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DESIGN OF COMPOST MAKING MACHIINE

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Abstract - *Every day urban cities generate more and more waste and this overburdens our municipal systems, and systematic waste management is a big problem. Composting is a well-known and easy process for managing organic waste. It is a self-heating biotransformation, which generates desired end products such as substrates for growing crops in agriculture, biogas and fertilizers. Proper maintenance of temperature and humidity in the pulverized organic waste will increase the bio-degradation process. The compost produced by this bio-degradation process is rich in nutrients and also in less time farmer will get good quality manure at low cost. The study was conducted to evaluate the performance of the compost machine. Proper management of temperature and humidity is important. The goal is to reduce unscientific backfill, separate waste and increase the quality of compost or manure.*

Key Words: Compost, Manure, Agriculture, organic waste, shredding.

1. INTRODUCTION

In India especially in rural areas, waste poses a serious threat to sanitation and hygiene concern [1]. Although the form of waste generated in rural areas is mostly organic and biodegradable but it has become a major problem for sustaining the ecological balance in general while people, animals and the environment benefit from biodegradation, it may cause some problems [2]. Too much biodegradable waste in the water supply can deplete the oxygen. Additionally, some types of biodegradable waste, such as livestock manure, can pose health and environmental concerns if too much of it is produced [3]. Biodegradable waste in landfills around the world is the main factor in generating methane from greenhouse gases [4].

The solution to this problem is to recycle biodegradable waste to produce a nutrient rich compost or organic fertilizers [2][4]. The biodegradable waste can be recycled either via composting or anaerobic digestion (AD). Composting is considered as more efficient method of recycling biodegradable waste because it provides a rich growing medium, or a porous absorbent material that holds moisture and soluble materials which provides strength and nutrients to plants. It also helps in soil conditioning. A healthier plant can be obtained as the soil is enriched by the organic compost. It can be used in dressing lawns, gardens, kitchen garden, vegetable garden, trees and shrubs, house plants, farm fields etc...[5][6] Composting is more suitable for fibrous materials. While biodegradable wastes like food, garden waste, paper and cardboard, you can send it to be recycled into compost [7]. The properties such as porosity, water holding capacity, pH, Carbon: Nitrogen ratio depends upon the proportion a physical existence. [8] The cleaner the waste you send for composting, the higher the quality of the compost and the more benefits it will have for the environment [8][9]. For good quality compost the garbage has to be separated at early stage. The metal content can be increased if sewage sludge is added into the compost. This high quality compost is used in horticulture and agriculture [7].

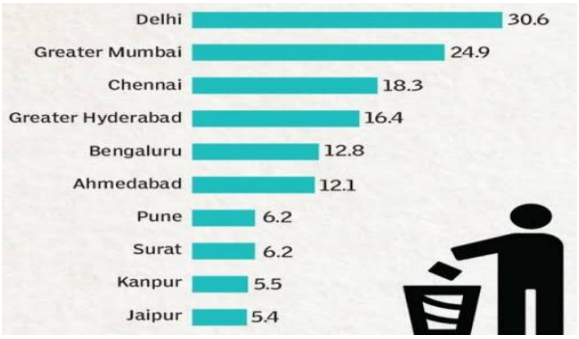

Fig 1. Annual waste generation in Indian cities

2. OBJECTIVES

The biodegradable waste is recycled to recover materials for one or more purposes and to stabilize the organic part of the remaining waste.

1. Selection and recovery of dry materials to send for recycling.
2. Recovering a "fertilizer-like" material suitable for agriculture.
3. Study the various factors in the composting process.
4. Increase the lower heating value of the waste to recover the waste derived fuel.
5. Make the machine as energy efficient as possible.
6. Increasing public awareness of organic waste and how to deal with it.
7. Study the effect of bacteria on fertilization.
8. Disposal of pre-treated and bio available waste in landfills with lower environmental impacts in the short term (less attractive to rodents, birds, insects, etc.) and in the long term (less GHG and production in landfills).

3. METHODOLOGY

1. The composting machine consists of a cylindrical composting drum made of mild steel,

2. Raw wastes and additives are feed from outside through the cylindrical housing into the compost drum.

3. The cylindrical composting drum is placed on a tray, in which water is poured.

4. This tray contains a heating coil installed beside the composting drum.

5. Heat is produced by an electrically controlled heating coil and regulated by a thermostat. A constant temperature of 70 degree is maintained for 24 hrs.

6. Which heats the water in the tray, along with the air coming from outside through an opening created in the composting drum.

7. Thus the heat is transferred into the drum by means of the customary heat transfer, by this process the waste to be composted achieves slow drying.

8. A shaft with a diameter of 12 mm passes through the center of the compost drum horizontally and runs through the length of the compost drum inside.

9. This shaft acts as a mesher, which performs the task of crushing the waste on the inner walls of the composting drum. This mesher is driven by a 0.5 HP gear motor with an average output speed of 25 rpm.

10. At the same time, low-temperature crushing, mixing and adding (drying) processes take place over a period of time to achieve the desired result.

