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LOW COST PLASTIC BALERS

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ABSTRACT

This paper focuses mainly on the concept of low cost and balers for plastic materials. As we know, normally the balers costs high and they are used more in industrial areas. The purpose for making plastic balers is because the Plastic contributes to a large amount of waste by human in residential areas. According to the recent survey, 15,342 tonne plastic waste is been generated every day in India. So the plastic waste became the great threat for the hazardous environment we face right now. Normally the balers can be used to reduce the amount of waste disposed in the land and stop from degrading in the soil. So we decided to make a low cost baler which can be useful to the residential areas, so that we can reduce the amount of plastic waste that has been discharged through the residents. On account of creating the balers in a low cost it is possible to make balers in mechanical rather being electrical.

1. INTRODUCTION:

This baler is used f chopping and compacting plastic waste and send it for recycling process. Normally the baler we designed here can be able to bale 15-20 chopped plastic bottles. Here we use a frame which is supported by four legs made of steel will be supported by it. And suspended load is made to drop inside the frame having plastic chops through mechanically and will be baled when the pressure of the load exerts on it. After baling the product is given as block covering it by a film on all the sides firmly where it will be easy for transportation process

2. LITERATURE REVIEW:

Normally there are many types of balers found in the recycling of waste products from the agricultural, paper waste etc.

1) **Agricultural Baler (Arsene Roth February 1997)** This research relates to an agricultural baler which includes substantially a pickup element, a conveyor which transports a harvested product stream picked up from a field, and a transferring device which conveys the collected product stream in direction toward a bailing chamber. In the known balers

the transferring device is composed of several profiled disks Which are fixedly mounted on a cylinder, the baler has sensors Which are formed as pilotable sensing brackets located between the pressing chamber for detecting the harvested product stream over the Width, an evaluating device connected with sensors, and adjusting means connected with the evaluating device. Basically this kind of device can only be used in making bales in agricultural field.

1) **Baler Machine and Method of Baling (Roman Schmaltz, Robert J. Wolf, and Enrich E. Salzmann, April 1993)** they carried out that that baler machine including a charging chamber for receiving material to be baled. The charging chamber has a charging passage through which material is forced into a baling compression chamber by a compression ram to thereby form a bale in the compression chamber. An ejection ram is provided for forcing the compressed material out of the baling compression chamber through an exit passageway. A movable decompression walls functions as one wall of the baling compression chamber. Such wall is located opposite and spaced from the charging passage through which material is forced from the charging chamber

2) **Baler machine with a bale transfer conveyor (Wilbur Van Ryswick, June 2003)** Here cylindrical bale forming machine has a bale transfer unit yieldable maintained in a transport or rest horizontal position located below the bale discharge gate to receive a bale discharged from the machine for transfer to a ground location rearward clear of the discharge gate. The transfer unit is operated in response to the movement of the discharge gate into its open or bale discharge position and is returned to its rest position in response to movement of the discharge gate out of the open position. These helped me frame idea towards our creation

3) OBJECTIVE:

As we gathered the few daily facts the waste discharged from the residential areas has been increased tremendously so we have made a low cost baler which can be kept in the residential areas to reduce the amount of waste plastic products. Considering the important factor as low cost, we have decided to design the baler which works mechanically with human help. We have designed the baler in the steel and the baler has press on its each side to get covered inside a film firmly and gives as a packed baled product inside a film.

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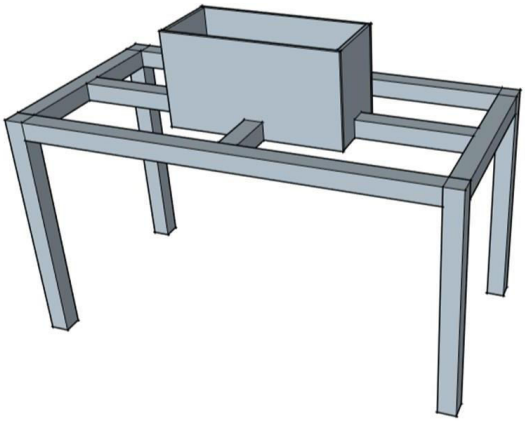

