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Waste to Energy Generation from Municipal Solid Waste in India

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Abstract: The energy crisis and environmental degradation are currently two vital issues for global sustainable development. Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands tons of municipal solid waste daily, which is one of the important contributors for environmental degradation at national level. Improper management of municipal solid waste (MSW) causes hazards to inhabitants. The management of MSW requires proper infrastructure, maintenance and upgrade for all activities. In this regard, Waste to Energy (WtE) provides a solution towards complying with government regulations, and achieving integrated solid waste management.
Keywords: Waste to Energy; Municipal solid waste; Solid waste management; Energy crisis.

Introduction

India has drawn the world's attention in recent years with its booming economic growth, large demographic of young, English-speaking workers, and its shift from an agricultural to a more service-oriented economy. The consequence of this economic success has been a massive increase in waste this has led to a rapid growth in the quantity and variety of MSW.

Why Waste to Energy is Important?

Most wastes that are generated, find their way into land and water bodies without proper treatment, causing severe water pollution. They also emit greenhouse gases like methane and carbon dioxide, and add to air pollution. Any organic waste from urban and rural areas and industries is a resource due to its ability to get degraded, resulting in energy generation.

India – Waste Generation Scenario

Every year, about 55 million tonnes of municipal solid waste (MSW) and 38 billion liters of sewage are generated in the urban areas of India [1]. In addition, large quantities of solid and liquid wastes are generated by industries. Waste generation in India is expected to increase rapidly in the future. As more people migrate to

urban areas and as incomes increase, consumption levels are likely to rise, as are rates of waste generation. It is estimated that the amount of waste generated in India will increase at a per capita rate of approximately 1-1.33% annually. This has significant impacts on the amount of land that is and will be needed for disposal, economic costs of collecting and transporting waste, and the environmental consequences of increased MSW generation levels [2].

Generation of MSW in Indian cities

According to MNRE estimates, there exists a potential of about 1460 MW from MSW and 226 MW from sewage [3].

State/Union Territory	From Liquid Wastes* (MW)	From Solid Wastes (MW)	Total (MW)
Andhra Pradesh	16.0	107.0	123.0
Assam	2.0	6.0	8.0
Bihar	6.0	67.0	73.0
Chandigarh	1.0	5.0	6.0
Chhattisgah	2.0	22.0	24.0
Delhi	20.0	111.0	131.0
Gujarat	14.0	98.0	112.0
Haryana	6.0	18.0	24.0
Himachal Pradesh	0.5	1.0	1.5
Jharkhand	2.0	8.0	10.0
Karnataka	26.0	125.0	151.0
Kerala	4.0	32.0	36.0
Madhya Pradesh	10.0	68.0	78.0
Maharashta	37.0	250.0	287.0
Manipur	0.5	1.5	2.0
Meghalaya	0.5	1.5	2.0
Mizoram	0.5	1.0	1.5
Orissa	3.0	19.0	22.0
Pondichery	0.5	2.0	2.5
Punjab	6.0	39.0	45.0
Rajasthan	9.0	53.0	62.0
Tamil Nadu	14.0	137.0	151.0
Tripura	0.5	1.0	1.5
Uttar Pradesh	22.0	154.0	176.0
Uttaranchal	1.0	4.0	5.0
West Bengal	22.0	126.0	148.0
Total	**226.0**	**1457.0**	**1683.0**

In its 2009-10 Annual Report the Ministry of New and Renewable Energy (MNRE) [4] estimated that approximately 55 million tonnes of MSW are generated in urban areas of India annually. It is estimated that the amount of waste generated in India will increase at a rate of approximately 1-1.33% annually.

The Ministry of Environment and Forests (MoEF) promulgated the Municipal Solid Wastes (Management and Handling) Rules in 2000 [5] requiring municipalities across India adopt sustainable and environmentally sound ways of processing MSW, including incineration. In this regard, Waste to Energy (WtE) provides a solution towards complying with government regulations, and achieving integrated solid waste management.

WtE[6] is perceived as a means to dispose MSW, produce energy, recover materials, and free up scarce land that would otherwise have been used for landfill.

The Indian Government considers WtE to be a renewable technology, and the MNRE has developed the National Master Plan for Development of WtE in India. The MNRE lists a number of technologies for energy recovery from urban and industrial wastes that "not only reduce the quantity but also improve the quality of waste to meet the required pollution control standards, besides generating a substantial quantity of energy".

The MNRE estimates that the potential to generate power from MSW [7] will more than double in the next ten years, while the potential from industrial waste is likely to increase by more than 50%.

While the Indian Government's own figures would suggest that the cost of WtE is somewhat higher than other renewable sources, it should be kept in mind that WtE facilities serve a dual role of waste disposal and energy production. Although the cost per MW of capacity may be greater than other renewable sources, the benefits of waste management, energy and metals recovery, and reduction of GHG emissions need to be considered.

India Waste to Energy Tapped Potential

From the above section one can infer that there exists an estimated potential of about 225 MW from all sewage (taking the conservative estimate from MNRE) and about 1460 MW of power from the MSW generated in India, thus a total of close to 1700 MW of power.

Of this, only about 24 MW have been exploited, according to MNRE. Thus, less than 1.5% of the total potential has been achieved[7].

