7th National Conference on
"Role of Engineers in Nation Building" organized by VIVA Institute of Technology, Mumbai
(1st and 2nd March 2019)
International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

Review Paper on Decomposition of Organic Waste

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Abstract— *Municipal solid waste management is one of the major environmental problems of most developing countries & developed countries, though the scale of the problem differs from country to another country. Due to the population growth and flow of migration towards cities and from one country to another leads to increase in problems on earth. The accumulation of the solid organic waste are reaching to the critical levels all over the world. These organic waste need to be managed in the sustainable way which did not cause depletion of natural resources. Organic waste creates pollution in our surrounding and thus when naturally it tries to decompose, it takes longer duration. Almost 66% of organic waste is not used in our country. India alone generate across 150 million tones solid waste per day. Mumbai is 2nd highest city which produces 2.7millions tones per year. This paper reviews the different methods of decomposition and describe the suitable method.*

Keywords— Compost, Humidity & temperature sensor, Organic waste, aerobic digestion.

I. INTRODUCTION

'Swachh Bharat Abhiyaan' is a national campaign initiated by Government of India, which covers 4,041 cities and towns, to clean the streets, roads and infrastructure of the country. The main motto is to create a sustainable development and create awareness about the impacts of improper waste disposal .In a country, 300 to 400 grams of solid waste per person per day is generated in a town of normal size. In cities like Delhi and Mumbai, the figure is almost 500 to 800 grams per person per day. Waste management and its disposal is day by day becoming a massive and expensive problem to the authorities especially in cities where concrete jungle is increasing rapidly. When the waste is improperly dumped and is left to accumulate, it causes a serious health hazard affecting all forms of terrestrial, aquatic animals and human beings. Various toxic wastes are released from industries in the form of solid, liquid and gas which may be hazardous to humans, plants and various unicellular and multicellular species. Serious health issues such as cancer, reproduction problems, mental and physical disorders are caused due to such toxic elements. People living in the nearby vicinity of dumping grounds are at a risk of infectious diseases. As the accumulated heaps produce an unpleasant odor leading to severe problems which have abundant effects on nature. People working in such conditions are at a mere risk of getting infected also it leads to contamination of water leading to water prone diseases. Due to the improper disposal of waste many diseases like stomach infections, typhoid, malaria, vomiting and diarrhea, cholera as well as skin diseases and many other respiratory infections too.

In a country, organic waste constitutes almost 35% of the total waste, disposing of at least the household organic waste at source, can create a positive impact in the domain of waste disposal. If this disposal is reused efficiently, can prove to be a useful material. This project focuses mainly on improving the drawbacks of the existing scenario. Currently, problems are encountered when potential customers are shut out of the composting technologies owing to expensive, space consuming and complicated methods of composting solutions offered by large vessel capacity organic composters as opposed to what is normally required by a domestic household. The six to eight month natural composting process poses problems due to the consumption of time for composting and maintenance of the composting process. Our project aims at reducing the level of garbage thereby using organic waste in a precised manner.

II. RELATED WORK

2.1 Home Composter:

The process of composting organic waste by the means of in-vessel composting, wherein fertilizer in the form of compost may be prepared, and undesirable organic kitchen waste, including food waste can be conveniently disposed of. Composting is the controlled aerobic biological decomposition of organic matter into stable, humus like product called compost. It is fundamentally

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the same process as natural decomposition except that it is enhanced and accelerated by mixing organic waste with other ingredients to optimize microbial growth. The vessel capacity for the home composter is calculated against the highest value of waste contained within a single composting chamber. The density of compost is taken as 581.8 kg/cubic meter. Maximum vessel capacity required is 20 L per composting chamber.

Parameters	Remarks
Temperature	40-70°C
Aeration	Regular agitation
Inoculum Used	Bioculum

Figure 1

Sampling of waste generated in a household was carried out to obtain the waste input expected for the proposed Home Composter. Table 2 presents the data for the same.

Day	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Waste Generated (in grams)	820	780	695	830	805	850	868

Figure 2

2.2 Automation of smart waste management using IoT to support "Swatch Bharat Abhiyan":

The main motto of this application is collection of dry and wet waste separately which placed in a conveyor belt on which the dry waste collected dustbins are placed left side and wet waste collected bins on right side [2].

2.3 An automated waste composting system for public areas:

In this paper the author design a prototype for composting an aluminium can by a mechatronic machine. For automation purpose they used an infrared sensor to detect can and level of collector and it is controlled using Arduino. They design their prototype specially for aluminium cans. The results show that they compress the size of can by 70.1 [3].

2.4 Aerobic digestion

Aerobic process is the process that relies on microorganisms that thrive under aerobic conditions i.e. where plentiful of oxygen is available and a sufficient amount of food is present [4].

