



Biomass Electricity

For Prelims: Renewable Energy, Biomass electricity, Pyrolysis, Gasification

For Mains: Renewable energy, Government initiatives for Renewable Energy

Why in News?

Recently, a **new biomass-based boiler technology was launched in India** (Kurukshehra, Haryana) that claims to accommodate all kinds of agricultural residue as fuel and can be greener and may also help reduce the burden of **stubble burning**.

- Biomass-based electricity is gaining the attention of regulators and policy makers, as the country moves towards power generation that is not carbon-intensive.
- Around 2.6% of the country's electricity demand is met by biomass.

What are the Key Highlights?

- **Features of the Biomass-based Boiler:**
 - The new boiler had a **capacity of 75 tonnes per hour** and generated **15 megawatts of electricity**.
 - This new **Denmark-based technology** allows the plant to fire a wide range of fuels with less fuel preparation and handling.
 - This combustion technology is advantageous because of the **vibrating grate**.
 - The grate of a steam boiler supports the solid fuel in the furnace.
 - Vibrating grate accommodates **biomass of every density**.
 - The moisture content of the fuel, however, has to be 15-20%
 - Since the vibrating grate supports firing agro residue of any size, it **saves energy consumed for processing biomass for energy generation**.
- **Advantages over Conventional Boilers:**
 - The existing conventional boilers are designed **only for specific types of agro residue** such as paddy husk, paddy straw, mustard, etc and thus restrict the biomass contribution in energy generation.
 - While vibrating grate boiler technology can be a solution for firing any kind of biomass.

What is Biomass?

- **About**
 - Biomass is renewable organic material that comes from plants and animals.
- **Uses**
 - Biomass is used for facility heating, electric power generation, and combined heat and power.
- **Methods to convert Electricity:** Biomass can be converted into electric power through several methods.:
 - **Combustion of biomass material:**

- The most common is direct combustion of biomass material, such as agricultural waste or woody materials.
- **Gasification:**
 - Gasification produces a synthesis gas with usable energy content by heating the biomass with less oxygen than needed for complete combustion.
- **Pyrolysis:**
 - Pyrolysis yields bio-oil by rapidly heating the biomass in the absence of oxygen.
- **Anaerobic digestion:**
 - Anaerobic digestion produces a renewable natural gas when organic matter is decomposed by bacteria in the absence of oxygen.
 - Very wet wastes, like animal and human wastes, are converted into a medium-energy content gas in an anaerobic digester.
- **Advantages:**
 - Compared to many other renewable energy options, biomass has the advantage of **dispatchability**, meaning it is **controllable and available when needed**.
- **Disadvantages:**
 - The fuel needs to be procured, delivered, stored, and paid for.
 - Also, biomass combustion produces emissions, which must be carefully monitored and controlled to comply with regulations.
- **Government Initiatives:**
 - **Biomass power & cogeneration programme** is implemented with the main objective of promoting technologies for optimum use of country's biomass resources for grid power generation.
 - The Union Ministry of New and Renewable Energy (MNRE) announced **central financial assistance** for projects utilising biomass like bagasse, agro-based industrial residue, crop residues, wood produced through energy plantations, weeds as well as wood waste produced in industrial operations for power generation.
 - The move was aimed at enhancing biomass combustion in a controlled environment for energy production.

UPSC Civil Services Examination, Previous Year Question

Q. With reference to the usefulness of the by-products of sugar industry, which of the following statements is/are correct? (2013)

1. Bagasse can be used as biomass fuel for the generation of energy.
2. Molasses can be used as one of the feedstocks for the production of synthetic chemical fertilizers.
3. Molasses can be used for the production of ethanol.

Select the correct answer using the codes given below:

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (c)

Exp:

- There are four main by-products of sugar industry, which are cane tops, bagasse, filter muds and molasses.
- Sugarcane bagasse is a highly promising source of biomass for the establishment of a bio-based economy. Bagasse can be used to produce electricity, ethanol, paper board and chemicals such as Vanillin. **Hence, statement 1 is correct.**
- Molasses is a by-product of refined sugar. It is used for alcohol production. It has several important roles in livestock feeding due to the nutritive, appetizing and physical properties of its sugar contents. It can also be used for the production of ethanol, spirit and alcohol among other products. **Hence, statement 3 is correct.**

- Molasses is used as one of the feedstocks for the production of organic, but not chemical fertilizers. **Hence, statement 2 is not correct.**
- Therefore, option (c) is the correct answer

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