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Design , Analysis And Manufacturing of Garbage compactor

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ABSTRACT

The collection of waste is vital work that ensures our communities remain pleasant environments in which to live. But major problem we are facing today is transportation of the waste which can be reduced by compacting or reducing size of particular waste. A compactor can be used to reduce the volume of waste streams. The waste weight will remain the same so there will be no savings from the total amount of waste produced. However, savings will occur because waste volume will be reduced by approximately 80% which will decrease the number of times the dumpster will need to be emptied, therefore resulting in lower pick up fees

Keywords— **compactor , dumpster, weight**

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I. INTRODUCTION

Compactors are run very infrequently and are relatively efficient when run meaning the amount of energy consumed by the compactor will be low. Compactors come in a variety of mounting configurations, including free standing and through-the-wall types. It is at the discretion of facility personnel to select the compactor that will best serve the facility layout since the difference in type does not alter the compactor effectiveness.

H. Corpora land T. Veldman**[1**] which has published paper on "The Design Space of Garbage Collection. In this paper they have been presented a new garbage collection design and classification model, based on **six** parameters. This was made possible by carefully reconsidering the fundamentals of garbage collection in relation to the discussed developments. This paper has concluded a new design model for garbage collection, based on 6 collection parameters.

A Fast Analysis for Thread-Local Garbage Collection with Dynamic Class Loading"**[2**]has been represented by Richard Jones and Andy C. King. In this they have presented a new static analysis and a novel GC frame worked signed to address this issue by allowing independent collection of thread local heaps.

Yuming Guan, Baoshuang Yao, ShaohuaZhang ,Yanjun Xiao presented paper on [**3]"** Analysis on Vibrator of Vibrating Compactor Based on ANSYS". In this paper they has been analysed the working process of vibrating compactor points that the traditional motion mode of vibrator may cause uneven distribution of materials and proposes a new mode of motion.

Alan Jay Smith published paper on**[4**] "The Need for Measured Data in Computer System Performance Analysis or Garbage In, Garbage Out". In this paper they discussed various types of models and when and what type of accurate workload data is needed.

"Analysis with ADAMS/ANSIS on Dynamic Properties of Rotating Hook lift Garbag Truck" **[5]**published by Guanglin SHI, Shuxun CHEN, Guangmin LIANG and GuanglinSHI.In this paper, they said to find the exact position where stress is the biggest while rotating hook-lift hoisting, firstly, they used ADAMS to realized dynamic simulation of working process, and then took the information got from ADAMS as boundary conditions of finite element analysis.

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Fred Brown published "Incremental Garbage Collection in Massive Object Stores"**[6]**. In this paper they have presented two new algorithms that both employ reference counting at the local level. One algorithmwas used reference counting at the higher level and the other used tracing at the higher level. An evaluation strategy was presented to support comparisons between these four algorithms and preliminary experiments are outlined

Douglas M. Washabaugh and Dennis Kafura**[7]** published "Incremental Garbage Collection of Concurrent Objects for Real-Time Applications". This paper shows how to perform real-time automatic garbage collection of objects possessing their own thread of control. The main problem, the relevance of automatic management and concurrent objects to real-time applications is briefly discussed.

Analysis and Design of optimal combinational compactors **[8]** published by peter wohl and lender thuisman proceedings of the 21st IEEE VlSI test symposium. In this paper they have been analyses a basic requirement of compactors to support efficient test and diagnosis, focusing on practical compactors. They show how graph theory can be used to model compactors and design compactors with robust non-aliasing properties that have minimal area and delay overhead and are independent of the test set, the fault model and the circuit tested.

II. OBJECTIVES OF THIS WORK.

1. To Design and manufacture Garbage Compactor which will make blocks of garbage for easy handling
2. To analyze various forces which will be imparted on the parts of compactor while handling the garbage
3. To find solution to overcome and increase life of compactor parts

Main Objective will be obtained through following sub-objectives as follows:

1. To design this model by catia-v5.
2. To analyze various forces which will be imparted on the parts of compactor while handling the garbage by the using Finite Element Analysis software package like ANSYS i.e

III. DESIGN CALCULATIONS

1] Dimeention of block:

I] L= 600mm (length of the block)
II] W=300mm (width of the block)
III] H=300mm (height of the block).
2] height of the moving plate is same as height block:
H= 285mm

2] design of power screw:

We assume that dimension for screw,
D=36mm (nominal diameter)
P= 6mm (pitch)
L= P= 6(single threaded)
μ=0.15 (coefficient of friction)
Mean dia = d-0.5*p
= 36- 0.5*6
= 33mm
Core dia = (d-P)
= 36-6
= 30 mm
Tan α = l/π*dm
= 6/π*(33)
α = 3.312
tan φ = μ=0.15
φ = 8.530
torque required to raise the load,
Mt = Wdm/2*Tan(φ+α)
= 12*10^3*36)/2*tan(8.531+3.312)
= (198*10^3). N-mm
Material used for the screw is steel.

