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Sustainable Solid Waste Management Solutions for Asian Countries Using the Potential in Municipal Solid Waste of Indian Cities

Authors : S. H. Babu Gurucharan, Priyanka Kaushal

Abstract : Majority of the world's population is expected to live in the Asia and Pacific region by 2050 and thus their cities will generate the maximum waste. India, being the second populous country in the world, is an ideal case study to identify a solution for Asian countries. Waste minimisation and utilisation have always been part of the Indian culture. During rapid urbanisation, our society lost the art of waste minimisation and utilisation habits. Presently, Waste is not considered as a resource, thus wasting an opportunity to tap resources. The technologies in vogue are not suited for effective treatment of large quantities of generated solid waste, without impacting the environment and the population. If not treated efficiently, Waste can become a silent killer. The article is trying to highlight the Indian municipal solid waste scenario as a key indicator of Asian waste management and recommend sustainable waste management and suggest effective solutions to treat the Solid Waste. The methods followed during the research were to analyse the solid waste data on characteristics of solid waste generated in Indian cities, then evaluate the current technologies to identify the most suitable technology in Indian conditions with minimal environmental impact, interact with the technology technical teams, then generate a technical process specific to Indian conditions and further examining the environmental impact and advantages/ disadvantages of the suggested process. The most important finding from the study was the recognition that most of the current municipal waste treatment technologies being employed, operate sub-optimally in Indian conditions. Therefore, the study using the available data, generated heat and mass balance of processes to arrive at the final technical process, which was broadly divided into Waste processing, Waste Treatment, Power Generation, through various permutations and combinations at each stage to ensure that the process is techno-commercially viable in Indian conditions. Then environmental impact was arrived through secondary sources and a comparison of environmental impact of different technologies was tabulated. The major advantages of the suggested process are the effective use of waste for resource generation both in terms of maximised power output or conversion to eco-friendly products like biofuels or chemicals using advanced technologies, minimum environmental impact and the least landfill requirement. The major drawbacks are the capital, operations and maintenance costs. The existing technologies in use in Indian municipalities have their own limitations and the shortlisted technology is far superior to other technologies in vogue. Treatment of Municipal Solid Waste with an efficient green power generation is possible through a combination of suitable environment-friendly technologies. A combination of bio-reactors and plasma-based gasification technology is most suitable for Indian Waste and in turn for Asian waste conditions.

Keywords : calorific value, gas fermentation, landfill, municipal solid waste, plasma gasification, syngas
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