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MSW USED AS ENERGY RECOVERY IN JABALPUR CITY

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Abstract

The increase in socio-economic condition during the past ten years has also significantly increased the amount of solid waste generated.The growing amount of municipal solid waste (MSW) and the related problems of waste disposal urge the development of a more sustainable waste management practice [1]. Waste-to- Energy (WTE) technologies – recovering energy in the form of electricity and/or heat from waste – are being developed worldwide. The thermo chemical technologies for energetic valorization of calorific waste streams (WTE), with focus on refuse derived fuel (RDF) – a processed form of municipal solid waste (MSW). The basic principles of the available technologies and process details of some specific technologies are summarized. Technologically advanced processes (e.g. plasma gasification) receive more attention, with particular focus on the potential for energy recovery (WTE) and material recovery (WTE). The review concludes with an argumentation of the advantages of processing RDF as opposed to MSW, and a comparison between the different technologies, stressing factors affecting their applicability and operational suitability [2]. A comparison of different parameters affecting Waste to Energy technology and a state-wise comparison was conducted along with comparative study of waste-to-energy plants in Jabalpur.

There are around 600 tons of municipal solid waste (MSW) generated daily, of which the combustibles namely plastics, paper and textile waste represent 28%. The study was, therefore, initiated to assess the potential of power generation from refused derived fuels (RDF) from municipal solid waste (MSW) in order to reduce the dependency on fossil fuels. There are 360 tons which is equivalent to 12 tons/h of RDF that can be generated daily from the MSW and this would generate 10 MW power [3]. There will be 157 kg/h of ash that would be generated and the NOx and SOX concentration were found to be 136.5 and 20.5 mg/Nm3 respectively which is below the EU standard.

Introduction

Waste disposal is one of the pressing problems. Millions of tons of municipal solid waste, hazardous/industrial wastes and agricultural wastes are handled daily throughout municipal areas. Each municipality confronts great challenges in disposing of its wastes in an efficient, cost effective and environmentally safe manner. Landfills in metropolitan areas are becoming full, and new ones are more difficult to open [4]. Failure to effectively deal with these waste disposal problems could significantly impact the country's economy as well as the health and welfare of its people. Population growth creates waste disposal problems thus inadequate waste disposal creates health and environmental problems. Per capital solid waste disposal will continue to be high in municipal areas. Solid waste landfills are becoming a mounting problem – creating space limitations and significant health concerns. The beginning of the third millennium has been characterized by a progressive increase in the demand for fossil fuels, which has caused a steep rise in oil price. At the same time, several environmental disasters have increased the sensitivity of world-wide public opinion towards the effect that environmental Pollution has on human health and climate change. These conditions have fostered a renewed interest in renewable energy like solar energy, wind energy, biomass and solid wastes. In addition, the disposal of municipal solid waste (MSW) has become a critical and costly problem. The traditional landfill method requires large amounts of land and contaminates air, water and soil [5].

Potential of MSW in India

India generates about 62 million tonnes of Municipal Solid Waste annually, out of which, 82% is being collected and the remaining 18% is littered; out of the total collected waste, only 28% is being treated and disposed. The rate of increase of MSW generated per capita is estimated at 1 to 1.33% annually [6]. The per capita generation rate of MSW in India ranges from 0.2 to 0.5 kg/ day.

Composition of Solid Waste in India

The municipal solid waste composition is influenced by many factors such as culture, economic development, and climate and energy sources. Although waste composition, usually provided by weight, impacts how often waste is collected and disposed off especially with regard to collection: organics and inert generally decreases in relative terms, while increasing paper and plastic increases overall waste volumes. Generally, low and middle-income cities have a high percentage of organic matter in the solid waste ranging from 40 to 60% of the total while paper (3 to 6%), earth material (30 to 40%) and plastic, glass, and metal fractions (< 1%) increases in the waste produced.

