



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: V Month of publication: May 2019

DOI: <https://doi.org/10.22214/ijraset.2019.5254>

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Design & Fabrication of Portable Waste Shredder Machine for Domestic Compost

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Abstract: Waste is an unavoidable by product of human activities. Economic development, urbanization and improving living standards in cities, have led to an increase in the quantity and complexity of generated waste. Rapid growth of population and industrialization degrades the urban environment and places serious stress on natural resources. Municipal corporations of the developing countries are not able to handle increasing quantities of waste, which results in uncollected waste on roads and in other public places. Proper waste disposal is critical due to the fact that certain types of wastes can be hazardous and can contaminate the environment if not handled properly. Tons of biodegradable waste is produced annually. These types of waste also have the potential to cause disease or get into water supplies. With the rise in amount of biodegradable waste and increasing pollution levels, it is becoming essential to find the solution of this problem. The waste needs to be disposed in order to have a healthy environment.

I. INTRODUCTION

Health-care waste management in India is receiving greater attention due to recent regulations (the Biomedical Wastes (Management & Handling) Rules, 1998). As looking upon the problem faced by us there is a need to work towards a sustainable waste management system, which requires environmental, institutional, financial, economic and social sustainability. Garbage disposal unit is one of them, which is used for disposing the biodegradable waste. Our aim is to use this technology to overcome the bad effects on environment due to this waste and utilize it in a meaningful way.

Garbage waste disposers are used to comminute food scraps into particles small enough to safely pass through household drain plumbing. A conventional disposer includes a food conveying section, a motor section, and a grinding mechanism disposed between the food conveying section and the motor section.

The biodegradable waste disposer provides assistance in the direction of waste decomposition. The unit provides various advantages as compared to the currently used decomposition methods. The unit is easy to install as well as easy to operate. It does not require any skill for the decomposition of the waste so even an illiterate person can operate it. One of the major benefits of this unit is that there is no need to accumulate a waste at a particular place and transfer it to the plant where it is decomposed so that the use of dumping sites reduces. The motivation for this project came into mind as we look around in our society. The waste of the university and our society is not disposed properly. The management of Municipal Corporation fails to dispose waste in an efficient way. Like any other educational institute, colonies, firms and societies our university produces a large amount of biodegradable waste including residual food from mess and canteen, residuals of vegetables and leaves. This waste is not disposed properly and causes foul smell and various diseases. Thus this waste needs to be disposed so the idea of making a waste disposer is generated.



Figure-1 Biodegradable waste

II. LITERATURE

Food wastage is an alarming issue in India. It is estimated that annually about 0-33 million tons of waste are generated in India. According to a statistic, INDIANS waste as much food as the whole of United Kingdom consumes. According to the United Nations Development Programme, up to 40% of the food produced in India is wasted.

According to a survey by Bhook (an organization working towards reducing hunger) in 2013, 20 crore Indians sleep hungry on any given night. About 7 million children died in 2012 because of hunger/malnutrition. Acres of land are deforested to grow food. Approximately 45% of India's land is degraded primarily due to deforestation, unsustainable agricultural practices, and excessive groundwater extraction to meet the food demand.

The landfilled dumping of the food waste produce methane gas. Methane gas is greenhouse gas. It is 25 times more dangerous than carbon Dioxide. According to a survey 1 kg of waste food produce approximate 4 kg of methane gas.

Food scraps range from 10% to 20% of household waste and are a problematic component of municipal waste, creating public health, sanitation and environmental problems at each step, beginning with internal storage and followed by truck-based collection. Burned in waste-to-energy facilities, the high water-content of food scraps means that their heating and burning consumes more energy than it generates; buried in landfills, food scraps decompose and generate methane gas; a greenhouse gas which contributes to climate change.

III. PROBLEM FORMULATION AND METHODOLOGY

Now a days the problem is not about finding the right technology for waste disposal, the problem is how to integrate the technology with the system of house hold level segregation so that the waste does not ends up in landfills, but is processed and reuse. It is clear that there will be no value for waste, as energy or material, if it is not segregated .but this is where our waste management system stop short Globally millions of tons of household solid waste are generated everyday household waste management is drawing increasing attention, as it can easily be observed that too much garbage is lying uncollected in the streets causing inconvenience environmental pollution and posing a public health risk the present garbage disposal plant of large capacity these garbage disposal plant include large processes to segregate the waste this process involve collection of waste ,transportation of waste, separation of different type of waste ,segregating then storing the segregating waste and the conventional garbage disposal processes are costly and labor cost is also to high.

The basic aim is to manage the labor cost, daily transportation cost of garbage disposal efficiently. Since it is small size under sink garbage disposal so it requires less space to be installed and it also reduces the meshing up of various household waste the bio degradable waste is directly converted into the compost which can further be used as manure or alternatively it can also be used for the bio gas production.

