

Design A New Household Recycle Trash Bin

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Abstract Recycling practices have become commonplace in household settings. Bottles, cans, and certain degradation materials such as chicken bones, fish bones and etc are commodities typically targeted. The paper presented the development of new concept of household recycle trash bin. Traditional trash cans still sit under or beside each household kitchen to be emptied by the nightly custodian. Discarded items with the exception of bottles, cans, and certain degradation materials end up in the trash can. Initially, the trash bin is drawn in SolidWork according to the design and finally fabricated it according to the final design. The heart of this recycle bin system is making people responsible for their trash by replacing each trash can with a recycle trash bin. The recycle trash bin can be a “saddle basket” placed on the side of the kitchen cabinet. In this system, people empty their recycle trash bins into centralized trash containers and their recycling bins into centralized recycling containers. Custodial workers no longer go house to house emptying trash cans. The unique of this recycle bin is a device attached together with it to compact the trash according to plastic bottles, aluminium cans and bones. After compact, people can easily place it inside centralized recycle bin according to the items. The degradation material can be used as a bio-fuel.

Keywords: Recycle, trash bin, household

INTRODUCTION

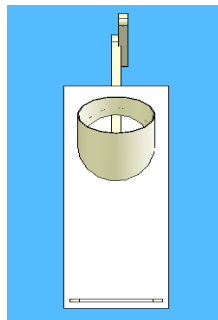
Basically compactor made from material which has high and quality strength. This is because to ensure materials that need to compact are well compacted or compressed. In order to design a well function compactor, the important thing to be considers is the strength of material which will use to build the compactor [1]. Basically compactor is used to crush or compress waste materials for example car crusher[2,3]. This compactor is used for decrease the size of car to be much smaller than before. Normally compactor powered is depending on hydraulics. Special fluid is used as one of the medium to run the hydraulic system. The example of fluid types includes synthetic compounds, mineral oil, water, and water-based mixtures. The compactor can run

to recycle automatically or the operator can manually forward or reverse the compacting ram. The compacting ram will only operate if the power is on and the door or hatch is fully closed [3]. Doors and hatches are equipped with safety switches [4].The entire machines have their own safety rules. Those are same with the compactor. In order to avoid the accident, there are some rules should have to obey. Basically the rules divided into 4 major sections in concerning of the safety. There are site set up, equipment operator and equipment rental establishments.

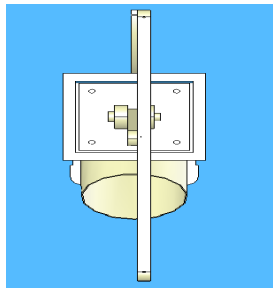
METHODOLOGY

The trash bin model design in Solidwork as shown in Figure 1. The finite element analysis

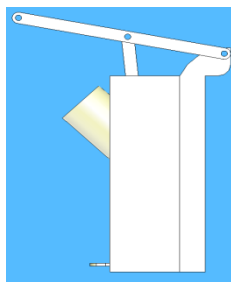
was done using ALGOR. After satisfied with the data, record all the result from solidwork. The material that used for this design is steels, angle iron slotted, acrylic, screws and nuts. The fabricate process need to follow with design from Solidwork to avoid any mistake .When all the fabricate process done, the trash bin need to be tested with few experiment. By using a hydraulic concept, it did not need high force to compact the trash. Every level of user including children can use the machine. The other advantage is that, it can compact the trash easily and able to compact many cans and bottles at one time. As a result, it will reduce the processing time.



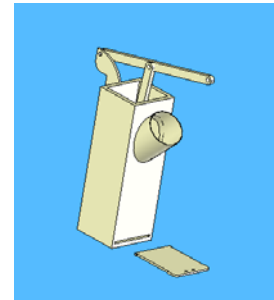
Front View Design



Top View Design



Side View Design



Isentropic View Design

Figure 1. Four view of the design in solidwork

Compactor is the part which is use to compact the cans and bottles. Basically the compactor is dividing into 3 major parts. There are handle shaft, shaft that connect compactor and the handle shaft and last part is solid compactor. The fully compactor was fabricate using steel which have high strength and hardness as shown in Figure 2a and 2b. Shaft handle was fabricated from steel plate which has thickness 5 mm. The width of the shaft is 25mm and the length is 300mm as shown in Figure 3.

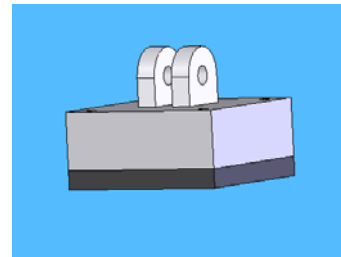


Figure 2a. Design compactor in Solidwork

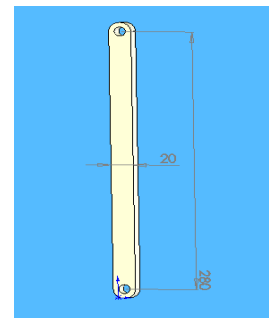


Figure 2b. Design shaft in Solidwork

The second part is the shaft between handle and solid compactor. This shaft was made from steel plate also. This shaft is longer than handle shaft. Same width which is 25 mm but the length is 350 mm. The last part in compactor is the solid compactor which fabricated from steel. The dimension of round solid steel is 100 mm in diameter and 40mm in length.

In fabricate the compactor casting as shown in Figure 3, the material that needed were sheet metal iron steel and plate steel. The dimension of sheet metal is 300x350 mm. The holder attach at the back of compactor casting. The function of the holder is to hold the shaft handle with the nuts. At the holder, there are a hole for attach with the nuts to joint compactor casting and the shaft handle. The final trash bin fabricated as shown in Figure 4.

