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Review on Solid Waste Management and Treatment Technology

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Abstract

Solid waste management is increasingly critical in safeguarding public health, the environment, and natural resources. Contaminated food, water, soil, and air from various environmental matrices pose health risks, highlighting waste as a significant topic on the European Environment and Health Agenda. Managing and disposing of hazardous waste is a global concern, with anthropogenic sources such as industrial operations and domestic and agricultural waste contaminating numerous natural resources. Public concern over the environmental impact of solid waste pollution has grown, prompting the use of various standard solid waste treatment methods. These include chemical incineration, waste compaction, biogas generation, composting, and vermicomposting. However, these methods face several limitations, primarily the high operational costs. Despite these challenges, aerobic treatment stands out as the most effective method for disposing of medical waste because it eliminates infectious organisms. Every type of solid waste poses significant risks to human health, facilitating the spread of infectious diseases. As such, effective solid waste management is essential to mitigate these risks. Addressing the high costs and improving the efficiency of waste treatment methods are crucial steps towards better protecting public health and the environment. Enhanced public awareness and global cooperation are necessary to develop sustainable and affordable solutions for solid waste management.

Keywords: Hazardous waste, solid waste, industrial waste, inventorization, toxic

INTRODUCTION

Varying nations utilize varying definitions of "hazardous" waste, which broadly refers to non-household waste containing hazardous chemicals. In our search literature. The terms "hazardous," "toxic," and "industrial" trash were used, but the papers on municipal dumps were left out which do not keep track of the disposal of radioactive waste, e-waste, hazardous items, or incinerators. This review does not contain any studies on occupation.Waste and humans and other species have a long history together. It is unavoidable and comes from a variety of sources, including agricultural crop leftovers, the production of food and how it moves up the food chain, and industry and their operations. It is unavoidable and comes from a variety of sources, including agricultural crop leftovers, the production of food and how it moves up the food chain, and industry and their operations. One of the main concerns for the Member States of the World Health Organization's (WHO) Regional Office for Europe is trash, and in particular hazardous waste, which was on the agenda of the Sixth Ministerial Conference on Environment and Health. Waste that is either disposed of or constitutes a risk to human life or health is classified as hazardous waste. The effect of hazardous waste depends on its size, composition physical, chemical, or biological characteristics. Hazardous waste impact on human health inadequate storage, handling, processing, treatment and disposal of hazardous waste may affect human health and the environment by releasing contaminants into groundwater, soil, and

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atmosphere. The population may be adversely affected if toxic waste is absorbed through contaminated water supplies and polluted air and soil pollution and may eventually enter the human food chain either directly or indirectly by agriculture. Exposure to hazardous waste can cause a number of health issues, including skin irritation, impairment and disease, breathing problems, cancer, hormonal disruption of the nervous system, liver damage mental retardation, weight loss etc depending on the type of waste to which it is exposed, Lead: This affects the central nervous system of humans. It is a toxin caused by ingestion and is mildly annoying. Common air pollutant due to substandard fuel used in the automobile industry, petrol: and the atmosphere near to industrial facilities where steps are not taken. Due to the solid waste particles can cause respiratory problems in people who are nearby and can also lead to chronic lung diseases such as asthma. In addition, climate change by absorbing sunlight and contributing to global warming. Solid waste management also affects the quality of water [1-3].

India has produced a staggering amount of solid waste as a result of its fast growing population, urbanization, and changing consumption patterns. Based on the Ministry of Housing and Urban Affairs' January 2020 Swachhata Sandesh Newsletter, 84,475 wards in India produce tons of solid garbage every day. Figure 1.