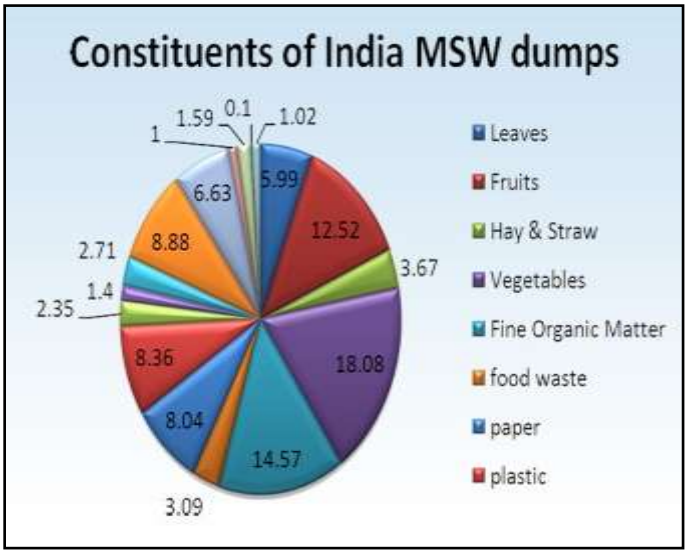

Figure 1: Composition of MSW in India

Jabalpur MSW Potential

In the year 2001, MSW (Municipal Solid Waste) generation rate in Jabalpur is 600 tons/day, which is increases 743 ton/day in the year 2017 [7]. On a yearly average basis solid waste generation increases at a rate of 14%. Greenhouse gases are produced from the degradation of wastes under anaerobic conditions through microbial activities. These waste disposal sites are considered as one of the most important anthropogenic sources of greenhouse gases, especially methane gas, which has a global warming potential 21 times that of carbon dioxide [8].

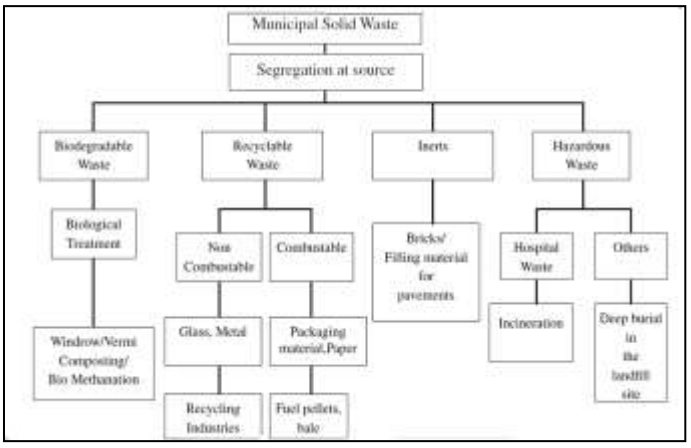

Figure 2: Schematic of solid waste segregation at source at Jabalpur

About our Jabalpur waste-to-energy plant

Essel Infraprojects Ltd. has been awarded the project of setting up 600 TPD Processing plant for converting MSW to Energy/Compost/RDF/Useful product at Jabalpur (M.P.) project on BOT basis with concession for 20 years for electricity generation of 11.5 MW, May 13, 2016.Essel Infra announces the successful commissioning of its flagship Waste to Energy plant in Jabalpur Essel Infra enters a new era of sustainable development with a first-of-its-kind Municipal Solid Waste (MSW) treatment plant in India [9]. This is a big achievement and a moment of great pride for the Essel Group as this plant is a testimony of not just our commitment to deliver sustainable solutions through innovation, but also India's vision towards contributing to environmental sustainability. The waste collected from secondary collection points is dumped in an unorganized manner at Ranital dumpsite in Jabalpur city area. The proposed Sanitary Land Fills (SLF) site is located at village Kathonda towards North West direction of Jabalpur city with a spread of over 24.60 hec with an investment of Rs. 750 lacks, the proposed Compost Plant will be designed to process 400 TPD (Tonnes per Day) of MSW with a progressive processing capacity of 800 TPD at the end of 20 years [10].