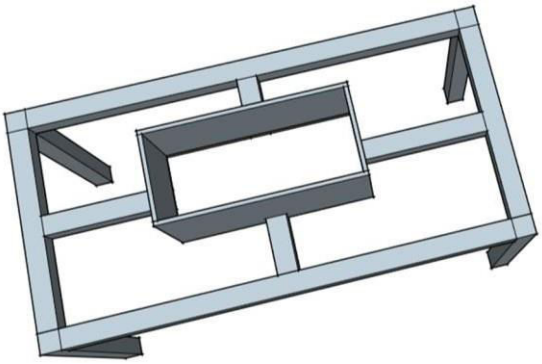

MATERIALS USED:

Here all the materials are made in the MS steel. The equipment's that are used in baler are

1. Base tray
2. Weight press
3. Four sided closed plates
4. Handle press
5. Supporting legs
6. Rotating arms
7. Motion plate.
8. Thin film

EXPERIMENTAL WORKING:

Initially the base tray is prepared by attaching four legs on its each side and they have grids in between them to withstand the pressure. The grids between the legs are equally spaced as 20x20 cm as 5 boxes and in which a single grid is movable.

Five plates are made ready for preparing a closed chamber on the base tray. The plates which are made to stand vertically on each sides are drilled with 18 mm hole for attaching handle on it.

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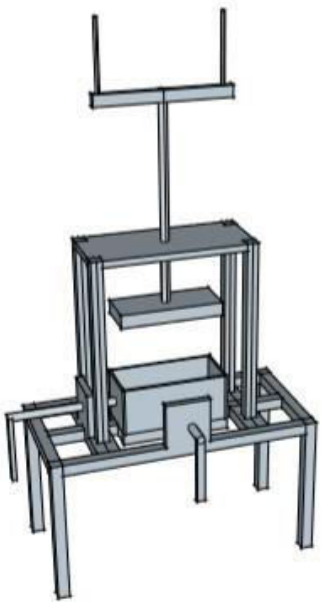

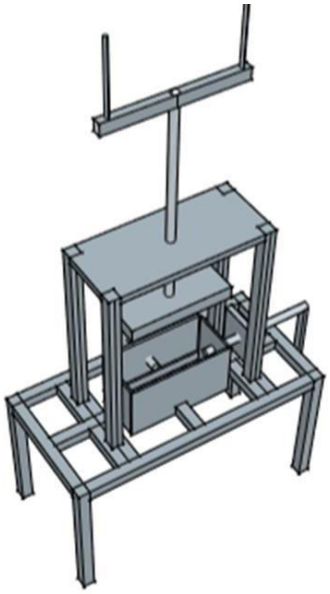

As very next process on the base tray four drilled plates are attached and the undrilled plate is used to close its bottom side. The movable grid has a plate attached to it. This makes the plate to come out and get the final product.

After attaching the plates, four legs are raised from the base plate to attach the vertical load that is suspended above. The weight suspended above is driven down to compress the chopped plastic using the rotating arm.

1. At first 20-25 plastic bottles are chopped initially before baling.
2. A film is made to attach on the all side of the plates. The chopped plastics are dropped inside the chamber.
3. At first the suspended load from the top is brought down by rotating the arm so the pressure is given on the plastic
4. After that all the sides of the plates gives pressure to the chopped plastic by rotating the arms in all the sides.
5. Then the baled plastic is equally pressurised from all the sides and covered by the thin film around it tightly.
6. By pulling out the moving plate we can remove the baled product from the baler.

IMPACT CALUCULATION:

1) To find the mass of the pressing weight

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volume of a cube V = L * W *H mm3

V--> volume of the cube in mm3

L--> length of the cube in mm

W--> width of the cube in mm

H--> Height of the cube in mm

as per the design structure dimension as below

L--> 200mm, W--> 100 mm, T/H --> 20mm

V= 200*100*20 = **400000 mm3**

2) The mass of an object can be determined by isolating m from the following formula:

P= m/v

and the final formula is:

m = p * V

where p --> is the density,

m -- > is the mass of the object/material and

V -- > is the volume.

