AUTOMATION IN MATERIAL FILLING AND HANDLING SYSTEM IN GAYATRI PSYLLIUM INDUSRY

Group no-21

GUIDED BY: Prof.M.P.Rajapara
Prof.H.C.Patel

PRESENTED BY:

1) NADODA VIJAY N.(120780119070)
2) DESAI VISHAL N.(120780119085)
3) MAHESHWARI KARAN(110780119115)
4) RABARI VIJAY D.(120780119086)

OUTLINE

- Introduction
- Objective of project
- Methodology
- Structural modeling
- Design
- Workplan
- Scope of project
- References

INTRODUCTION

- In this project,we find and solve problem of material filling and handling problem in Gayatri psyllium industry,Dabhi,Unjha.
- In every manufacturing industry, raw materials need to be transported from one manufacturing stage to another.
- Material handling equipment are designed such that they facilitate easy, cheap, fast and safe loading and unloading with least human interference.
- It is easier, safer, faster, more efficient and cheaper to transport materials from one processing stage to another with the aid of material handling equipment devoid of manual handling.

OBJECTIVE

- Automation in material filling and handling system of industries using belt conveyor and sensors.
- Automation with less human interference.
- Improve efficiency.
- Reduce time

METHODOLOGY

Literature Survey

Detailed Study of material filling&handling

Development of layout design

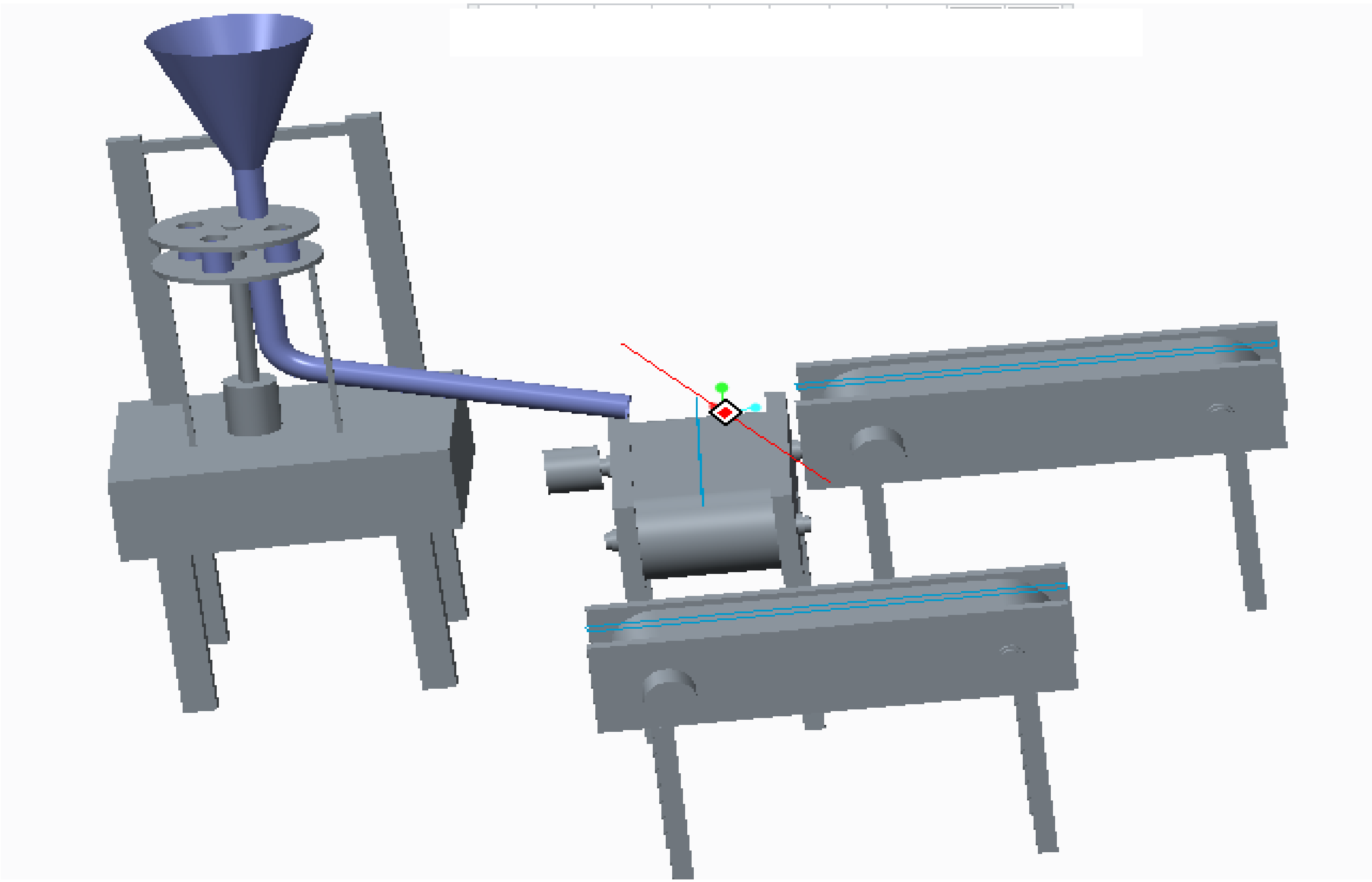
Material selection

Parameter Selection

Optimization

Final report

STRUCTURAL MODELLING



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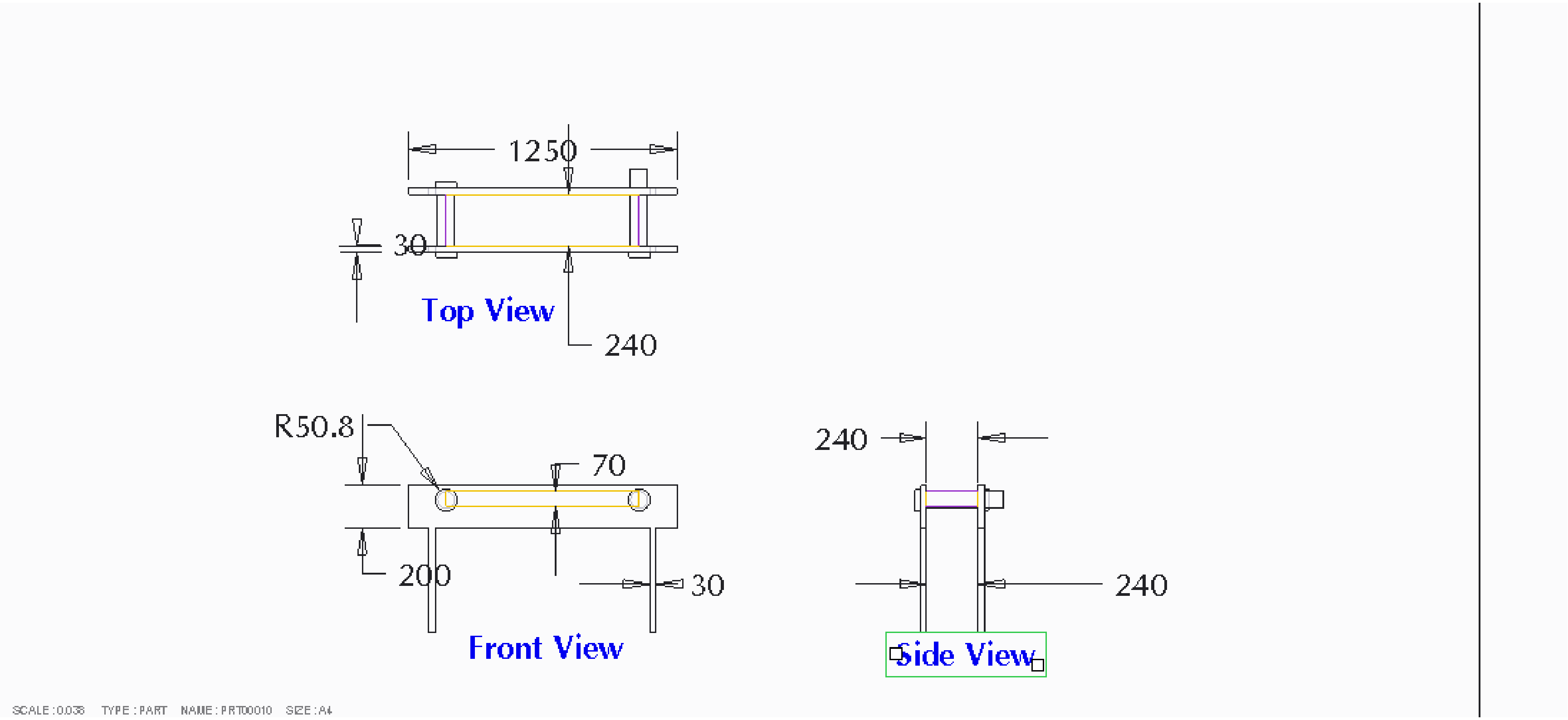
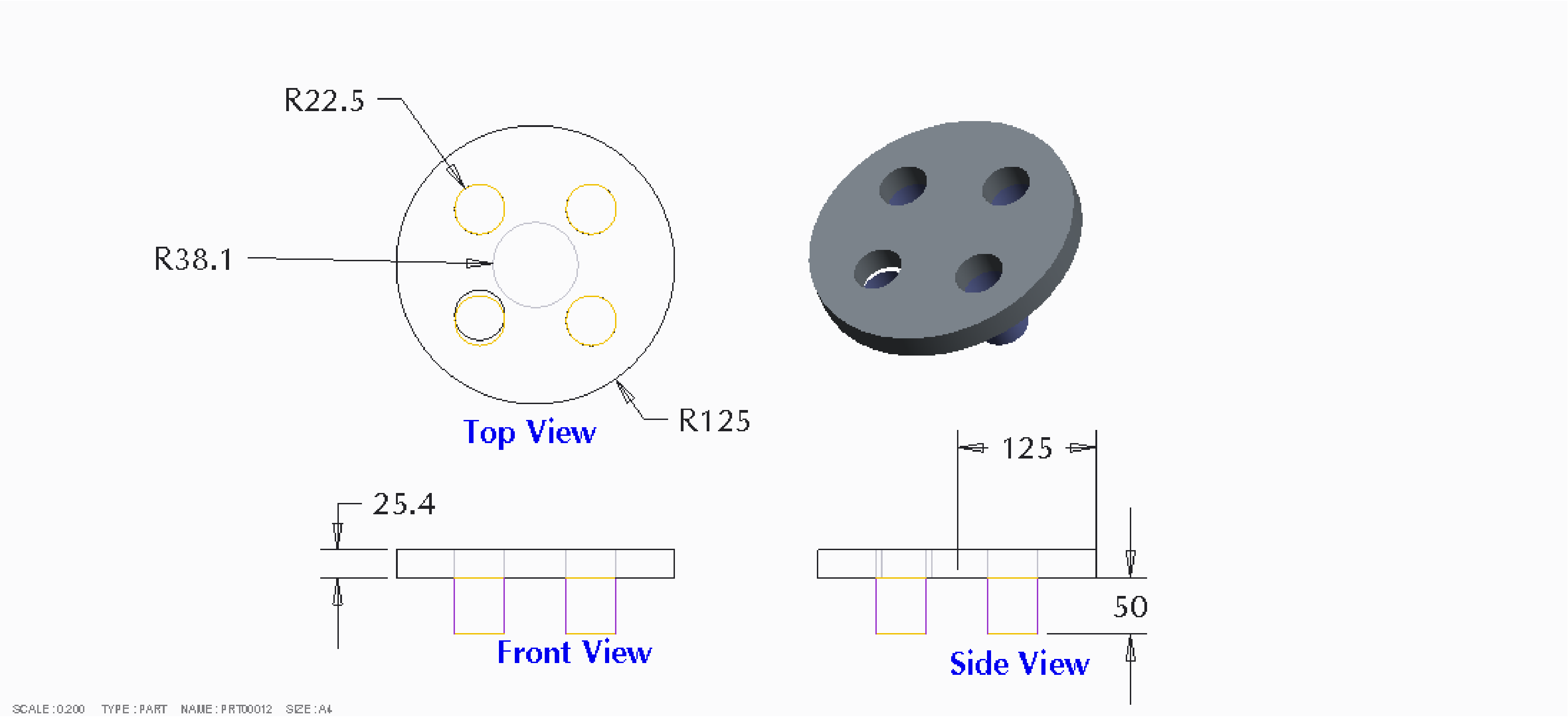
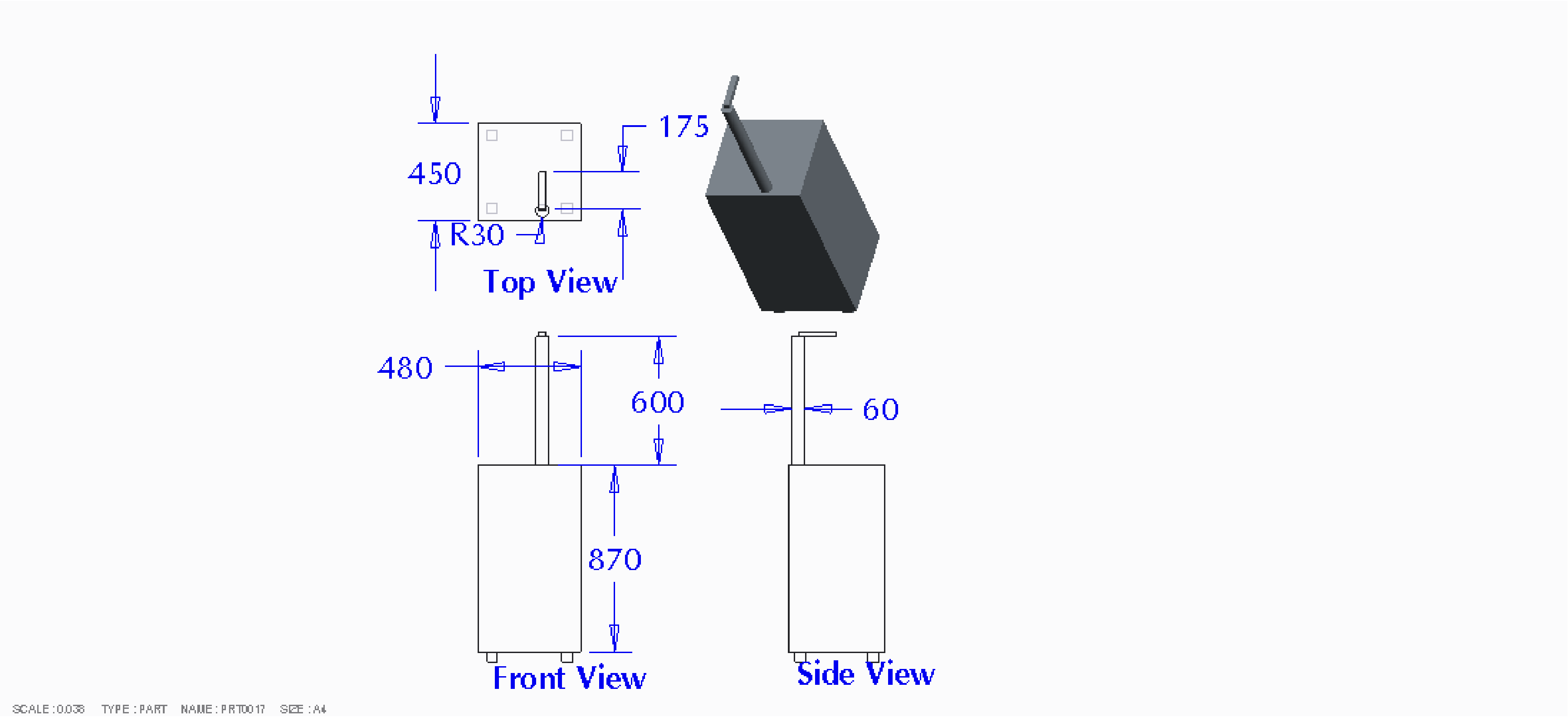

