

# **iTRASH PLASTIC COMPACTOR: INNOVATIVE RUBBISH CONTAINER**

Farrah Noor Ahmad, Muhammad Haziq Mohd Asri, Muhammad Adi Ikhwan Ahmad, Muhammad Rafiq Rahimi Rosli and Sazarul Aiman Zakaria

*Faculty of Mechanical Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Jalan Permatang Pauh, 13500 Permatang Pauh, Pulau Pinang, MALAYSIA*

*E-mail: farra728@uitm.edu.my*

## **ABSTRACT**

A trash container is intended for a temporary waste storage in a designated area prior to its disposal of which recycling is not emphasized and taken into consideration. The objective of this project is to design an innovative trash container that will be able to increase efficiency of recycling based on plastic bottles, which is more feasible for all. It involves the compression mechanism which transformed the plastic bottles into smaller than its original sizes. This will provide some space to keep the disposed bottles before being sent to the recycling centre. The concept of this project is translated through calculation, simulations, and even customizing a digital prototype of trash container. CATIA software performs the simulation on the critical component known as gear, which suggests promising results without higher stress that could possibly damage the gear. As a result, the rendering waste shall be compressed more efficiently. Manual control of the element compaction from the handle to the piston via gears demonstrates the product's uniqueness making it more fun, simple and easy to operate. This will pave the way to encourage users to be highly involved in the recycling process and lead to the sustainable waste management approach.

**Keywords:** plastic, trash, recycle

## **1. INTRODUCTION**

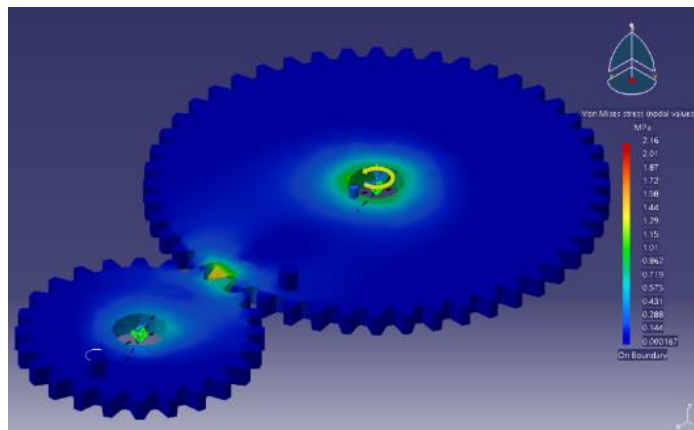
Planning waste management and trash recycling is an extensive task that requires both logistical planning and scientific knowledge as well as understanding to balance the impact on the environment and the operation cost effectiveness. Even the basic trash requires innovation that could create more efficient plans for waste management and increase recycling practice. An innovative rubbish container would require critical thinking on their usage and impact towards the people of the world. On the contrary, it is more complicated in practice than one could have ever imagined since the concepts have to be interrelated with the relevant mathematical method, calculation, simulation, test and result. According to [1], plastic bags are the most popular plastic item in Malaysia and the next rank goes to plastic bottles. From this data, only 68% of the 3000 Malaysians realize that plastic bottles can be recycled. The lack of awareness occurred because the existing trash container does not have a recycling feature. Moreover, given limited space, people are facing challenges to remove trash more often. Apart from that, the size of the trash container restricts the space of trash. Hence, this work aims to design trash containers with compression mechanisms for the purpose of making waste management more efficient and meets the sustainability requirement.

## 2. METHOD

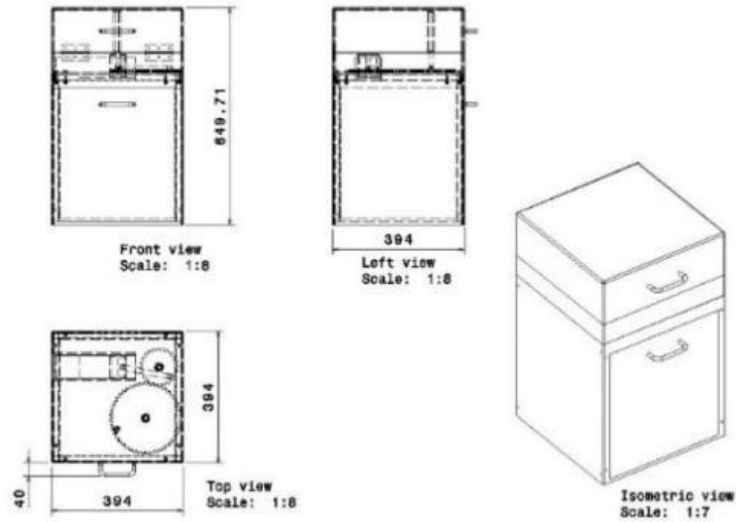
The trash container consists of the main frame, bed, casing, cover, gears, piston and piston slots. The length, width and height of the trash container are 39.2 cm, 39.2 cm and 57.5 cm, respectively. The plastic bottle compressible in the slot has a length of 22 cm long and width of 7 cm. The stress, displacement and deformation of the critical part known as gears have been analysed based on the simulation via CATIA software.

## 3. RESULT AND DISCUSSION

Using CATIA software, Finite Element Analysis (FEA) simulation of trash containers gears is generated. Stress occurs at the contacted teeth of both gears, as shown in Figure 1. The maximum stress was 2.16 MPa. The gears are used to compress waste by connecting the gears to the connecting rod and the block. The yellow colour in the diagram indicates low stress, which could avoid damage to the gear. The use of gears mechanism offers cost effective maintenance as compared to sensor or motor since electricity is required. The compression mode helps to compress the plastic bottles with minimal effort. In order to compress a bottle, maximum force of 98.1 N is required. When the plastic bottles are compressed, the minimal size would provide more space in the trash container.



**Figure 1.** Von Mises Stress diagram of the gears



**Figure 2.** Drawing of iTrash Plastic Compactor

#### 4. CONCLUSION

This work is able to raise awareness on recycling materials due to the unique design and creative way to manage the waste. The users are not required to empty the trash as often with less usage of bin liners that will provide more space when the plastic bottles are compressed.

#### REFERENCES

1. The Last Straw: Discouraging Single-Use Plastic. Retrieved from <https://www.ipsos.com/en-my/last-straw-discouraging-single-use-plastic>, 2020.



Surat kami : 700-KPK (PRP.UP.1/20/1)  
Tarikh : 30 Ogos 2022

YBhg. Profesor Ts Sr Dr Md Yusof Hamid, PMP, AMP  
Rektor  
Universiti Teknologi MARA  
Cawangan Perak



YBhg. Profesor

**PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK  
MELALUI REPOSITORY INSTITUSI UiTM (IR)**

Perkara di atas adalah dirujuk.

2. Pihak Perpustakaan ingin memohon kelulusan YBhg. Profesor untuk membuat imbasan (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.
3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna Perpustakaan terhadap semua bahan penerbitan UiTM melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak YBhg. Profesor dalam perkara ini amat dihargai.

Sekian, terima kasih.

**“WAWASAN KEMAKMURAN BERSAMA 2030”**

**“BERKHIDMAT UNTUK NEGARA”**

Yang benar