

BIOMASS AS AN ALTERNATIVE SOURCE OF ENERGY FOR FUTURE

***Ahmad Ashfaq**

Faculty of Engineering & Technology, AMU, Aligarh

**Author for Correspondence*

ABSTRACT

Energy consumption and environmental pollution are increasing rapidly due to economic growth. As for the energy consumption, in parallel to the demand for heat and electricity, a greenhouse gas emission increases accordingly. The alternate fuels are substitute to petroleum. There are several reasons for biofuels to be considered as relevant technologies by both developing and industrialized countries. They include energy security reasons, environmental concerns, foreign exchange savings, and socioeconomic issues related to the rural sector. Biomass can play a dual role in greenhouse gas mitigation, as an energy source to substitute for fossil fuels and as a carbon store. Modern biomass options offer significant, cost-effective and perpetual opportunities toward meeting emission reduction targets while providing additional ancillary benefits. This paper focuses on how the biofuels can be used as a source of energy to substitute the fossil fuels and act as a carbon source.

Keywords: *Pollution, Biomass, Sustainable Energy, Greenhouse Emissions, Renewable*

INTRODUCTION

Known petroleum reserves are estimated to be depleted in less than 50 years at the present rate of consumption. In developed countries, there is a growing trend towards employing modern technologies and efficient bio-energy conversion. Renewable resources are more evenly distributed than fossil and nuclear resources, and energy flows from renewable resources are more than three orders of magnitude higher than current global energy use. Today's energy system is unsustainable because of equity issues as well as environmental, economic, and geopolitical concerns that have implications far into the future. It is a continuously increasing problem that the industrial economy, particularly the current energy system, is largely fossil fuel based. Biomass appears to be an attractive feedstock for three main reasons. First, it is a renewable resource that could be sustainably developed in the future. Second, it appears to have formidably positive environmental properties resulting in no net releases of carbon dioxide and very low sulfur content. Third, it appears to have significant economic potential provided that fossil fuel prices increase in the future. Biofuel is a non-polluting, locally available, accessible, sustainable, and reliable fuel obtained from renewable sources. Biomass (combustible renewable and waste) accounted for 10.6% of the world's total primary energy supply in 2003, overshadowing all other renewable energy sources. In addition, energy from biomass can be linked to other environmental and socioeconomic benefits.

State of the Art of an Energy Sector

Over the last year, high energy prices, continued demand growth, rising import dependence, and political tensions have increased concerns about adequate and affordable energy supplies, making energy security a policy priority in many countries. Renewable energy sources (RES) are essential to tackle climate change. Renewable energy technologies are uniquely well suited to respond to the limitations of current patterns of energy generation and consumption, to complement existing energy production systems, and to contribute to the further modernization of the energy sector. Renewable energy sources can also help improve industrial competitiveness and have a positive impact on regional development and employment. Biomass is a versatile source of energy. It can be burnt directly for heat, fermented for alcohol fuels, anaerobically digested for biogas production, or gasified to get producer gas. It includes all plant life (trees, agricultural plants, bush, grass, algae, etc.), agricultural residues (crop and agro-processing), and wastes municipal waste, animal and human wastes). The resource is highly decentralized and scattered. In India, the potential of biomass as an energy resource is very large. The aim of biomass conversion is to convert biomass into more useful forms: gaseous or liquid fuels. Gasification systems with 5 kW to 1000

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kW unit capacity suitable for using a variety of biomass, have been developed in the country. There are various types of gasifiers; the suitability of a particular type depends on the application and type of biomass.

Biomass as an Energy Source

Concerns about emissions of greenhouse gases and global climate warming have led to heightened interest in low emission sources of energy, most notably renewable energy sources and technologies. Energy from biomass is one such renewable energy source. Biomass is organic matter, derived in recent times, directly or indirectly, from plants as a result of photosynthesis. It includes a wide variety of materials, from forestry and agricultural residues, to organic waste by-products from various industries, purpose-grown energy crops, human sewage and animal manures, to woody weeds and municipal green waste. Energy from biomass can be linked to other environmental and socioeconomic benefits. *These include:*

- ✓ Management of waste streams. Many jurisdictions wish to reduce the amount of waste going to landfills.
- ✓ Stimulation of jobs and rural and regional development.
- ✓ Multiple product streams can be produced from biomass. These include power, heat, saleable ash, biofertilizers, activated carbon, chemicals and fuels.
- ✓ Salinity mitigation and land repair.
- ✓ Growing biomass with the consequential increase in animal habitats and hence fostering biodiversity.
- ✓ Fire hazard reduction.
- ✓ New business opportunities associated with Renewable Energy Certificates (RECs), Greenpower and New South Wales Greenhouse Gas Abatement Certificates.
- ✓ Link to carbon sequestration and carbon management.
- ✓ Dispatchable electricity. Bioenergy has inherent energy storage, unlike renewable energy sources such as wind and solar.
- ✓ Distributed generation. This can defer capital expenditure on transmission works, and reduce energy losses in the transmission and distribution networks.
- ✓ Response to Government programs (Kyoto target, the Renewable Energy Development Initiative).
- ✓ Local environmental benefits, such as odour reduction and improvement in local air and water quality improvement.