1250
30
Top View
240
R50.8
70
200
30
Front View
240
240
Side View
SCALE : 0.038 TYPE : PART NAME : PRT00010 SIZE : A4

CONTINUE



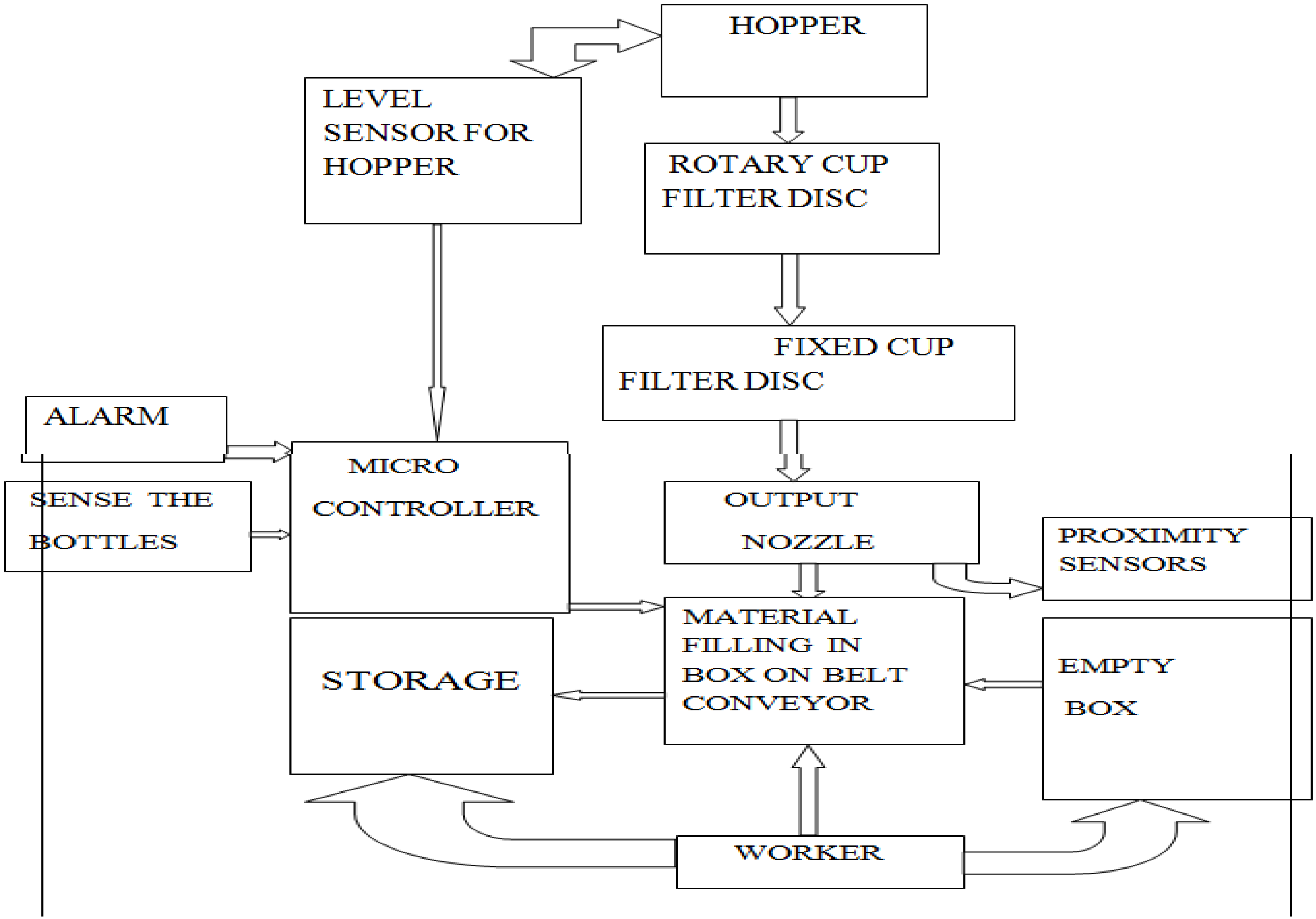
R22.5
R38.1
R125
Top View
25.4
Front View
125
50
Side View
SCALE : 0.200 TYPE : PART NAME : PRT00012 SIZE : A4

CONTINUE



175
450
R30
Top View
480
600
60
870
Front View
Side View
SCALE : 0.038 TYPE : PART NAME : PRT0017 SIZE : A4

DIAGRAM OF MACHINE



DESIGN

❖ CONVEYOR ENERGY REQUIREMENTS

- Power consumption is a conveyor system operating cost.
- Most unit handling conveyor systems are driven by a motor.
- The electric power required to drive the system is function of belt speed, unit load, belt weights, pulleys drive mechanism, length of belt conveyor and other component.

