

## Engineering design on food waste composting bin

S.N. Khalil<sup>1,2,\*</sup>, K.A. Zulkifli<sup>1</sup>

<sup>1</sup> Faculty of Mechanical Engineering, Universiti Teknikal Malaysia Melaka,  
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

<sup>2</sup> Centre for Advanced Research on Energy, Universiti Teknikal Malaysia Melaka,  
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

\*Corresponding e-mail: snurhaidakhalil@utem.edu.my

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**ABSTRACT** – Green technology has been imprinted in our country to gain better future or greener future for our future generations. It is part of our hidden duty to prepare good platform for them to lead on and continually taking care of our earth. Composting is one of the steps towards that greener future. Composting is known as one of the method or solution for wastes around the world. However, it is neither a familiar word nor action in Malaysia and specifically in Universiti Teknikal Malaysia, Melaka. Composting can avoid landfills that are filled with wastes that can be reuse and recycle thus can reduce the usage of incinerator. This research will explain on the benefits of composting and how the process will be done as well as the phases and important parameters. In order to implement it in the University, a conceptual design was made based on the current designs that are already in the market and some new designs were sketched and design using the CATIA software. The material selection for the parts was done using the CES Edupack software and analysis was made as well as the costing of the model to apply the concept according to the University's environment.

### 1. INTRODUCTION

The main purpose of this research is to conceptually design composting bin that reduces the amount of food wasted in Industrial Café Campus. The Industrial Café Campus located at Faculty of Mechanical Engineering, UTeM, Malacca. In 2012, all cafeteria or café that operates in UTeM was known as Green Café. Green Café is one of the ideas that have been proposed by Vice Chancellor UTeM, Professor Datuk Dr Ahmad Yusof Bin Hassan during the Strategic Plan 2012-2020 meeting at Durian Tunggal, Malacca. This idea was also an initiative from ULDP (UTeM Leadership and Development Program) society. The green concept that was to be applied has its own slogan for the Green Café which is self-service, self-cleaning and saving the earth. The composting bin method [2] is one of the green technology concepts that have been implemented especially in cafeteria in Europe [4], and home composting has been an economical trend nowadays in Europe. The green technology was created and implemented to minimize the harmful effects[3] on the environment that will lead to global warming in the near future.

Food waste is one of the highest rated problems that occur all over the world. People are still finding ways on how to fill up the landfills that are currently full with mostly food disposals. According to (Eco-Business, 2013), Melaka produce between 1,300 tonnes and 1,400 tonnes of waste daily with the cost of disposing them reaching up to RM70,000 daily. Moreover, the Krubong landfill can only last for another three years and the other landfill in Sungai Udang can only last another five years and have to be replaced with new sites. These wastes are coming from houses, apartments, schools, universities and prisons in Melaka. According to the Melaka Chief Minister Datuk Seri Mohd Ali Rustam after being interviewed by Bernama News in 2010[1], an incinerator will help to turn the non-recyclable waste into income and the incinerator can last up to 30 years and is seen as a viable option but the price tag of RM500 million seems to be a stumbling block he said. However, Melaka has prepared an area of 4 hectares in case the incinerator development is approved. Nevertheless, the Melaka Chief Minister has spark awareness around the country to reduce the use of plastic and will be charged 10 to 20 cent for anyone that requests a plastic bag. In regards to this matter, we should still continue to finding ways to solve the problem that will cause our future if we took this important matter for granted.

### 2. METHODOLOGY

The research will be held by conducting literature review on the broad subject and issues in green technology and narrowed down to composting waste management, composting waste products and lastly composting waste bin design. From the literature the researcher will design the composting bin based on the specifications gathered from literature review. The design shall be held in 3-D CAD software CATIA and analysis of the material used will be held by using CES Edupack software package, highlighting on green materials in both design and material analysis.

### 3. RESULTS AND DISCUSSION

The design of the composting bin focused on two elements that has critical function during operation i.e. shredder and mixer. The finite element analysis (FEA) results for these two parts are as follows;

Table 1 Shredder and Mixer material properties

Parameters	Properties
Material	Steel
Young's Modulus	2e+011N_m2
Possion's ratio	0.285
Density	7800kg_m3
Coefficient of thermal expansion	1.17e-005_Kdeg
Yield Strength	3.05+008N_m2

The design of the composting device is as shown in Figure 1 and Figure 2. In Figure 1, the manual composting device is illustrated. The machine is wall hung and operated by using manual labor. In Figure 2, the proposed automated composting device is illustrated. The design include the body, table door, shredder, mixer and support, transparent glass, service door, wheels and bucket.

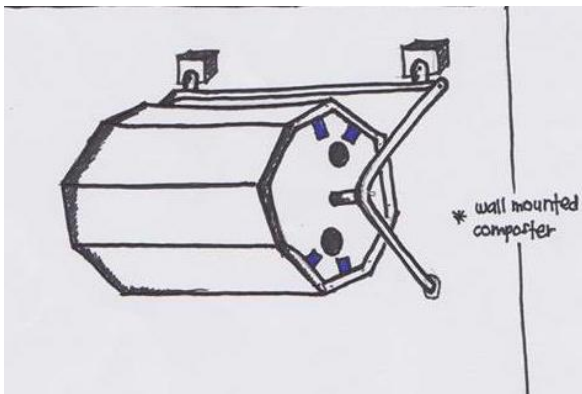


Figure 1 Manual Composting Device

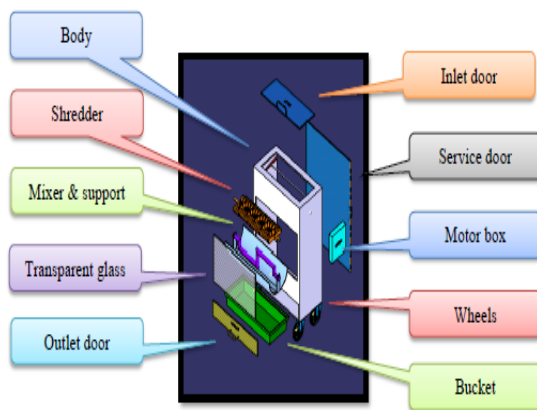


Figure 2 Proposed Automated Composting Device

#### 4. CONCLUSIONS

In this reserach, at the end of the finding, the researcher will be able to understand the composting process and implement the green technology concept by producing a conceptual composting bin. The research also will produce composting bin design that will incorporate processes needed to produce good compost for UTeM's landscaping purposes.

#### 5. ACKNOWLEDGMENT

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