3] Design of spur gear

Following data considered for design of gear and pinion
1] material of pinion 45c8 . permissible bending stress = 130 N/mm²
2] material of gear 45c8. permissible bending stress = 130 N/mm²
3] minimum no of teeth of pinion 20 to avoid interference .
4] as pinion and gear are made of same material pinion will be weaker than gear.
5] failure of pinion due to teeth breakage only wear failure neglected.
6] compressive and shear stress neglected as they are marginal.
7] only bending stress is taken as determining factor.
The bending stress is the only determining factor
M= √2000*T*qk*qe/zmin²*(b/d)*σb
M= module
qk= form factor
qe = contact ratio factor
σb = permissible bending stress as qk and qe are not known factor at this stage average values are taken as qk= 2.25 and qe= 0.9
value of b/d to be assumed to be 0.5,
so m = √2000*T*qk*qe/zmin²*(b/d)*σb
m= √2000* 42.84/20²*0.5*130
= 1.87
We taken that module for this calculation is 2.5.
Dimension of the gear and pinion.
1] pitch circle dia of pinion = m*teeth of pinion
= 2.5*40
= 100 mm.
2] pitch circle dia of gear = m* teeth of gear
= 2.5*108
= 275 mm.
3] face width of the pinion
B = pcd of pinion *0.5
= 100*0.5
= 50 mm.
Face width is same for both pinion and gear
4] m=2.5
Zp= 40mm
Zg = 108mm
Dp = 100 mm.
Dp = 270mm.
A = central distance between two gear .
= dp+dg/2
= 100+270/2
= 185 mm.
Ha = addendum
= 1m
= 1*2.5=2.5 mm
Hg = dedendum
= 1.25m

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= 1.25*2.5= 3.125 mm.

4] Thickness of moving plate.

We calculated the thickness of moving plate from bending stress of the plate using this formula.

M/I= Fb/y,

M= bending moment in mm

I = moment of inertia in mm^4

Fb = bending stress.

Y = distance from extreme fibre .

material for plate taken as ‘ Mild steel’ 45c8.

The bending stress of that material 155-165 N/mm².

So we considered the simply supported beam

M= W*l/4

W= force

L= length of the beam.

M= 12000*600/4= 1.8*10^6 N-mm.

I= $b*t^3/12 = 300*t^3/12= 25t^3$

Y= t/2

So, M/I=Fb/Y

$1.8*10^6/25t^3= 165*2/t$

T = 15mm.

We have taken as 300mm length.

5] Design of nut

Bearing pressure on threads.

n = no of thread

n= height of nut/ pitch of thread

We consider that height of nut on the nominal dia.

H= 50 mm

N= 50/6=8.33mm.

Pb = bearing pressure

$Pb = W/\pi*dm*t*n$

W= load

Dm= mean dia.

T = thickness of thread

N = no of thread.

T= p/2=6/2=3mm

$Pb= 12000/\pi*33*3*10$

Pb = 3.85N/mm²

Shear stress in the thread

$Fs = 16*T/\pi*dc^3$

$Fs = 16*198*10^3/\pi*30^3$

Fs = 37.34 N/mm².

6] Efficiency of the model.

Ƞ = volume occupied after compression/ volume occupied before compression

= 420/600*100 = 70%

8] Density – before compression

ρ = m/v

mass is 3 kg and v= l * b * h

V = 600*300*300= 54*10 ^6.

ρ = 3 / 65.33*10 ^3= 5.6*10^-8. Kg /mm³

density – after compression

mass remains sir and V= 420*300*300

= 37.8*10^6 mm³

ρ = 3/ 37.8^6. mm³

ρ = 7.93*10^-8. Kg/ mm³.

IV. SPECIFICATION TABLE

SRN	PARAMETER	MATERIAL	SIZE
O			
1	Rectangular Block	M.S	600X300X300 MM
2	Moving Plate Thickness	M.S	10MM
3	Iength of Leaver	M.S	200MM
4	Lead Screw	N.H	d=36MM
5	Compression Ratio		70%
6	Capacity		3kg

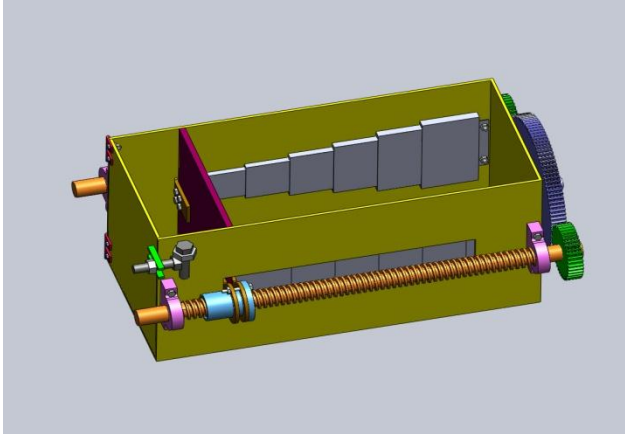

FIG 4.1 MODEL OF GARBAGE COMPACTOR.