Status of Solid Waste in India

India produces 62 million tons of waste annually, of which 70 million are collected, 12 million are processed, and 31 million are dumped in landfills. The rapid economic growth and changing consumption patterns are expected to result in the generation of 165 million tons of municipal solid waste by 2030. The Central Pollution Board (CPCB) estimates that 160,000 metric tons of solid garbage are produced nationwide each day (TPD). 153,000 TPD of waste are collected at a 96% collection efficiency, meaning that 96% of the waste produced goes unaccounted for. The generation of solid waste per capita has slightly increased from 119.7 gm/day in 2020–21. Delhi produces the highest amount of solid trash produced per person.[4].

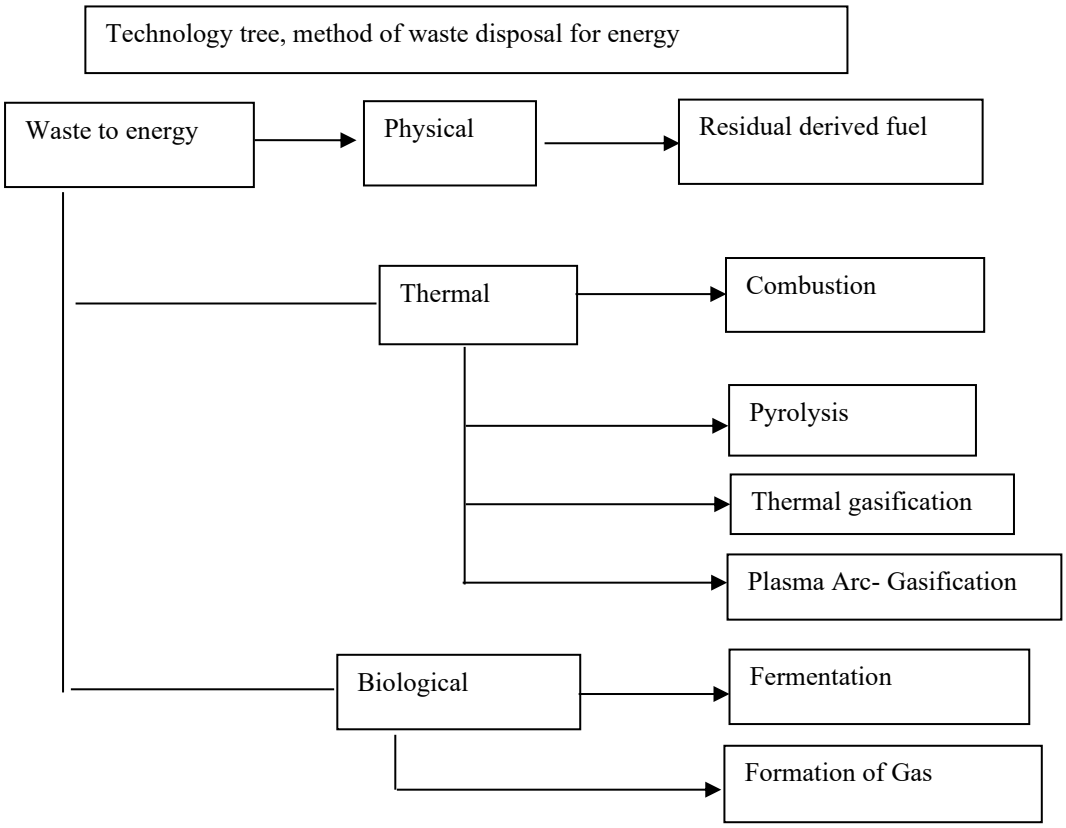

Figure 1. Technology tree, method of waste disposal for energy.

Processing of Solid Waste

Chhattisgarh treats all of its solid waste (100%) followed by 89% in Daman and Diu, 87% in Goa, and Dadra and Nagar Haveli (DDDNH). A World Bank report states that every year, 2.01 billion tons of municipal solid garbage are produced worldwide, at least thirty-three percent of which are not managed in a way that is safe for the environment.