11. The compost obtained was reduced to 70-80% of the initial amount of organic waste

4. 3D DESIGN

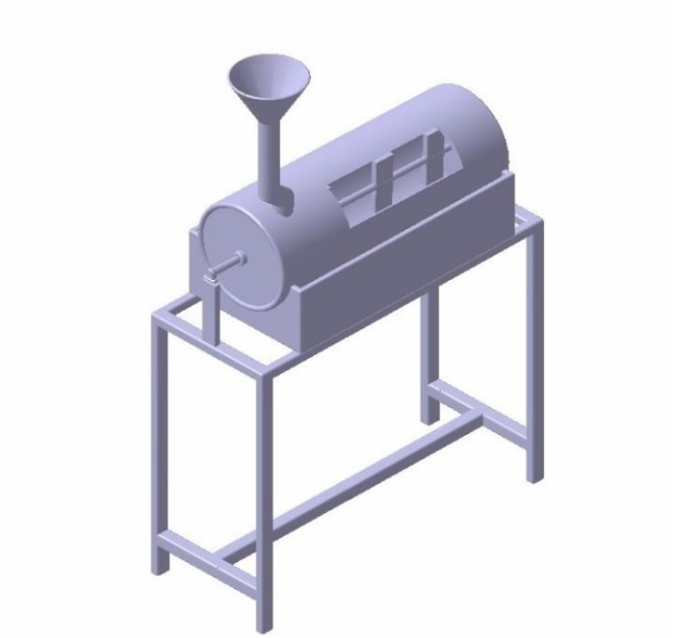

Fig 2. Isometric view of Compost making machine

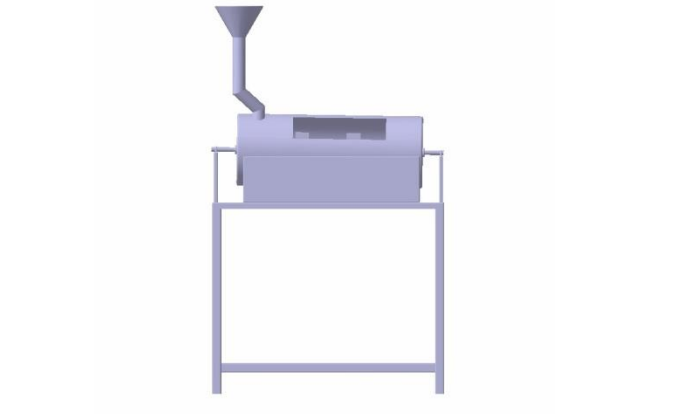

Fig 3. Front view of Compost making machine

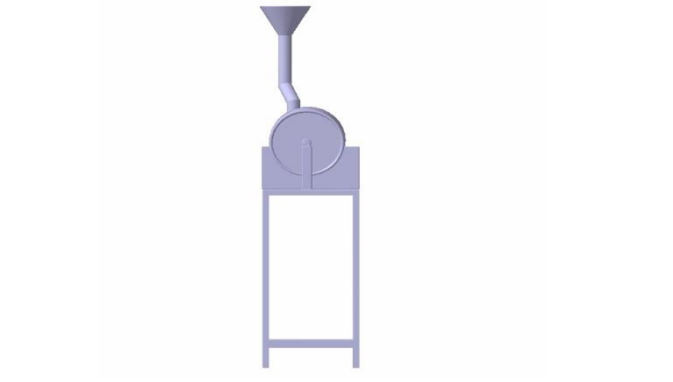

Fig 4. Side view of Compost making machine

5. TESTING AND RESULTS

5.1 Raw wastes used in sample :

Fruit peels: 1000g

Vegetable waste: 1000g

Tree leaves: 500g

Cow manure: 500g

Red soil: 500g

Additives: 50+50= 100g

Total time taken: 24hours

The obtained compost sample is tested and analyzed by KIDAO LABORATRIES, MOGAPPAIR, CHENNAI-600050

NITROGEN (kg/ha)	4357.79
ORGANIC CARBON (%)	4.89
pH	6.62
PHOSPHOURS (kg/ha)	1421.86
POTASSIUM (kg/ha)	1908.2
CALCIUM (kg/ha)	1.18

Table 1. Tested results of the compost sample

5.2 Plant samples:

The obtained compost samples are tested with tomato plant and their growth is monitored. The results are as follow:

Fig 5. Result of Day 10

Fig 6. Result of Day 20

6. FUTURE ENCHANCEMENT

1. Installing a chopper on the inlet port. So the wastes can be chopped automatically.
2. There is a strong need to do work on non-cultivable microorganisms and besides composting, agricultural waste can be used as a useful resource for producing animal feed, bio fuels and enzymes to generate additional income from the biotransformation process.
3. Taking into account the different agro-climatic zones, technologies are needed to suit the requirements of local farmers to produce high-quality compost.

7. CONCLUSION

The composting machine helps to optimize the composting process and reduce the cost required for waste degradation, separation and transportation etc. Flexibility is increased and the total volume of organic waste is reduced. The quality of the compost also depends on factors like moisture content, pH, temperature, time, etc.

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