Compactor is a simple mechanism involving use of manual force to control the working of manual operated lead screw and gear arrangement system. A compactor consists of cylindrical block in which the garbage is collected from the people in the society comes an through the garbage in the cylindrical block which is placed inside the society. The compaction is performed through the action of gear arrangement and lead screw that is mounted upon the cylindrical shell which is operated by the simple hand lever. in this also consists of the moving plate which is attached to the lead screw by the nut .The compactor is to be designed and analyzed such that the whole system sustains the compaction force and maintain structural stability.

V. ANAYLYSIS AND RESULT

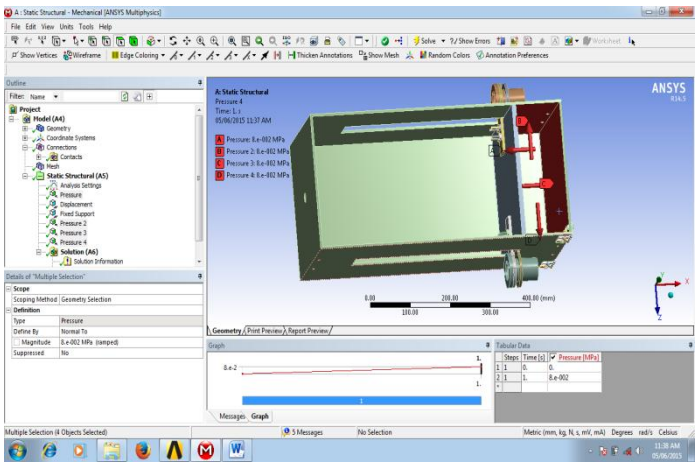

FIG 5.1 FORCE / PRESSURE APPLIED

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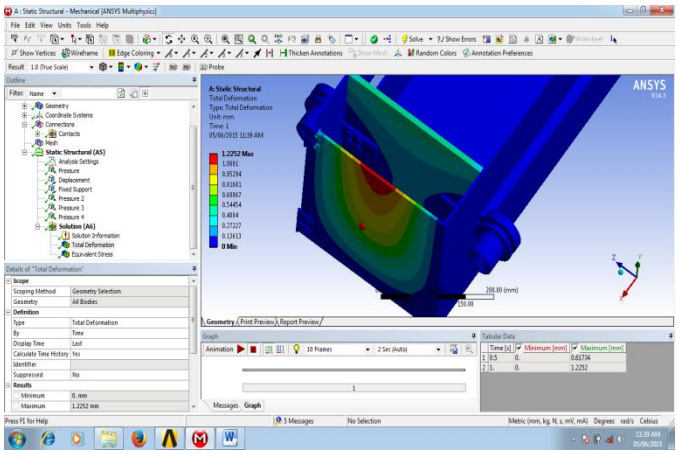

FIG 5.2 DEFORMATION

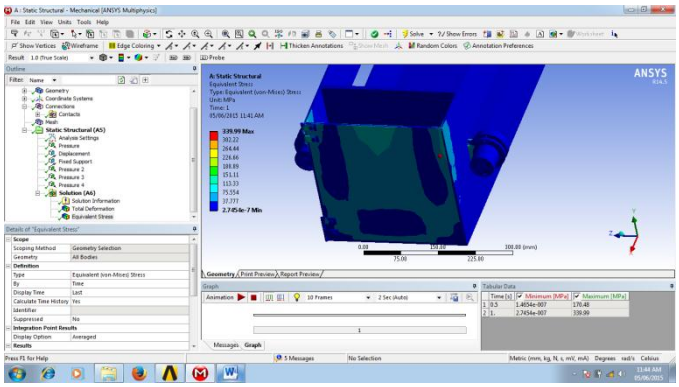

FIG. 5.3 VON MISES STRESSES

Time [s]	Minimum [mm]	Maximum [mm]
0.5	0.	0.61734
1.		1.2252

Time [s]	Minimum [MPa]	Maximum [MPa]
0.5	1.4654e-007	170.48
1.	2.7454e-007	339.99

Compressive Yield Strength MPa
250

Tensile Yield Strength MPa
250

Tensile Ultimate Strength MPa
460

VI . CONCLUSION

We can then conclude after this work the simple manually operated garbage compactor it can be reducing the volume of garbage also reducing the pollution of garbages which is harmful to the human life. Its used in society to control the volume of the waste stream also routine problem of the garbage in the society.

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