❖ EFFECTIVE BELT PULL

For roller belt

$$T_e = F_r L\left(W_m + 2W_b + R_t C_t + R_p + C_p + R_i C_i\right) + (W_m)h\}/F_t$$

$$\therefore T_e = \{0.075\ x\ 1(5 + (2 + 4) + (0.3\ x\ 16)\ + 0 + 0\ + 0) +\ (5)0\ \}/0.85$$

$$\therefore T_e = 1.57\ \mathrm{N/m}$$

CONTINUE

For roller belt

$$T_e = F_r L(W_m + 2W_b + R_t C_t + R_p + C_p + R_i C_i) + (W_m)h\}/F_t$$

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$$\therefore T_e = 1.57\ \mathrm{N/m}$$

Where,

T_e=Effective belt pull (kg)

L=Length of conveyor (m) =1m

W_m=Weight of unit load (kg/m) =5kg/m

W_b=Weight of belt (kg/m)

R_t=Unit weight of carrying roller less shaft (kg) =0.3kg

R_p=Unit weight of pressure roller less shaft (kg) =0

CONTINUE

R_i=Unit weight of return roller less shaft (kg) =0

C_t=No of carrying rollers per meter =16

C_p=No of pressure rollers per meter =0

C_i =No of return roller per meter =0

h =Net change in elevation (m) =0

- The unit load weight is determined by the no of loads on conveyor.

W_m=No of loads on conveyor x $\frac{\text{weight}}{\text{load}}$

- Drive pulley forces
- The drive pulley moves the belt by friction between two the amount of power loss from the pulley to belt is consider minor because forces $T_1$and $T_2$are designed to prevent slippage between pulley and belt.
- The relationship between T_1 & T_2 is

$$T_2 = K_2 \, T_e$$

CONTINUE

$$T_1 = K_1\, T_e$$

Where, $K_1 = \frac{C}{C-1} = \frac{2.49}{2.49-1} = 1.67$

$$C = ep\left(\frac{\pi}{180} f_a\right) = 2.49$$

f=0.25 for bare steel pulley

a =Arc of contact between belt & pulley = 210°

$$K_2 = {}^{1}/_{C-1} = {}^{1}/_{2.49-1} = 0.67$$

$$\therefore T_2 = 0.67 \text{ X}1.57 = 1.05 \frac{N}{m}$$

$$\therefore T_1 = 1.67 \text{ X}1.57 = 2.62 \frac{N}{m}$$

CONTINUE

- The torque requirement at the drive pulley to move the belt is

Torque = T_e x drive pulley diameter (m)

$=1.57 \times 0.10$

$=0.157$ N.m

- Angular velocity

$V = \text{Velocity of belt} = 0.06 \text{ m/s} = {}^{\pi DN}/_{60}$

$\therefore V = {}^{V \text{ X } 60}/_{\pi \text{ X } D}$

$= {}^{0.06 \text{ X } 60}/_{3.14 \text{ X } 0.1}$

$=11.46$

W_{dp} (r.p.m) = 3.187 X $^{\text{belt spped}}/_{\text{drive pulley diameter}}$

$=3.187 \text{ X } {}^{11.46}/_{0.1}$

$=437.42$

CONTINUE

- Power required at the pulley shaft

$$P_{dp} = {}^{W_{dp} + \text{Torque}}/_{63025 \text{ X } 0.95}$$

$$= {}^{437.92 + 0.157}/_{63025 \text{ X } 0.95}$$

$$= 6.94 \text{ X} 10^{-3} \text{ KW}$$

$$= 6.94 \text{ W}$$

$$\approx 7\text{W}$$

COMPONENTS

- Belt conveyor
- Hopper
- DC motor
- Microcontroller
- Transformer
- Buzzer alarm

BELT CONVEYOR

- A Conveyor Belt is the carrying medium of automatic bottle filling machine.
- The powered Pulley is called drive pulley and the unpowered pulley is called idler pulley.
- In the Box filling machine generally the rubber conveyor belt is used for convey the bottle.
- The Belt looped around each of the rollers which are powered by an Electrical DC Motor.