Challenges in solid waste management in India

Growing Waste creation: Consumption of waste creation rises in response to economic growth. The production of e-waste will multiply as the digital economy grows. Furthermore, the population's rapid growth will increase trash. India is expected to produce 165 million tons by 2030, according to a 2014 Planning Commission report (60 million tons annually in 2020).

Scientific Waste Management

Planning for waste management needs to be based on trustworthy engineering and scientific research. garbage composition, initial and ongoing operational expenses, transportation distances, and the locations of facilities for processing and disposing of garbage should all be taken into account. Planning for solid waste management requires precise data, which can only be obtained through thorough waste characterisation investigations.

Energy Recovery Technologies of Gasification

The definition of gasification is a thermal reaction in which there is not enough oxygen present for all hydrocarbons to react to produce CO2 and H2O. This partial oxidation process yields a composite gas that is mostly made up of carbon monoxide and hydrogen. Steam, pure oxygen, or air can all be used as oxidants. The temperature range for gasification is 700–1600 0C. To encourage CO and H2, steam is fed into the gasification reactor.

The main reaction takes place during gasification are

Oxidation: $C + O_2 \rightarrow CO_2$ (exothermic)

Water evaporation reaction: $C + H_2O \rightarrow CO + H_2$ (endothermic)

$CO + H_2O \rightarrow CO_2 + CO_2$

$C + 2H_2 \rightarrow 2CO$

CH_4 formation reaction: $C + 2H_2 \rightarrow CH_4$ (exothermic)

SOLID WASTE TREATMENT TECHNIQUES

Chemical Incineration or Combustion

To put it simply, waste incineration means burning trash. The process of incineration, often known as thermal treatment in the industry. It entails burning solid waste under strict control at very high temperatures. With this process, waste volume is reduced by over 90% while waste volume is generated and energy is produced through burning. Proper air pollution control systems are vital to lowering the amount of hazardous emissions into the environment. generating bottom ash as well, which is an inert residue made of metal, glass, and other solid materials. The gaseous byproducts of incomplete combustion and fly ash, a finely broken-up particulate matter, are carried by the incinerator airstream. Soot, dust, and cinders make up fly ash. To prevent fly ash and gaseous byproducts from entering the atmosphere, contemporary incinerators need to be equipped with comprehensive emission control systems.

Composting

The biological process of composting involves allowing the organic component of municipal solid waste to break down under strictly controlled conditions. Microbes digest organic waste, reducing its volume by as much as fifty percent [5-7].

Sludge from sewage systems and trash can both be processed and recycled in one step using composting. It is anticipated to gain popularity as the use of solid-waste incineration and disposal alternatives is restricted by more stringent environmental rules and site limitations. Phases of the process include waste digestion, size reduction, and sorting and separating.

Sanitary Land Filling

According to the United Nations Environmental Program (UNEP), sanitary landfilling is the managed disposal of waste on land so that waste-environment contact is minimized, waste concentration occurs in a well-defined area, and waste is significantly reduced.

Waste Compacting

It is the trash's size reduction and compacting. Compressed waste should be collected by garbage compactor trucks and waste collection trucks. Compress waste to make it fit into a smaller place with higher capacity. Waste is compacted again, but more firmly, to protect precious airspace and lengthen the landfill's life.

Vermicomposition

Comparing this procedure to ordinary composting, it reduces organic waste more quickly. This method breaks down organic waste by using both the action of bacteria and earthworms. Vermicomposting is a technique that breaks down trash by biological decomposition in an aerobic atmosphere to produce stabilized organic fertilizer, much like traditional composting. Vermicomposting, on the other hand, involves both earthworms and microorganisms, which works to biodegrade organic waste more quickly than composting. With a low C:N ratio, this method yields fertilizer and soil conditioner with good porosity, water-holding capacity, and nutritional status.[8]

CONCLUSION

Domestic and Household Treatment

The management of solid waste is a crucial procedure for safeguarding both the environment and public health. Household solid waste management is strongly tied to daily living and is a major public health concern among community members worldwide. Solid waste management at home includes waste material collection, transportation, processing, recycling, disposal, and monitoring. Waste may be easily separated in your home. For garbage identification and segregation, color-coded bins in shades of green, blue, and yellow can be used. Food scraps and garden debris should be separated from other organic and biodegradable rubbish in the green. Composting is one use for the organic waste.