3) **density of steel is 7.85 g/cc** (gram / cubic centimeter)

m = 7.85 * 400000

m = 3.14 Kg (Kilo Gram)

BY USING ONLINE CALCULATOR

Considering the cross section as a rectangle and the material used is steel.

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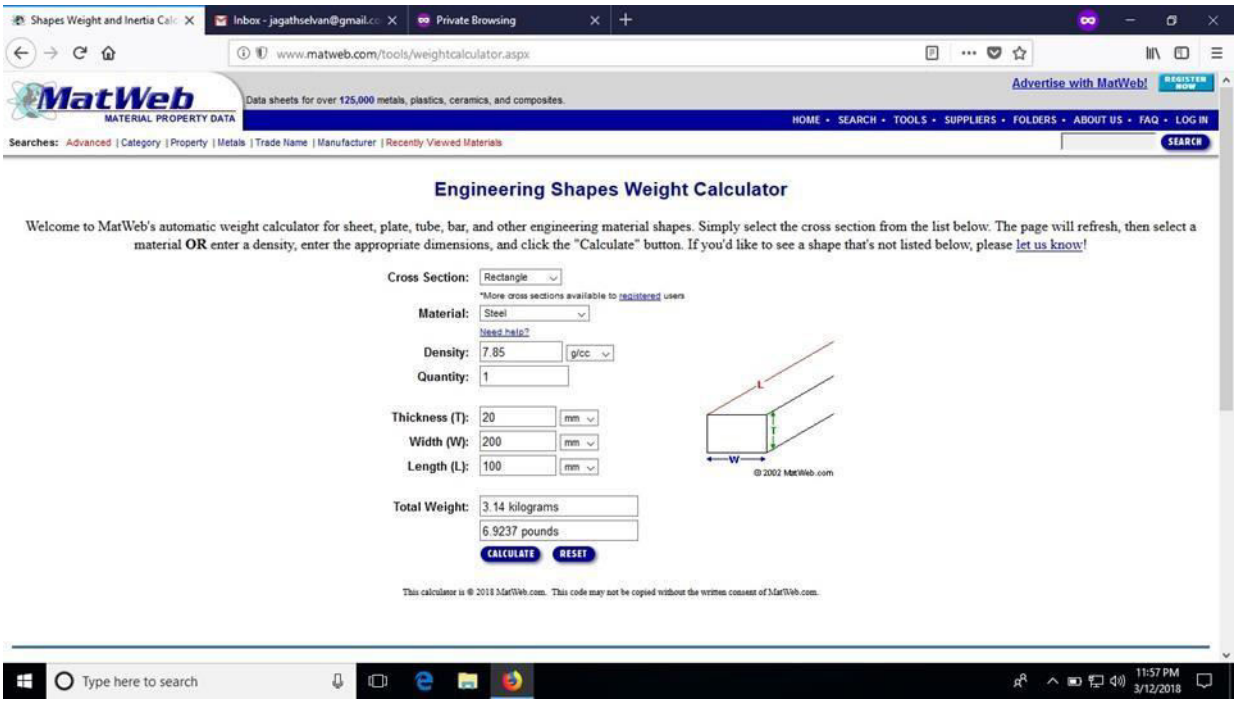

The weight obtained is **3.14 kilograms**

4) DISTANCE MOVE 'D':

DIN975 Standard Threaded Rod

Size	Diameter		Pitch
	Min	Max	
M5	4.83mm	4.98mm	0.80mm
M6	5.79mm	5.97mm	1.00mm
M8	7.76mm	7.97mm	1.25mm
M10	9.73mm	9.97mm	1.50mm
M12	11.70mm	11.97mm	1.75mm
M14	13.68mm	13.96mm	2.00mm
M16	15.68mm	15.96mm	2.00mm
M18	17.62mm	17.96mm	2.50mm
M20	19.62mm	19.96mm	2.50mm
M22	21.62mm	21.96mm	2.50mm