Materials and Methods

a) Collection and Transportation by the Jabalpur Municipal Corporation (JMC)

Jabalpur is one of the four major cities in Madhya Pradesh (India) with a population of approximately above 24 lacks

produces 2, 19,000 tons per annum and 600 tons per day of MSW. This waste is disposed by open dumping site at the Ranital dumping site MSW problem is a major concern in major cities Jabalpur. The organic fraction of solid waste composition comprised about 71%. The waste generation rate has increased from 0.23kg/capita/day in 2004-05 to 0.50 kg/capita/day (500 g/c/d) in 2016 indicating an increase rate of 3.8% per year. MSW is the waste generated in a community with the exception of industrial and agricultural wastes. Hence MSW includes residential waste (e.g., households), commercial (e.g., from stores, markets, shops, hotels etc), and institutional waste (e.g., schools, hospitals etc). Paper, paperboard, garden and food waste can be classified in a broad category known as organic or biodegradable waste [11]

In Jabalpur mostly MSW management, i.e. its collection, transportation, segregation and disposal, is done by the municipal agencies who work under the state government as per MSW management and handling rules, 2000 which is under the Environment Protection Act, 1986. And in some urban areas it is handled by the private agencies as well, such as non-governmental organizations (NGO's) [12]. But the management process is almost same, which is unscientific and chaotic as stated by.

The JMC is responsible for the collection of MSW in 8 zones. The JMC has 1700 workers employed to handle the MSW in these 8 zones, most of whom are street sweepers. The JMC's vehicles are coloured red, green and yellow. The tricycle used for door-to-door collection and the compactor can be seen in figure [13]. Door to door primary collection by engaging private sweepers. Waste is mostly collected through community bins/containers and road sweeping. Sweepers and sanitary workers engaged by the Jabalpur Municipal cooperation (JMC) sweep the streets. They accumulated the collected waste into small heaps and subsequently loaded manually or mechanically onto the community containers/bins or directly loaded onto the solid waste transportation vehicles for onward transportation to the disposal site. JMC presently utilizes the vehicles and equipment for transportation of solid waste.

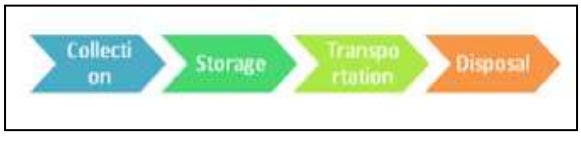

Fig: 3. MSW Methodology used in Jabalpur City

This project is a literature study targeting a feasibility analysis of MSW gasification plant in an Indian scenario. Lot of scientific articles were collected and studied, to come up with a technical, economical and legal feasibility study. The procedure to setup such plants was also studied and summarized in this project [14].

Every day the work of the municipal field staff starts at 5:00 am with the sweeping and cleaning of the streets and pavements and is completed till 7:30 am. All the sand and garbage is collected in a small hand cart and is disposed of in the nearest reinforced cement concrete (RCC) bin or metallic container [15].

The collection and transportation of waste are similar in all zones, regardless if it is the government or the private company who is responsible. Both of them need to follow the Municipal Solid Waste (M&H) Rules, 2000. The structure of the transportation and collection system is described in this section.

Conclusion

An extensive economic analysis of an MSW management option has been carried out to evaluate the feasibility of integrating RDF production to RDF-to-energy facilities under current MSW generation in Jabalpur (M.P.). The economic feasibility of RDF-to-energy plant has been investigated by carrying out a capacity analysis as well as evaluating energy generation and also reduces the environmental impact. Sensitivity analysis of total air emissions in environments. The analysis showed that, with technological option considered, up to 10 MW power plant has attractive return on investment.

Under this scenario, majority of MSW will still be disposed of in landfills. Hence, environmental benefit is not realized to the full. To gain considerable environmental, social and economic benefits such as reduction of need for new landfill sites, prolonged existing landfill sites, clean air and less underground contamination, lower chance of disease spreading, new business and employment for recycling, government subsidies for the RDF to-energy project may be offered. These can be in terms of subsidized credits, partial public funding, etc. considering its social relevance in the framework of government waste management policy.

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