Factory waste treatment

Physical treatment refers to procedures that could alter the waste's dimensions or form. By contrast, biological treatments use organisms to break down waste components into simpler organic matter and biomass, whereas chemical treatments use chemicals to change the content of the waste. Because factory waste contains chemicals and toxic acids that could harm aquatic life and pollute water, it should be processed before being disposed away.

Technology is employed by smart waste management systems to enhance the effectiveness, durability, and eco-friendliness of the waste management procedure. The internet of things (IOT) is used by a lot of this new, cutting-edge waste management technologies to help increase sustainability and streamline rubbish collection. For instance, several companies in the waste management sector currently use smart garbage bins to schedule collections and track trash levels in real-time to increase productivity.

Several forward-thinking businesses are developing novel waste management technologies and systems with the express goal of creating a more sustainable waste management sector.

Eg: Pello

This innovative technology was created to assist companies in lessening their environmental effect and improving the efficiency of their waste collecting operations. Pello provides a range of solutions to help companies accomplish these goals. First of all, the Pello system keeps track of the amount of waste in your trash cans and gives you up-to-date information on the position and contents of the dumpsters. It also notifies you when a collection is due and lets you know if your container has been confined.

Even like that many more innovative techniques are use eg: Recycling Robots, Pneumatic waste pipes, Solar powered trash compactors, E-waste kiosks etc [9,10].

Technology plays a major role in recycling and trash management. When used properly, it can assist us in recycling more of our roadways and reusing outdated technology. Future technological developments should have an even bigger influence on recycling rates and effectiveness, making the world a greener and healthier place for all of us.

LITERATURE CITED: REFERENCES

1. Sharma, S,Shah, K.W.2005' "Generation and disposal of solid waste in Hoshangabad". In: Book of Proceeding of the Second International Congress of Chemistry and Environment, Indore, India, 749-751
2. Shekdar, A.V, 1999. Municipal Solid Waste Management-the Indian perspective, Journal of Indian Association for Environmental Management 26 (2): 100-108
3. Studies on Environmental Quality in and around Municipal Solid Waste Dumpsite. Arun K. Biswas, Sunil Kumar, S.Sateesh Babu, J.K. Bhattacharya, Tapan Chakrabati. 2,Kolkata, Nagour, Resources, Conservation and Recycling,2010,vol55.
4. Cooper, P.F.(2001). Historical aspects of wastewater treatment. In Decentralized sanitation and reuse concepts, system and Implementation. Eds, Lens P., Zeeman G.,Lettinga. IWA Publishing. London.pp. 11-38.
5. Day,D.(1996). How Australian social policy neglects environments. Australian Journal of Soil and Water Conservation. : 3-9.
6. Denny, P.(1997). Implementation of constructed wetlands in developing countries. Water Science and Technology.35:27-34.
7. Sharma, S, Shaj, K, W,"Generation and disposal of solid waste in Hoshangabad". In book of Proceedings of the Second International Congress of Chemistry and Environment, India, pp. 749-751, 2005.
8. Vikash Talyan, R,P,. Dahiya a,T,R. Sreekrishnan, "State of municipal solid waste management in Delhi, the capital of India:, Waste Management 28(2008)1276-1287
9. Abas, M.A, & Wee, S.T.(2014).The issues of policy implementation on solid waste management in Malasia. International Journal of Conception on Management and Social Science, 2(3),12-17.S
10. Barbarino, S., et al., Wing shape control through an SMA-based device. Journal of Intelligent Material Systems and Structures, 2009. 20(3): p. 283-296.