ANSI / BSW Threaded Rod

Size	Diameter		Thread / Inch
	Min	Max	
3/16"	4.62mm	4.80mm	24
1/4"	6.12mm	6.32mm	20
5/16"	7.69mm	7.91mm	18
3/8"	9.25mm	9.39mm	16
7/16"	10.82mm	11.08mm	14
1/2"	12.39mm	12.66mm	13
5/8"	15.53mm	15.83mm	11
3/4"	18.68mm	19.00mm	10
7/8"	21.82mm	22.18mm	9
1"	24.97mm	25.35mm	8

The linear distance d a screw shaft moves when it is rotated through an angle of α alpha degrees is:

d= l*α/360

l --> lead of the screw

from the design dimension 18 mm thread rod radius 9mm and standard pitch of 2.5 mm

Pitch is defined as the axial distance between adjacent threads on a helix or screw. In most screws, called "single start" screws, which have a single helical thread along their length, the lead and pitch are equal.

l = 2.5 mm

d = 2.5 * 360/360, α alpha --> 360 for a complete one rotation

d= 2.5 mm

5) The velocity of an object is the rate of change of its position with respect to a frame of reference, and is a function of time.

velocity v= d*t

d--> distance in mm

t--> time in sec

v= 2.5 * 1

= 2.5 mm/sec

6) The dynamic kinetic energy of a moving object

E = 1/2 m v2 (1)

where

E = dynamic energy (J, ft. lb.)

m = mass of the object (kg, slugs)

v = velocity of the object (m/s, ft./s)

v = 2.5 mm/s = 0.0025 m/sec

E = 1/2 * 3.14 * 0.0025 = 0.003925 Joules

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7) In an impact - like a can crush- the work made by an impact force slowing down the moving object in a deformation equals to the work done by a spring force - and can be expressed as

$W = 1/2\ F_{max}\ s$

$= 1/2\ k\ s2$ (2)

where

W = work done (J, ft. lb.)

Fmax = maximum force at the end of the deformation (N, lb.)

k = spring constant

s = deformation distance (m, ft.)

In a crush the dynamic energy is converted to work and equation 1 and 2 can be combined to

1/2 Fmax s = 1/2 m v2 (3)

The impact force can be expressed as

Fmax = m v2 / s (3b)

The deformation slow-down distance can be expressed as

s = m v2 / Fmax (3c)

As per the dimension the compression ratio of the plastic can is: 30 mm = 0.03 m

8) The impact force can be calculated as

Fmax = (3.14 kg) (0.0025 m/sec) ^2 / (0.03 m) = 6.54 KN

9) Note that the gravitation force (weight) acting on the can is only

F.w = m g

= (3.14 kg) (9.81 m/s2)

= 30.8034 KN

impact creates is less than the gravitational force because of the screw friction

10) Impact Force from a Falling Object

The dynamic energy in a falling object at the impact moment when it hits the ground can be calculated as

E = Fw h

= magh (4)

where

F.w = force due to gravity - weight (N, lb.)

ag = acceleration of gravity (9.81 m/s2, 32.17405 ft./s2)

h = falling height (m)

If the dynamic energy from the fall is converted to impact work - equation 2 and 4 can be combined to

1/2 Fmax s = m ag h (5)

The impact force can be expressed as

Fmax = 2 m ag h / s (5b)

The deformation slow-down distance can be expressed as

s = 2 m ag h / F (5c)

from the design dimension as height of 400 mm = 0.04m

Fmax = 2 (3.14 kg) (9.81 m/s2) (0.04 m) / (0.03m)

= 2.46 /0.03

Fmax = 82.14 KN

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ADVANTAGES:

- The Main Advantage Is We Can Use the Baler in Residential Areas Due to its Low Cost
- The Waste Plastic Can Be Used Efficiently Rather Throwing and Spoiling the Environment
- Shipping The Baled Materials for Recycling Becomes Easy and Reduces the Amount of Fuel Consumption of Vehicle.
- Baler Can Reduce the Labour Costs.

CONCLUSION:

1) The bales formed by this machine helps in easy handling, storage and transportation.

2) The manoeuvrability of the device is quite good and the handling is quite simple.

3) The cost of the machine is too low when compared to the balers which are used in industrial regions.

4) The amount of plastic bottle waste which are discharged in the environment can be reduced using the recycling through the balers.

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