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Cycle 2 Compost: Cycling-Based Compost Machine

Abdullah Fahim Mohamed Fariz[1,*], Amirul Imran Roslan[1], Muhammad Aiman Daniel Zaidi[1], Muna Izzah Md. Arfizal[1], Mairuz Asmarafariza Azlan[2]

[1]Centre for Foundation Studies in Science, University of Malaya, 50603 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia.

[2]UM Zero Waste Campaign, University of Malaya, 50603 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia.

*Email: fahimfariz14@gmail.com

ABSTRACT

Malaysians produce 38,000 tons of waste every day, where more than 45% of the waste generated comprises organic and food waste. Ironically an average Malaysian household waste about RM225 of food a month and this contributes to the high composition of waste generated. It is a major concern because disposal of food waste to landfill contributes significantly to climate change and environmental pollution. In order to tackle this issue, we have set a few objectives as a guideline for our innovation. These objectives include to utilise organic waste technology (anaerobic composting and digestion processes) in technical and economic aspects, develop a more efficient composting system for the people in any housing area, reduce food waste by making a product using it and ensure a healthy lifestyle to the user. In developing the product, we proposed that we created a composter that is attached to a stationary bicycle. Instead of a regular compost bin that required the user to mix and aerate with a trowel or a composter that had a crank to turn the internal mechanisms to process the waste, our composer would require the user to cycle which will turn the mixing shaft and aerate the waste. The marketability elements of this innovation include an ease in home-processing the compost, environment sustainability due to the lack of electricity use and encourages a healthy lifestyle through cycling. Through this project, it is hoped that the objectives set are achieved. We hope to help with the ongoing issue of food wastage and provide a sustainable alternative instead of throwing organic waste when it is in fact a valuable resource.

Keywords: Food waste; compost; compost machine

1. INTRODUCTION

Problem Statement

Malaysians' daily food waste is equal to the quantity of food that can be consumed by 12 million people. One of the ways to reduce food waste is by composting the food waste to make organic fertilizer. However, there are some problems that discourage people from producing compost from food waste such as lack of time, insufficient or lack of equipment such as compost bins and/or machines to compost the food waste,

and the consistency of people's effort to do it. So, what is the solution to make composting easier for people to do it and get to overcome the problems above?

Objectives

I. To utilise knowledge of environmental conservation, waste disposal, integrated waste management and biological treatment for organic waste.
II. To utilise organic waste technology (anaerobic composting and digestion processes) in technical and economic aspects.
III. To develop a more efficient composting system for the people in any housing area.
IV. To reduce food waste by making a product using it.
V. To ensure a healthy lifestyle to the user.

Innovation Motivation

"About 8000 tonnes, nearly 60 percent of waste that is being generated, is avoidable food waste," Mohd Pauze Mohamed Taha, Deputy CEO (Technical) SWCorp, told Channel NewsAsia. This shows that more than half of food waste is not supposed to be at the landfills. "Meaning that if there was proper management, proper consideration in our handling of resources, this amount of waste could be reduced," Dr Mohd Pauze said.

Based on the statement above, we believe that what drives our innovation is the need to divert and reduce waste transported to landfills by separating them at the source, then converting it into compost where it can be reused. In order to produce compost and encourage so at a domestic level, building an economic and practical composter must be proposed, which is what we aim to do through our innovation.

We were also inspired by UM Zero Waste Campaign, in which we have collaborated with in taking part in their volunteering program. Through this volunteering program, we learned knowledge of environmental conservation, waste disposal, integrated waste management and biological treatment for organic waste. Much of University Malaya's organic waste was separated at its source and has been converted into compost. We were inspired to promote this good habit as a way to reduce food waste at a small scale and instill awareness amongst the general public.

2. INNOVATION DEVELOPMENT

The main idea of this innovation is to not only to reduce the operating cost of the composting machine due to energy consumption, but also to engage the community in the habit of a healthy lifestyle through cycling. This alternative to manual mixing by hand can prevent muscle cramps due to long periods of mixing. The machine does not depend on the use of electricity therefore does not pollute the environment. Plus, operating the machine through cycling adds an exercising element which can lead people into a healthier life. The prototype will consist of a standard composting machine with a stationary bicycle that will act as the motor for mixing and processing the organic waste into fertilizer.

The machine will have two plastic cylindrical compartments, first is where immature compost is loaded and processed and the second is where processed compost is stored. Each compartment has a hatch, one above the first compartment to fill the machine with organic waste and below the second compartment where compost is harvested in a harvest tray. Inside the machine is a spiral-shaped, metal shaft that mixes and aerates the organic materials. A small wheel of a stationary bicycle will be attached to the shaft with a rubber belt. As the person pedals the bicycle, the wheel rotates and transfers energy to the shaft through the belt. This causes the mixing shaft to rotate as well and in turn, process the organic waste inside the machine into compost. An average person can cycle at least five minutes a day to keep the composting in check. The ingredients needed to produce the compost are brown materials (carbon-based Exp: sawdust and wood pellets) and green materials (nitrogen-based Exp: vegetable and fruit scraps, leaves and grass). The first compartment is filled at most, two-thirds full with the ingredients to avoid obstruction of the mixing shaft. The machine has a capacity of about 40 to 60 kilograms of organic waste. The compost inside the machine needs about a month to mature if mixed regularly to keep the temperature inside the machine at optimum for the waste to break down. Pedaling for at least five minutes is sufficient to maintain optimum conditions for the composting process.