BELT

Length Of Belt : 180 cm
Width : 16 cm
Material : Resin

ROLLER

No. Of Rollers : 2

DC MOTOR

- A DC motor is any of class of electrical machines that converts the direct current electric power into mechanical power.
- It produce rotary motion; a linear motor directly produces force and motion in a straight line.
- In Box filling machine the dc motor is used to rotate the conveyor belt at a desired speed.

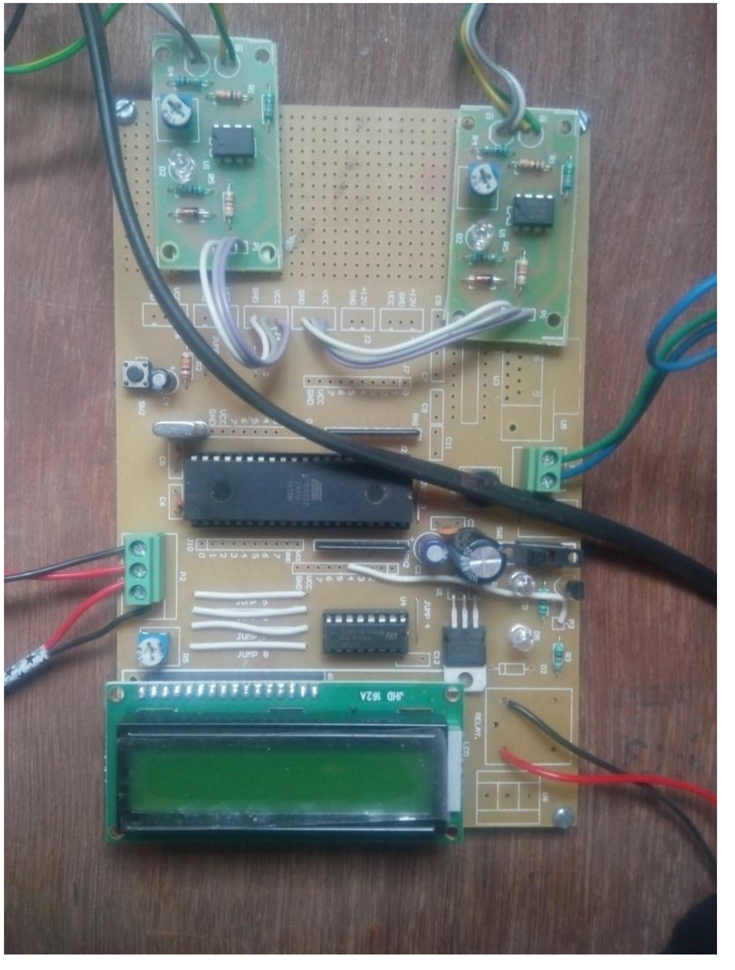
Voltage =12V
Rpm = 30 & 50

HOPPER

- A container for a loose bulk material such as grain, rock, or rubbish, typically one that tapers downward and is able to discharge its contents at the bottom.
- Upper cross-section=29cm x 29cm
- Lower cross section=7.5cm x 7.5cm
- Height= 20cm

MICROCONTROLLER

- Company name= ATMEL
- Model type= 8051 family



WORKPLAN

	2015						2016			
	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April
Survey										
Finding problems										
Literature review for solving problems										
Identify possible mechanisms										
Selection of best mechanism										
Design and calculation										
Decide the sizes of components										
Purchasing										
Fabrication										
Assembling										
Testing										

SCOPE OF PROJECT

- In food industries.
- In material handling industries.
- Agricultural product industries.
- Dairy products

CONCLUTION

- Using the designed values above, a belt conveyor system with 2 roll idlers can be developed for conveying material box efficiently without belt sllipage and fatalities.
- Racgin belt with the specifications above will sufficiently convey the material box.
- The belt conveyor system is designed with high degree of automation, loading, movement and unloading efficiency.
- It is also very flexible, safe, with low initial, operational and maintenance cost while eliminating repetitive short distance movement in the manufacturing industry.
- By use of level sensor in hopper, we set an alarm when hopper is empty.

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THANK YOU