Current Role of Biomass

It is estimated that the world's standing terrestrial biomass carbon (i.e., the renewable, aboveground biomass that could be harvested and used as an energy resource) is approximately 100 times the world's total annual energy consumption. The largest source of standing terrestrial biomass carbon is forest biomass, which contains about 80 to 90% of the total biomass carbon. Current total biomass use for energy is in the range about 12% of world primary energy consumption mainly in traditional applications in developing countries, but also in some developed countries for heat and power production. Modern biomass (bioenergy) technologies that feature high efficiencies, cleanliness, and convenience are now becoming technically and commercially viable. However, sustainable production and efficient conversion of biofuels have to be assured. Biofuels play a different role among countries regarding the extent and the way they are used. Whereas they only provide some 3% of total primary energy in the developed countries, they account for some 40% in developing countries.

Opportunities for Biomass

Even without additional land use for biomass, there is a variety of possibilities for improved use of existing biomass resources for energy. Examples include the use of residues from forestry and agriculture, residues from the food and wood processing industry, and the biomass fraction of municipal solid waste (paper, landfill gas, and disposed wood products). Thus a large fraction of the globally available biomass residues representing a potential for about 40% of present energy use could be available for biomass. New technologies for the production of biofuels in large quantities have been developed. The utilization of biofuels does not depend on the development of any fundamentally new technology.

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Technologies for the Use of Biomass

Biomass resources may be classed as ‘wet’ or ‘dry’, with moisture levels ranging from 98% for sewage and effluent streams to below 15% moisture content for agricultural straws. Energy conversion technologies need to match the biomass fuel. Thermal processing relates to combustion, gasification and pyrolysis processes, with combustion technology accounting for some 90% of bioelectricity plants. There is approximately 25 GW of installed bioelectricity plants in the OECD countries.

Bio Energy

A number of conversion routes exist to change biomass into a useful form of energy. Bio energy covers a large variety of routes, with many types of resources, many conversion technologies, and three final energy products—heat, electricity, and different types of liquid fuels.

Bio energy has following advantages:

- Contribution to the security of supply.
- Biomass as a resource can usually be stored in large amounts and as a consequence bio energy can be produced when needed.
- Creation of stable jobs, especially in rural areas.
- Developing technologies and know-how offer good opportunities for technology exports
- Carbon dioxide mitigation and other emission reduction (SO_x, etc).

Some Recent Outstanding Technological Developments

The Wood Fuel Supply Chain

Most of the wood for bio energy applications currently comes from industrial wood residues. However in the future, when all this resource will be used, biofuels will have to base on agricultural dedicated production and on the recovery of unutilized biomass reserves in the forests. As bio energy plant sizes are larger and larger logistics is becoming a crucial factor as transport distances from forest to plant increases.

Co-Firing

Energy production based on biomass might be hampered by limitations in the supply and/or fuel quality. Therefore co-firing of several types of biomass or with coal brings flexibility in technical and economical operation. Co-firing also provides means for emissions reduction

Small-Scale Space Heating

For individual households, wood-log stoves are widespread all over Europe and represent a large share of bio energy today. Wood logs are often inexpensive and stoves create a cozy corner in the house. Modern stoves and central heating systems have appeared with a much better combustion regulation, high efficiency, and minimal flue gas emissions. Automatic stoves and central heating systems for households fueled with pellets is seen by experts as a particularly promising bio energy route.

Gasification

Fluidized Bed (CFB) gasifiers are successfully producing gas for fueling existing coal-fired boilers; such technology allows using wet fuels and recycled energy fuels (fuels from sorted waste) with rather low specific investment and operational costs.

Issues Associated With Biomass

Biomass supplies are more spatially dispersed than fossil fuel supplies. The local availability of biomass for energy has the potential of reducing energy imports, and hence, increasing a country's self-sufficiency. Due to the limited availability of land, sometimes conflicts may arise between biomass and other options for land use, especially food production.

CONCLUSIONS

A sustainable energy system includes energy efficiency, energy reliability, energy flexibility, fuel poverty, and environmental impacts. Alternate fuels are substitute fuel sources to petroleum. These fuels are important because they replace petroleum fuels; however, there are many benefits in using alternate fuels as well. Modern biomass options offer significant, cost-effective and perpetual opportunities for GHG reductions. Additional benefits offered are employment creation in rural areas, reduction of a country's dependency on imported energy carriers (and the related improvement of the balance of trade),

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better waste control, and potentially benign effects with regard to biodiversity, desertification and recreational value. As a result, biomass can significantly contribute to sustainable development both in developed and developing countries, provided that all issues related to its practical exploitation are carefully considered. As a result, biomass can significantly contribute to sustainable development both in developed and developing countries. Biomass has a vital role to play in climate stabilization. Another major reason why the use of biomass for energy will increase is the growth in energy demand in developing countries, where affordable alternatives are often unavailable.

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