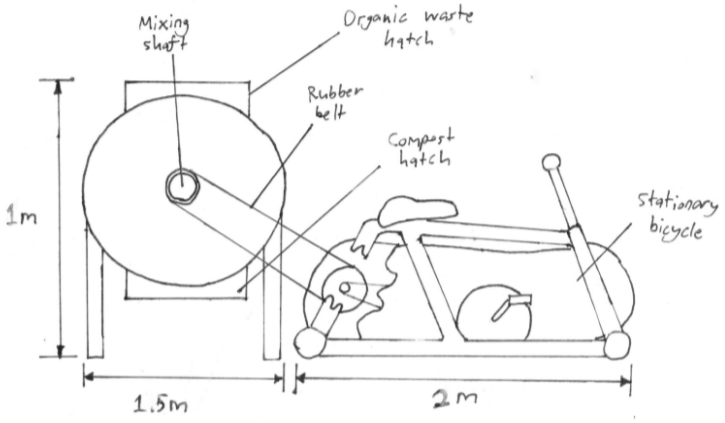

Figure 1: Front view of composting machine

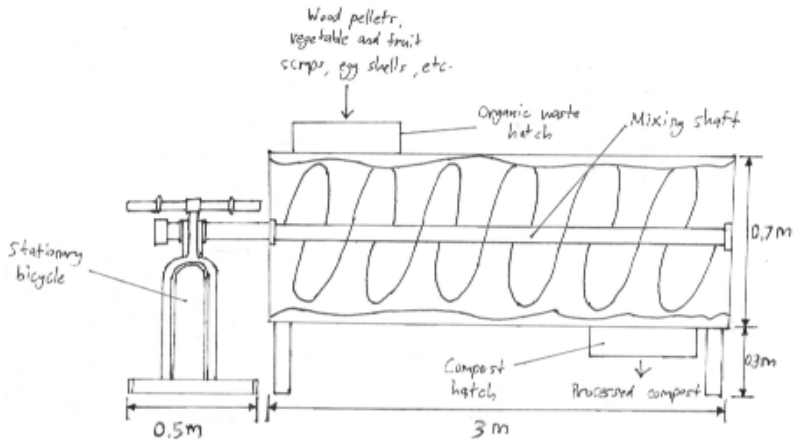

Figure 2: Side view of composting machine

3. COMMERCIAL POTENTIAL

The need for a composter that fits the needs of users is absolutely crucial in tackling the issues of massive food wastage in Malaysia. This is because a composter with a good selling point can encourage the general public to take on the issue of severe food wastage, in our case, by composting and essentially reusing and returning nutrients and chemical energy stored in food to the ecosystem. It is also a benefit for people who do planting as a pastime, where they do not have to spend up to RM25-RM40 for organic fertilisers when they can use the waste available at home. At the same time, people can also reduce their expenses.

Currently in the field of composting, compost bins and compost machines are readily available. Most compost bins look like a regular trash can, but they are most often equipped with an air-tight lid to prevent bad odour from escaping. Usually to prepare compost using these bins require the user to stir using a trowel or a small shovel in order to aerate the food waste. For the Bokashi method of preparing compost, a special additive is added called Bokashi powder. On the other hand, compost machines are machines that operate on electricity to mix and stir the food waste. They usually are applied on a large scale—for the food and beverage industry which produces massive quantities of food waste daily—and not suitable to be applied at home.

Referring to the paragraph above, as of now, a lot of composters/compost bins in Malaysia are either stirred manually or are industry-scale compost machines, which are unsuitable for small-scale, at-home waste-to-compost conversion. What people need is a more practical way to stir and treat food waste, without having to use too much labour. At the same time, we aim to create a machine as sustainable and environment-friendly as possible. Being low-cost is also a concern, as we want to provide the most reasonable option as possible. Considering that there is an urgency for better food waste management, providing a good alternative to simply throwing away leftovers and other sources of food waste is important in order to encourage sustainable food waste management amongst the public, and it starts at home.

What Makes Our Product Marketable

Our composter provides ease in mixing and producing the compost. This is because it can reduce the amount of labour put into preparing the compost. Instead of mixing by hand, the user only needs to cycle for no more than five minutes daily in order to turn the mixing shaft which mixes and aerates the compost.

Our composter also provides a more sustainable option for composting. It does not require any electricity to be put into it, thus reducing the amount of energy to make the compost. Most compost machines are electric-powered, which means our composter is far more sustainable.

Aside from composting and gardening, our innovation can also promote an exercising habit, since it requires cycling to turn the machine and mix the compost every day. This is an important aspect in order to combat many major health issues in our country, one of them being obesity. It is considered an attractive factor to people who would want to exercise in the comfort of their homes.

4. CONCLUSION

There is a lot of potential in this machine due to its usefulness in a lot of aspects. This device can convert household waste such as leftover food and scraps of wood into compost which in turn can be reused as organic fertilizers. This machine can increase productivity because little energy and time is required in order to operate the machine and make compost at a small scale as opposed to making compost using hand-operated tools. In the long run, this machine will save a lot of money as it does not depend on electricity, and it can also save money from being spent on fertilizers which can be costly for smaller-scale users. Plus, issues around muscle cramps in hand-operated composter has been tackled by this device because this device is operated like a bicycle. This also encourages people to engage in healthy activities (i.e. cycling). If enough people use this machine, it can bring an impact to the environment as it reduces the amount of domestic waste sent to landfill areas.

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