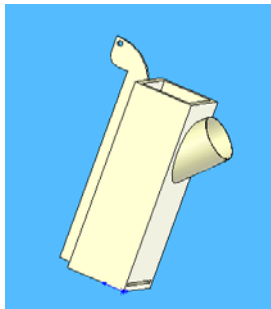


Figure 3. Design casting in Solidwork

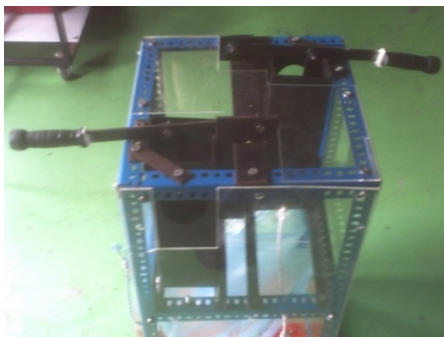


Figure 4: Fabricated trash bin

RESULT AND DISCUSSION

This analysis only focusing on the three parts from whole recycle trash bin. There are shaft handle, shaft that connect to solid compactor and shaft handle and last part is solid compactor as shown in Figure 5.

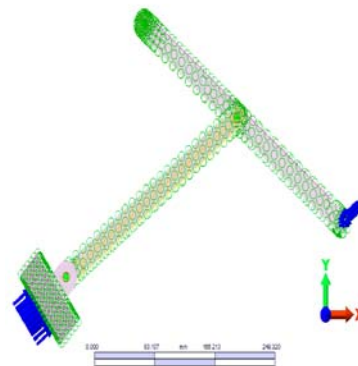
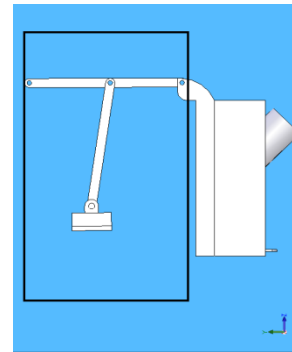


Figure 5. Part that need to analysis

Type of the analysis is MES with nonlinear material model. It is because the analysis focusing at the pin joint. From that part, there are 3 pin joint that need to be analysis. The first one is at the end of the shaft handle, at the middle of shaft angle and last one at the joint between solid compactor and shaft. Element type that use in this analysis is brick. The material that be used is Steel (ASTM-A36). The assumption force needed to compact the trash is 1000 N. Constant force which mean when pull the shaft handle, the force is constant. Boundary condition of the model is shown in Figure 6.

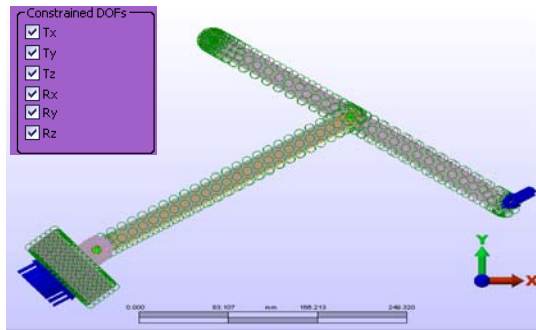


Figure 6. Boundary Condition

From the Figure 7, it can conclude that the maximum displacement occurs at the end point that has the force. This is because one of that shaft handle is fixed, so the displacement only occurs at the part which not fixed. Based on that boundary condition, the maximum value of the displacement is 27.386mm. Based on Figure 8, the maximum von Mises Stress occurs at pin joint. It is because at pin joint, there are lot of load applies on it.

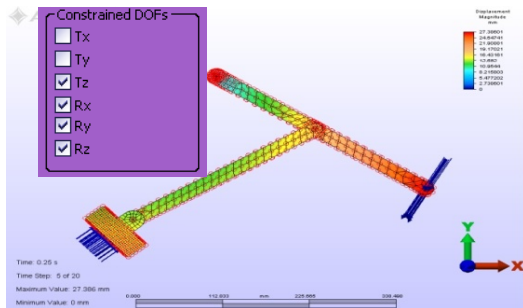


Figure 7. Displacement Diagram

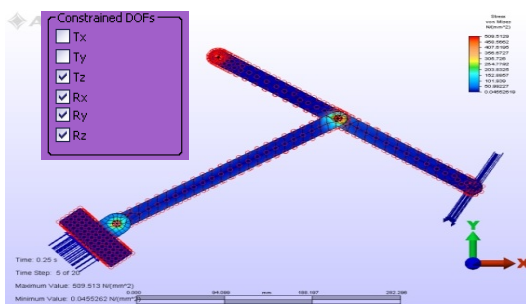


Figure 8. Von Mises Stress Diagram

CONCLUSION

In this paper it include the proposal of the new design of the recycle trash bin which hope can overcome the current issue faced by the community indirectly and also the government directly in the issue of recycling programmed. In order to “fabricate” this product, the “compactor” designed also included in this new concept of the recycle trash bin. By designing both of the new concepts, it is hope that the projects will be able to leads to the “Green Environments Life”. This new design and concept of recycle trash bin is the combining the advantages of the current trash bin product in market today. Now the advantages of this recycle trash bin are it can support more trash in that container. It is because, the trash have been compact by using compactor that include into this recycle trash bin. The other advantage is, it also can divide the trash based on the material. This recycle trash bin include with two different containers that are can and bottle. These new concepts of compactor that include with this recycle trash bin have their own disadvantages. There are need high force to compact the trash. This project only use mechanical concept. The other disadvantage is the weight of the recycle trash bin. Based on the materials that use to fabricate the recycle trash bin, which are steel, as a result the product is weightier. From the FEA analysis, it shown that pin joint is the critical part to have the failure. It is because, at the pin joint, there are maximum von Mises Stress occurs on it.

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