First step of is to design and calculations for the required prototype. In the very first step process layout is designed. It includes how the whole project is to be established. The whole plant includes the source, reservoir, disposal unit, pulp storage tank. It includes the flow

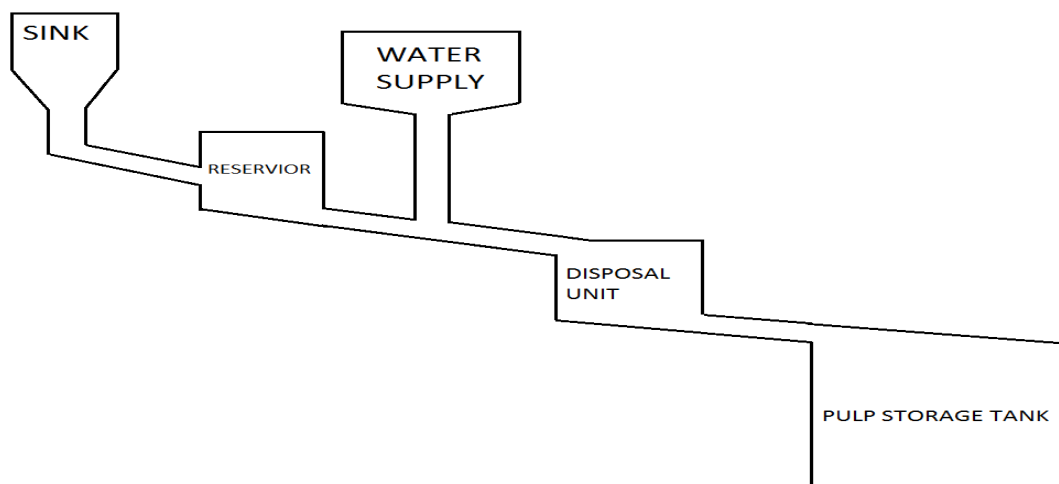


Figure-2 Process layout

The general flow of the waste follows the following route:

- 1) The waste is thrown in the sink or a unit to store waste.
- 2) It is transfer to reservoir, which is close to dispose unit, where waste is store just before it send to disposer unit.
- 3) From reservoir waste along with water is send into the dispose unit for operation.
- 4) After that the fine particle of waste from unit goes to pulp storage tank for composting. There it remain for certain period of time so that it convert into manure.

A. Fabrication Of Waste Shredder

Shredder for domestic waste has been fabricated after the calculation of waste produced in the mess for two days in three meals.

S. No	Days	Breakfast (kg)	Lunch (kg)	Dinner (kg)
1.	Day-1	05	28	25
2.	Day-2	09	13	12

Basic structure for supporting this model is made of cast iron because cast iron has a good compressive strength. The frame is welded together to make a rigid structure. After that other components are welded on the frame with the help of arc welding. The shredder includes a food conveying section, a motor section, and a grinding mechanism disposed between the food conveying section and the motor section. The food conveying section includes a housing that forms an inlet for receiving food waste and water. The food conveying section conveys the food waste to the grinding mechanism, and the motor section includes a motor imparting rotational movement to a motor shaft to operate the grinding mechanism.



Figure-3 Final Prototype

- 1) *Advantages:* The benefits that garbage waste disposer offers are
- a) The disposal helps to get a clean house and kitchen. This also ensures the hygiene of the kitchen and the food that was made in the kitchen.
 - b) Garbage disposals are eco-friendly devices.
 - c) Waste is converted into fine particles results in fast conversion of waste into manure.
 - d) Compact in size so it can be installed even under the sink.
 - e) Lesser handling of food scrap.
 - f) The setup for waste disposer is less expensive and parts are available easily.
 - g) This model is equipped with a hopper type inlet, which means that you are not left with a wide hole for foreign objects to fall into or small hands to grab.
 - h) For individuals and families who have only a small amount of waste to dispose off, this is the most efficient option.



- i) For households with a large amount of food waste, a continuous feed garbage disposal is this best option. We won't have to wait until the chamber is completely full to run it.
- j) This model is ideal for those who like to clean their kitchen as they work. Waste can simply be thrown into the disposal.
- k) By investing in a sink food disposer, we can reduce the amount of trash that we leave on the curb for pickup. This means that less trash will be buried in our town's local landfill. Conserving landfill space is a national concern, and it is one of multiple reasons why recycling is so important.

IV. CONCLUSIONS

While some argue that composting food scraps is a superior solution to both disposers and landfills, it is not always a practical one, particularly for people who live in urban areas. It also presents challenges to anyone during the cold weather seasons. And in practice, cities that have tried to mandate separating organic food waste from other waste so that it can be collected and composted have not been able to enforce participation in that program.

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