

ORGANIC COMPOSTING SYSTEM

Sneh Yadav¹, Amit Saxena², Kshitij Singhal³,
Somya Sharma¹, Mohd Danish¹

¹ U.G. Student, ² Assistant Professor, ³ Head of the Department,
Electronics and Communication Engineering Department,
Moradabad Institute of Technology, Moradabad

ABSTRACT

The paper presented the composting process of the kitchen waste. The designed module may be a fully automatic and compact composting machine, which uses biological microorganisms to crumble all types of organic waste into productive organic compost within 24 hrs. The process adopted is based on biological dis integration and is natural. The whole process is based on microorganism which are effective even in high acidic or salty conditions. The machine is installed with a temperature and humidity sensor in a cylindrical composting tank with mixing blades and a provision of removing exhaust gases. Initially the moisture is sensed in the added organic waste by the humidity sensor and mixing blades are enabled for smooth and overall proper mixing. The objective of this project is to design a composting machine. In this organic waste contains 70-80% water, we achieve 70-80% volume reduction at this stage itself. The decomposition done by the microorganism that converts or disintegrates the organic kitchen waste into useful compost which takes about a day. The process of decomposition does not uses crushing / grinding thus is noiseless. The blades are just for mixing the waste.

KEYWORDS: organic waste, waste management, temperature and humidity.

I. Introduction

Due to the large amount of organic waste in the environment, it has become one of the main global issues. We can use this treatment managing the organic waste for landfill and in biological process. Composting is one of low-cost biological decomposition process. The physical-chemical parameter affected by this process include temperature, aeration, moisture content, C:N ratio and pH. Composting can be used for the recycling of organic matters into useful products. In addition, it can also be used to control the increase of waste. It helps to clean the environment and the surroundings. Besides that, the characteristics of the microbial population depend on the substrate and physical conditions, which are the moisture, temperature and aeration of where composting take place. The performance of the composting process also will depend on the characteristics of the waste because composting is only suitable for waste that is biodegradable. There are many advantages that can arise from composting, including the reduction of volume, weight and water content of the waste as well as producing inactive pathogenic organisms. Therefore, the compost can contribute to the improvement of soil contents and nutrients required for harvesting plants, and will significantly reduce the use of synthetic fertilizers. The application of compost can improve soil properties that are badly in need of renewal. Meanwhile, compost also act as a soil intervention in improving soil structure, water infiltration rate, water holding capacity and tilts. This is the most suitable solution for various problems discussed above.

II. Kitchen Waste

Kitchen waste mostly generates food scraps for disposal. Throwing this scrap can create odour problems and adds to the volume of waste going to landfills. There are three methods of composting kitchen wastes were reviewed. As for the composting of kitchen waste, used bio composter as a composted. The highest temperature recorded was 64°C and decreased to 32.7 °C at the ambient temperature, the

moisture content was observed at 55.8% and decreased to 21.7%. The loss of moisture content was due to the high temperature. For the pH, an acid pH was recorded during the early days of composting due to the production of organic acids, the pH rose up to 8.6 but later dropped to 6.3. This was caused by the ammonification and mineralization of the organic matters through the activities of microorganisms. The ambient temperature was recorded, which was between 35 to 45 °C. The initial moisture content was maintained at 50 to 60%. Periodical turning was conducted to aerate the compost heap every 3 to 5 days. The maximum temperature recorded at was between 48 to 50 °C on the 3 days of the composting process. The moisture content and pH were between 25 to 41% and 7.75 to 7.84 respectively. For N, P and K contents, they ranged from 0.03 to 0.07%, 0.002 to 0.005% and 0.32 to 0.36% respectively. However, the N concentration was inadequate when compared to the standard concentration. Hence, this study suggested adding phosphoric acid to avoid the unnecessary volatilization of ammonia. In another study, Arslan used in-vessel composter as a method to compost kitchen wastes. The composting process was conducted for 22 days. The compost was mixed with 2 kg of sludges as inoculum and 3.5 kg of sawdust. The temperature was recorded at 55 °C on day 2 and this temperature maintained at day 7. The initial pH value was 5.5 and moisture contents were between 48 to 53%. The C:N ratio decreased from 35.92 to 19.69 while the total Kjeldahl Nitrogen (TKN) had increased at the end of composting from 1.43 to 2.45%. As for the heavy metal contents- chromium, cadmium, zinc, 05025-p.4. The cadmium concentration was below the detection limit and the others were 22.4 mg/kg, 190.7 mg/kg, 35 mg/kg, 2641.75 mg/kg and 15.33 mg/kg respectively.