Current Waste-to-Energy Installed Capacity

Grid-interactive power	Capacities in (mw)	Contribution (%)
Waste to Power		
Urban	20.20	27.4
Industrial	53.46	72.6
Total	**73.66**	
Waste to Energy		
Urban	3.50	4.6
Industrial	72.30	95.4
Total	**75.8**	

**MWEq: Megawatt Equivalent; Source: MNRE, 2011*

Major Constraints Faced by the Indian Waste to Energy Sector

The growth of this sector has been affected on account of the following limitations/ constraints:

- Waste-to-Energy is still a new concept in the country;
- Most of the proven and commercial technologies in respect of urban wastes are required to be imported;
- The costs of the projects especially based on biomethanation technology are high as critical equipment for a project is required to be imported.
- In view of low level of compliance of MSW Rules 2000 by the Municipal Corporations/ Urban Local Bodies, segregated municipal solid waste is generally not available at the plant site, which may lead to non-availability of waste-to-energy plants.
- Lack of financial resources with Municipal Corporations/Urban Local Bodies.
- Lack of conducive policy guidelines from State Governments in respect of allotment of land, supply of garbage and power purchase / evacuation facilities.

Indian Government Support for Waste to Energy Projects

MNRE has promoted the national programme for the recovery of energy from industrial and urban wastes [8]. Since this programme seeks to promote setting up of waste-to-energy plants, various financial incentives and other eligibility criteria have been proposed by the MNRE to encourage the participation in waste-to-energy projects.

These are listed below:

- Financial assistance is provided by way of interest subsidy for commercial projects.
- Financial assistance is provided on the capital cost for demonstration projects that are innovative in terms of generation of power from municipal/ industrial wastes.
- Financial assistance is provided for power generation in STPs.
- Financial incentives are given to municipal corporations for supplying garbage free of cost at the project site and for providing land.
- Incentives are given to the state nodal agencies for promotion, co-ordination and monitoring of such projects.
- Financial assistance is given for carrying out studies on waste to energy projects, covering full costs of such studies.
- Assistance is given in terms of training courses, workshops and seminars and awareness generation.

Things that Limit the Use of Waste to Produce Energy

- Waste typically has a lower energy density (energy available per unit mass) than fossil fuels. So if it needs to be moved at any stage during the process, the cost of energy production is increased, and the energy efficiency is reduced. Locating the waste processing plant near the waste resources would reduce this problem.
- Incomplete burning of waste can result in the production of noxious gases, such as carbon monoxide and nitrogen oxides. The solution is to strictly control the process to minimise their production.
- In countries where a waste-to-energy industry is not established, the cost of converting waste to energy is higher than in other countries because all the initial expertise and technology has to be imported.
- Relatively cheap domestic electricity and natural gas fuel tariffs, as well as political and institutional barriers to waste use (such as increased scrutiny by environmental agencies) decrease the cost competitiveness of waste-to-energy technologies.
- Legal complexities can slow things down.

Conclusion

Inclusion of waste to energy into a solid waste management plan can decrease landfill reliance, mitigate climate change, lower the need of fossil fuel for energy generation, and reduce the health risks related to landfill disposal, and release of important greenhouse gases, CO_2, CH_4 In addition, every municipality needs to recognize that waste to energy technology is based on sound science, incorporates the best available technologies, and generates non-renewable energy. There is a need to educate the public on current thermal treatment technologies, and overcome their misconceptions. State environmental agencies like pollution control boards, need to become more active in educating the public on each of the MSW management options in order to make the public for wise decisions.

References

1. Asokan Pappua, Mohini Saxenaa, Shyam R. Asolekar,Solid wastes generation in India and their recycling potential in building materials, Indian Journal of Environment Protection, 2007, 2311-2321
2. Dimpal Vij, Urbanization and solid waste management in India: Present practices and future challenges. Procedia - Social and Behavioral Sciences , 2012, 37, 437 – 447.
3. Samir Saini, Prakash Rao, Yogesh Patil, City based analysis of MSW to energy generation in India, calculation of state-wise potential and tariff comparison with EU, Procedia - Social and Behavioral Sciences,2012, 37, 407 – 416.
4. State of Environment Report- Ministry of Environment & Forest 2009.
5. Municipal Solid Waste (Management & Handling) Rule, 2000.

6 a. Don McCallum, P. Eng., Morrison Hershfield Ltd Waste to Energy, YEC back ground paper, March 2011,6-9 .

6b. International Brainstorming Workshop on, Waste to Energy in India, 24-25 August 2012, Worli,Mumbai,Council of Scientific and Industrial Research-National Environmental Engineering Research Institute (CSIR-NEERI), in association with Earth Engineering Centre, Columbia University, USA

7. Kevin De Cuba, Francisco Burgos, Ruben Contreras- Lisperguer, and Renortha Penny, Limits and potential of waste-to-energy systems in the Caribbean, http://www.oas.org/dsd/reia/Documents/ Limits and Potential of Waste to Energy.pdf
8. M. Vikram Reddy, MSW waste to energy conversion in India: an overview, Department of Ecology and Environmental Sciences, Pondicherry University, Puducherry 605014, India.

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