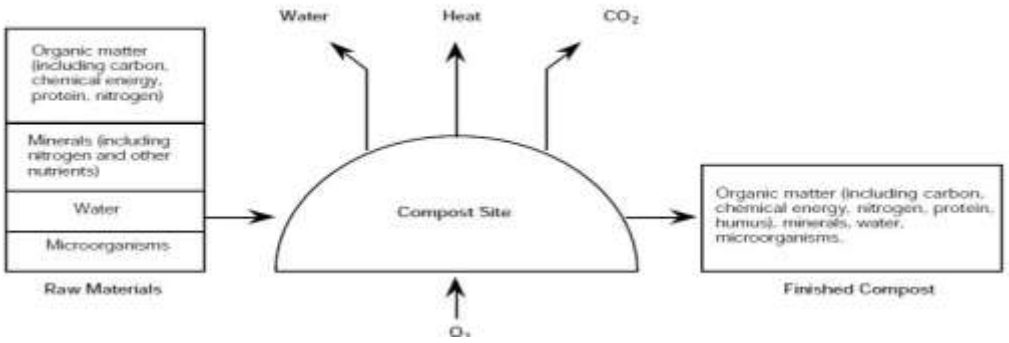

Figure 3

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2.5 Anaerobic digestion

Anaerobic digestion is a series of biological processes in which microorganisms break down biodegradable material into smaller pieces in absence of oxygen. In anaerobic digestion bacteria break down organic matter producing methane and carbon dioxide. It includes the processes such as hydrolysis, acidogenesis, acetogenesis, methanogenesis [5].

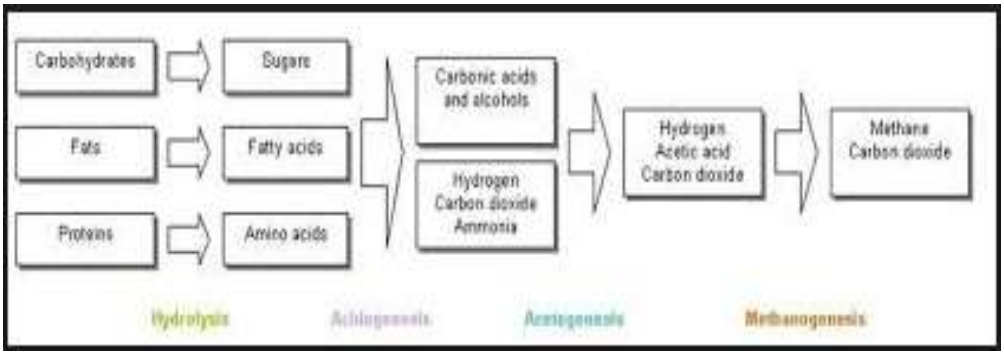

Figure 4

2.6 Advantages of aerobic method over anaerobic method

The main advantage of aerobic digestion is the rate of reaction is faster than anaerobic digestion, the capital costs of aerobic digestion are lower. The process is done at ambient temperature and the process is less complex than anaerobic digestion and is easier to manage. This operation is relatively easy as compared to anaerobic. Supernatant BOD concentration are lower than that of anaerobic digestion. The compost obtained by this process is free of odor than that obtained by anaerobic digestion.

III. RESULT AND DISCUSSION

This paper describes the various processes related to decomposition of organic waste such as anaerobic and aerobic digestion. This paper also includes heating procedures viz. mesophilic and thermophilic. In mesophilic process organic waste is break down by the bacteria at range of temperature 35-38 degree C. It is most common system which has more stable operation but lower biogas production. On the other hand, thermophilic digestion is a process in which temperature range is 50-65 degree C. The development of thermophilic digestion process is based on the facts that higher temperature minimize pathogens and also thermophilic temperatures provide more rapid reaction rates than mesophilic temperatures.

The advantages of thermophilic digestion are as follows:

- Increased volatile solids reduction
- Faster reaction rates
- Higher capacity for given volume

IV. CONCLUSION

This paper concludes that by using this model we can decrease the area required for dumping grounds. The composts generated by this model can be used for domestic purpose as well as farming purpose if made on a large scale. There are various benefits of this model & one of it is the use of dustbins can be decreased. This method lowers the ultimate waste disposal needs & reduces the consumption of natural resources. There are many methods to reduce the problems caused by organic waste. The methods which are applied are anaerobic and aerobic digestion. The anaerobic digestion is the process which is carried out in limited supply of oxygen and aerobic digestion is the process which is carried out in presence of oxygen. The aerobic digestion is most reliable and preferred method. The recent study indicates that aerobic digestion could be a best option to convert solid organic

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waste into useful products such as biogas, compost & other energy rich compounds. The main aim is to reduce the level of organic waste, to reduce the diseases caused by it & to make useful compost of it which can be used for domestic purpose.

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