

Integrated Waste to Energy Plant

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In News: Recently, Karnataka Chief Minister laid the foundation stone for a 11.5 MW waste-to-energy plant near Bidadi.

What is a waste-to-energy plant?

- A waste-to-energy (WTE) plant is a waste management facility that combusts wastes to produce electricity. This type of power plant is sometimes called a trash-to-energy, municipal waste incineration, energy recovery, or resource recovery plant.
- A number of WTE plants are coming up in urban India, using incineration, Refuse Derived Fuel based combustion or conversion technologies such as pyrolysis and gasification.
- There is a great deal of confusion about what the different technologies entail, and also apprehension about the potentially damaging impact of WTE plants on the quality of air and on public health. There are also questions about whether these plants are financially viable.
- Incineration-based waste-to-energy plants rely on mass burning of municipal solid waste, which involves complete combustion into ash. Depending on what is being combusted, the gases generated may contain dioxins and furans, which are toxic and can be lethal.
- These plants therefore need to put in place emission control filters of a very high standard to check the release of harmful gases into the atmosphere.
- There is a need for continuous monitoring of emissions and sharing information openly.

Some of WTE technologies

- The innovations in WTE technologies worldwide have been focusing on pyrolysis, gasification and plasma gasification, which can deliver cleaner emissions but are considerably more expensive.
- These technologies involve – heating of solid waste at very high temperatures in an oxygen-controlled environment, such that the thermal reactions produce syngas which has the advantage that it can be burned directly or transported through pipelines.

Benefits of wastes to energy plants:

- In terms of volume, usually waste-to-energy plants incinerate 80 to 90 percent of waste, thus helping large cities from choking due to unmanageable waste.
- Most wastes that are generated find their way into land and water bodies without proper treatment, causing severe water and air pollution.
- Waste to energy generates clean, reliable energy from a renewable fuel source, thus reducing dependence on fossil fuels, the combustion of which is a major contributor to Greenhouse Gas (GHG) emissions.
- Sometimes, the residue ash is clean enough to be used for some purposes such as raw materials for use in manufacturing cinder blocks or for road construction.
- In addition, the metals that may be burned are collected from the bottom of the furnace and sold to foundries.
- Some waste-to-energy plants convert salt water to potable fresh water as a by-product of cooling processes.
- Waste-to-energy plants cause less air pollution than coal plants.
- It is carbon-negative – processing waste into biofuel releases considerably less carbon and methane into the air than having waste decay away in landfills or the lake.

Refuse-derived fuel

- Refuse-derived fuel is a fuel produced from various types of waste such as municipal solid waste, industrial waste or commercial waste(it includes biodegradable material as well as plastics).
- The World Business Council for Sustainable Development defines Refuse-derived fuel as "Selected waste and by-products with recoverable calorific value can be used as fuels in a cement kiln, replacing a portion of conventional fossil fuels, like coal, if they meet strict specifications. Sometimes they can only be used after pre-processing to provide 'tailor-made' fuels for the cement process"
- RDF has many facets, meaning it can be further specified into TDF (Tyre Derived Fuels), SRF (Solid Recovered Fuels) and AF (Alternative Fuels).

Coal gas / syngas

- Coal gas / syngas is obtained by destructive distillation of coal. It is a mixture of hydrogen (50%), Methane (35%), carbon monoxide (10%), Ethylene (5%) and other volatile hydrocarbons, carbon dioxide and nitrogen.

coal gasification

- It is the process of producing syngas, a mixture consisting of carbon monoxide (CO), hydrogen (H₂), carbon dioxide (CO₂), natural gas (CH₄), and water vapour (H₂O).
- During gasification, coal is blown with oxygen and steam while also being heated under high pressure. During the reaction, oxygen and water molecules oxidize the coal and produce syngas.

