low on biomass energy utilization. Only Uttar Pradesh has utilized large part of the biomass potential in north Indian States and that is mainly due to the sugarcane industry and the co-generation power plants. Interestingly Punjab and Haryana don't have much installed capacity in comparison to potential even though tariff rates are
more than Rs. 5 per unit, which are better than most of the states. This can be attributed to the fact that these tariffs were implemented very recently and it will take time to reflect the capacity utilization.

Biomass Potential &installed capacity in key india states[2]:-

The electricity generation could be cheaper than coal if biomass could be sourced economically but some established biomass power plants tend to misuse the limit of coal use provided to them (generally 10-15% of biomass use) to keep it operational in lean period of biomass supply. They are not able to run power plants solely on biomass economically which can be attributed to: Biomass price increases very fast after commissioning of power project and therefore government tariff policy needs an annual revision[9].

Lack of mechanization in Indian Agriculture Sector

Defragmented land holdings

Most of the farmers are small or marginal

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology (IARJSET)

National Conference on Renewable Energy and Environment (NCREE-2015)

IMS Engineering College, Ghaziabad

Vol. 2, Special Issue 1, May 2015

Government policy is the biggest factor behind lack of investment in Bio power sector in states with high biomass potential. Defragmented natures of agricultural lands do not allow high mechanization which results in reduction of efficiency and increase in procurement cost.

Transportation cost constitutes a significant portion of the costs associated with the establishment and running of biomass power plants.

There is need of processing in form of shredding the biomass onsite before transportation to increase its density when procurement is done from more than a particular distance.

While transportation in any kind or form from more than 50 Km becomes unviable for a power plant of size 10-15MW. European power plants are importing their biomass in form of pellets from other countries to meet the requirement of the huge Bio power plants.

Not all the biomass which is regarded as agro-waste is usually a waste; part of it is used as fuel for cooking while some part is necessary to go back to soil to retain the soil nutrients.

According to conservative estimates, only two-third of agricultural residues could be procured for power production.

And as human mentality goes waste is nothing but a heap of ash for the farmer till someone finds a way to make profit out of it, and from there on the demand of waste increases and so its price.

Though there is nothing wrong in transferring benefits to the farmers and providing them a competitive cost of the agro -waste but operations becomes increasingly unviable with time.

A robust business model is necessary to motivate local entrepreneurs to take up the responsibility of supplying biomass to processing facilities.

Collection centre's covering 2-3 villages can be set up to Facilitate decentralization of biomass supply mechanism.

Biomass power plant operators may explore the possibility of using energy crops as a substitute for crop wastes, in case of crop failure.

Bamboo and Napier grass can be grown on marginal and degraded lands.

CONCLUSION

According to complete information of BIOMASS it is concluded that Bio Mass is cheap and more efficient energy not in India but also in world. It provides energy with simpler manner. It removes the burden on the head of farmer. And provide the better opportunity of them. The process of extraction these type energy have studies at starting. Mostly it can be extraction from the wastes. So it is more economically. Biomass systems can be used for village-power applications in the range of 10-250 kW scale.

Opportunities for biomass energy are growing. In June2000, the federal government in the United States passed a law that will provide $49 million per year for five years to develop advanced technologies and crops to produce energy, chemicals, and other products from biomass. A number of states also provide incentives for biomass energy. In 1998, biomass provided about 2% of America's electricity[4]. 1% of the fuel used in cars and trucks, and some of the heat and steam used by homes and businesses. With more energy crops and better conversion technology, it could gain a much larger portion of the market. Energy crops and crop residues could provide 14% of US electricity use by 2008 or 13% of the nation's motor fuel [8]. Thus it is seen that the emerging technologies of biomass as a renewable source of energy is highly advantageous to promote a greener planet and also cut down on the need for fossil fuels which not only cause pollution in the atmosphere but also are fast depleting.

REFERENCES:

[1]. Non conventional energy resources by G.D Rai Book. An Introduction to Biomass Energy a Renewable Resource.www.mnre.org.in.

[2]. BERA Biomass Energy Research Association, (www.bera1.org).U S Department of Energy, Energy Efficiency and Renewable Energy (www.eere.org).

[3]. NREL, Clean Energy Basics: Introduction to biomass electricity production, (www.nrel.gov/energy).

[4]. Biomass-The Growing Energy Source, (www.science. org.au/ nova).www.bchydro.com

[5].Lessons learned from Existing Biomass Plants.Overview of Biomass Power Generation in South East.Rural Energy in India, www.indiasolar.com/bio.htm.11.Renewable Energy system by D.Mukherjee & S.Chakrabarty.

View publication stats