III. Methodology

In order to achieve the objective, we are using organic waste. Organic waste is collected from kitchen waste and other wastes from the house, restaurant, etc. Waste is mixed and chopped with the help of mixing blades inside the machine. DC power supply is provided to the microcontroller. RTC is used for controlling motor according to the requirement and microcontroller control motor driver. DHT11 is used to measure temperature and humidity inside the roller and display on the screen. After 24 hours the compost start collecting in the bottom tray of the project.

IV. About Project

The temperature and moisture required for degradation of waste. Firstly, when the mixing blades start rotating inside the roller the waste start mixing and also cut into pieces. RTC will operate the motor according to the requirement and DHT11 will measure temperature and humidity inside the roller and display on the screen.

V. Block Diagram

The basic block diagram of the system is shown in fig 1. The microcontroller is controlling all the functions of the composting machine as shown. The RTC (real time clock) and DHT11 (temperature and humidity sensor) are controlled by the microcontroller. DC power supply is given to the microcontroller and motor is controlled using motor driver by microcontroller.

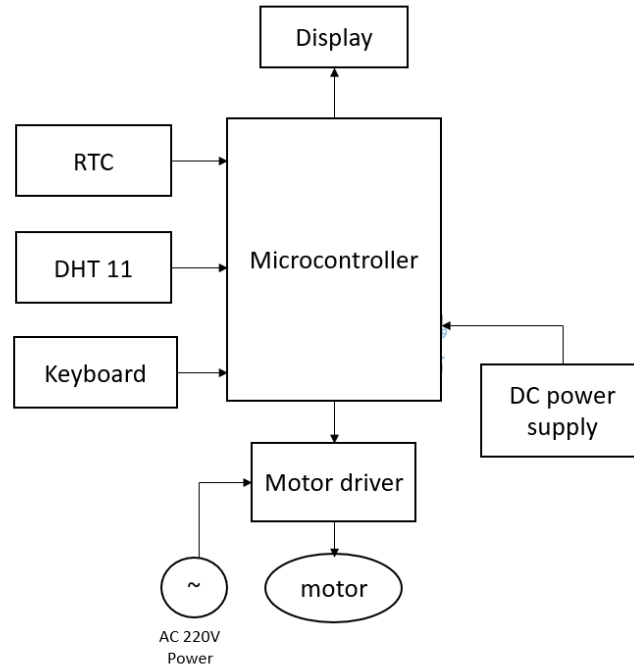


Fig 1. Basic block diagram of composting machine

VI. Result

The organic composting system is used for reuse of waste. It will make a compost easily with less labour work and good for the lands. Through the machine we can make compost easily and used in our garden areas and for fertility.

The steps involved in composting of the working prototype are as follows: Mixing and chopping of organic waste starts and after this temperature and humidity sensor start taking reading inside the roller and display on the screen.

VII. Advantages

1. Good and efficient use of organic kitchen waste.
2. Household production of natural fertilizer for plants.
3. Low investment.
4. Environment benefits
5. Environment friendly.
6. Light weight and easy to use.
7. Tendency to reduce landfills space in near future.

VIII. Conclusion

With the help of composting techniques there will be significant reduction of the quantity of wastes within the country. When trying to style the composting machine we expect it must be compact, easily usable by everyone, no extra labour needed to handle. Compost can be the replacement of chemical fertilizer since it can provide nutrients that are suitable for agriculture. Lastly, during composting if animal manure is added, it can enhance the degradation process. While composting of municipal solid waste and kitchen waste, it's very important segregate the heavy metal content since its toxicity does influence the nutrient status of compost.

Acknowledgment

We take this opportunity to thank Dr. Rohit Garg, Director, Moradabad Institute of Technology, Moradabad for his encouragement and useful suggestions to pursue this work.

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