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Conversion of Solid Organic Kitchen Waste into Useful Compost

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Abstract - *India is the second most populated country in the world with a population of about 130 crores and this population is expected to grow with time. With the growing population, the waste is also produced increasingly day by day. On an average, a household produces about 1.5 kilo grams of solid waste per day out of which about one-third is organic. This organic waste can be utilized for the betterment of soil in the form of compost which shall benefit plants and trees in a household. However, almost every composting process initially requires solid organic waste to be converted into smaller particles. This paper discusses the fabrication of a machine by which organic waste generated in a household kitchen can directly be converted into pulverized form (smaller particles).*

***Key Words*: Solid waste, Organic, Compost, Household, Pulverize**

1.INTRODUCTION

As the population is increasing rapidly in India, it is causing high rate of generation of Municipal Solid Waste (MSW). Municipal Solid Waste contains both domestic and commercial waste. The large amount of waste creates lots of problems in day to day life of living creatures and also in Environment. It requires application of some effective strategies for proper disposal of MSW. Composting is one of the best technologies to treat waste in a more sustainable way. From many decades composting has been used as a recycling method for solid organic matter as it improves the soil fertility, soil structure and also it maintains the moisture content of the soil. ***Composting*** is a natural process that turns organic material into a valuable humus like substance and this substance is called compost.

Kitchen waste is one of the major contribution in organic solid waste. Kitchen waste is defined as left-over organic matter from restaurants, hotels and households. Tons of kitchen wastes are produced daily in highly populated areas. Kitchen wastes entering the mixed-municipal waste system are difficult to process by standard means, such as incineration, due to the high moisture content. Furthermore, organic matter can be transformed into useful fertilizer and biofuel. Often, the waste is burnt in the open, and toxic pollutants from the fires have known to can cause respiratory problems, cardiovascular diseases and adverse birth defects. In addition, transporting, handling, and disposing such a huge amount of waste results in the emission of greenhouse gases, fumes of Sulphur dioxide and oxides of nitrogen (also called acid gases), particulate matter, and other toxic substances.

This paper discusses the fabrication of a machine for converting the organic waste into compost on a small scale. This will in turn reduce landfill space, reduce surface and groundwater contamination, reduce air pollution from burning waste, provide more flexible overall waste management, enhance recycling of materials and can be carried out with little capital and operating costs.

1.1 Objectives

- To promote composting at household level.
- Reduce the pollution of environment to certain extent.
- Promote the use of natural fertilizer over artificial as far as possible.
- To efficiently utilize the organic kitchen waste.

2. LITERATURE REVIEW

Esther Vanlalmawii and Mamta Awasthi, in their research paper discussed the factors affecting composting. According to their research, managing waste at source is more important than the conventional way of handling waste and composting is one of the methods to manage the waste at source.

The authors in their research paper have given certain standards values to be maintained during composting process which are as follows:

Table -1: Composting Standards

Factors	Standard Values
Temperature	50 ˚C to 60 ˚C
pH	6.5 to 7.5
C/N ratio	25 to 30
Moisture content	Beginning – 60% to 70% Later stages – 50% to 60%

K. Udhaya Kumar and two others in their research, employed the technique of ***vermicomposting*** to compost the organic waste and convert it into a bio-fertilizer. They used ***eisenia foetida species of earthworm*** for vermicomposting. Their research samples and results are given below:

Table -2: Sample

Item	Quantity in kg	Percentage
Paper	0.5	10
Dry leaves	1	20
Vegetable waste	3	60
Wood	0.5	10

Table -3: Result

SL NO.	Chemical Parameters	Content
1	pH	7.1
2	Salt EC (dSm^{-1})	1.2 kg
3	Nitrogen (N)	0.44 kg
4	Phosphorous (P)	0.257 kg
5	Potassium (K)	1.1 kg

According to K. Udhaya Kumar, the central idea of vermicomposting is not only to manage the solid waste system but also to save the environment from pollution. In their study, they conclude that they can earn 9.36 lakhs per annum using this vermicomposting method in their locality called *padmanadapuram* municipality.

Md. Maruf Mortula and two others, in their experimental research used a machine called ***nature mill*** to conduct the experiment on organic solid waste. Their experimental samples included greens such as salads, leftover vegetables, beans, lemons and fruits and browns such as potatoes, bread, poultry and meats, rice and noodles. Their experimental results are given in the table below:

Table -4: Results

Parameter	Sample 1	Sample 2	Sample 3	Ministry Standards
pH	4.44	4.28	4.16	≤7.5
Salinity	3.6%	4.7%	3.7%	<2%
Moisture content	55.53%	42.02%	55.10%	<25%
Organic carbon	54.56%	54.53%	53.96%	Around 54%
C:N ratio	29.65:1	24.02:1	28.10:1	≤20:1
Nitrogen	1.84%	2.27%	1.92%	1% to 5%
Colour	Light brown	Light brown	Light brown	Dark brown

3. PROPOSED SYSTEM

This paper describes the fabrication of a machine which will directly convert the organic waste generated in a household kitchen into pulverized form so as to serve the first step required in most of the composting methods. The process needs to be started by separating the organic waste out of all the kitchen waste produced. The next step is to remove the water content from the organic kitchen waste. This can be accomplished by various means such as heating, squeezing, vacuum dehydration etc. This project uses the technique of squeezing to remove the water content. The principle of squeezing used is based on a type of juicer called "*masticating juicer*" which squeezes the fruits to get the juice out of it. This project primarily uses 300W, 80 rpm motor to rotate the squeezing blade.

The next step is to grind the squeezed waste so as to convert it to pulverized form. This can be achieved either by crushing mechanism as in case of a common juicer or a grinding mechanism using grinding stones. This project uses two grinding stones, one kept stationary, and other rotated with

the help of a secondary motor with almost identical characteristics as that of primary motor. The waste matter after grinding process is let to cool for some time at normal room temperature.

The pulverized waste can then be converted to compost by various composting methods available. Since composting is concerned with the microbial activity which is a natural process, it cannot be accomplished by any synthetic means. However, by the addition of some pre-formed natural fertilizer into the powdered waste or by maintaining favorable environmental conditions, the composting process can be accelerated.

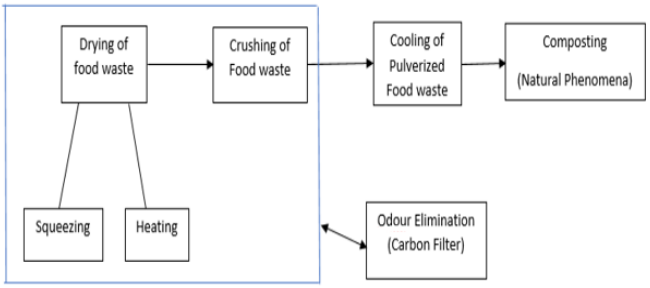

Fig -1: Block diagram of the machine

4. COMPONENTS REQUIRED

4.1 Squeezer

A small squeezer as shown below:

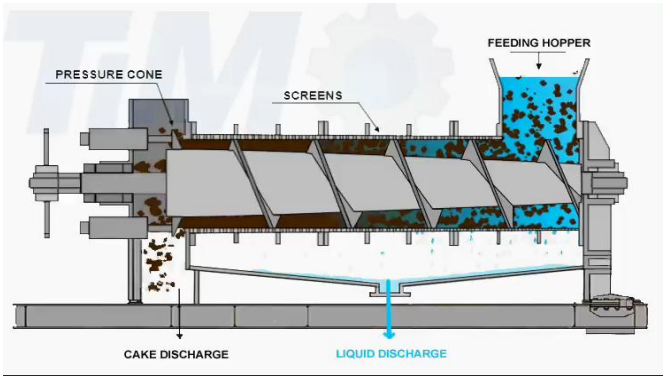

Fig -2: Squeezer

4.2 DC Motor

Two motors of 300W with 80 rpm, one used to rotate the squeezing shaft and another motor shall be used to rotate the grinder.

4.3 Grinder

Two grinding stones of 150 mm diameter, one kept stationary and other rotated using DC motor so as to grind the squeezed waste matter.

5. METHODOLOGY

The systematic approach followed during the project consisted of the following steps:

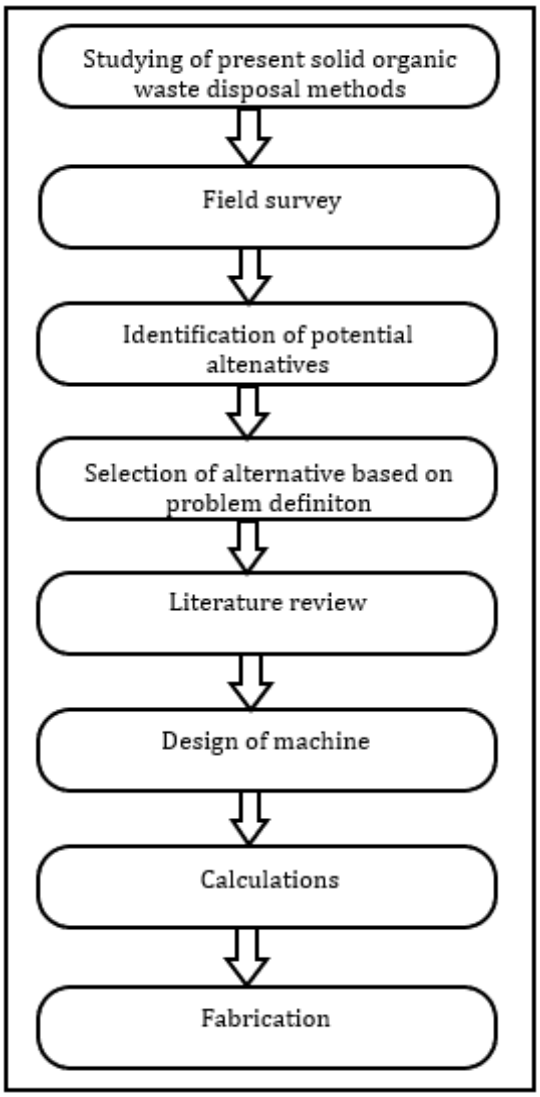

Fig -2: Process Flowchart

6. ADVANTAGES

- Good and efficient use of organic kitchen waste.
- Household production of natural fertilizer for plants.
- Low investment.

- Environment friendly.
- Light weight and easy to use.
- Tendency to reduce landfills space in near future.

7. CONCLUSION

Solid waste management is one of the serious problems today and with growing population, it is getting worst day by day. This project however cannot solve this problem but the proposed idea of this project can help to reduce the solid waste management problem by individually reducing the waste contribution (reduction of waste contribution from a household). The individual contribution in 'n' numbers shall thus reduce a lot of waste thereby helping to solve the problem of solid waste management.

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