Design And Fabrication of Material Handling System For Horn Manufacturing Power Press

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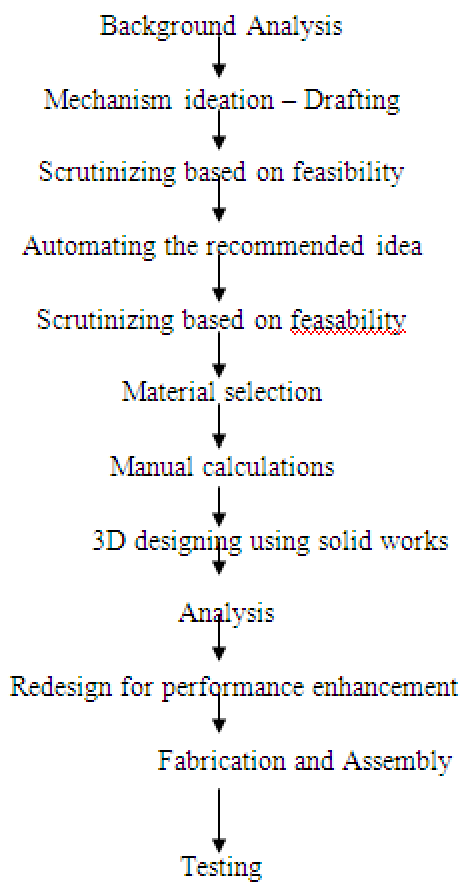
Abstract- *Material Handling is the field concerned with solving the pragmatic problems involving the movement, storage in a manufacturing plant or warehouse, control and protection of materials, goods and products throughout the processes of cleaning, preparation, manufacturing, distribution, consumption and disposal of all related materials, goods and their packaging. We visited the roots horn manufacturing division and identified a major problem which causes lot of defective products. The problem is improper material handling of material coming out for a power press. In our project we are design a new material handling system and analyze that for proper function. After that this will be implemented in that particular press.*

Keywords- the Material Handling, Power Press

I. INTRODUCTION

In automobile, Horn is one of the important electronic component. It consists of different parts like sheet metal and other electrical circuits.Presses are used to produce small parts used in horn. In this machine the all the processes are automated by feeder and decoiler unit. The current material system producing lot of defects while in the handing process like bending, scratches and spreading of workpiece. For the proper functioning of the horn and to increase the rate of production we have to reduce the defects.

1.2 Methodology



II. LITERATURE REVIEW

2.1. Concept

In this machine the all the processes are automated by feeder and decoiler unit.

2.2. Press

2.2.1.Decoiler

Figure 1 Decoiler

The work piece in the form of continuous sheet metal is in the form of coil is used in feeder press. The coiled work piece in decoiler is rectangular shape.

2.2.2. Decoiler cum straightener

These are suitable to uncoil as well as straighten the coil material and find extensive application in press shops

2.2.3. Pneumatic feeder

Press Feeder to meet new competitive challenges in Speed/ Accuracy/ Reliability/

2.2.4. Press Machine

High productivity: Continuous process machining is available Fast speed: It can approach 600 strokes per minute

2.3. Press Specification

Type	-	Power Press
Model	-	SN1 - 60
Serial No.	-	EW60 - 2541
Date	-	2010.12
Capacity	-	60tf
Stroke	-	50mm
Stroke/ min	-	70 – 150 mm
Die height	-	270 mm
Slide adjustment	-	70 mm
Slide area	-	480 × 400 mm
Bolster area	-	900 × 520 mm
Air pressure	-	5 kg
Main motor	-	10× 4 motor
Power supply	-	415 V, 50 Hz

III. PROBLEMS STATEMENT

- Bend in work piece
- Scratches
- Spreading of work piece

3.1. Bend in Work Piece

Causes

The work pieces coming out from press has high kinetic energy due to its high velocity.

Solution

The kinetic energy of the work piece was reduced by stopper attachment which was a cushion bed.

3.2. Stratches in Work Piece

Causes

The finished work piece has sharp corners in their edges.

Solution

These scratches are reduced by minimizing the metal contact between work piece coming out from the system

3.3. Spreading of Work Piece

Causes

This problem because there is no guidance for work piece from delivery of press to until it reaches the collecting tray base.

Solution

The proper guidance to the work piece is provided by the new system.

IV. CONCEPT DERIVED

The concept derived to solve the list of problems involves the following mechanical components

- Conveyer system
- Collecting tray
- Stopper

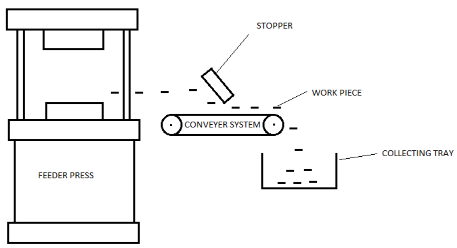


Figure 8 Concept Derived

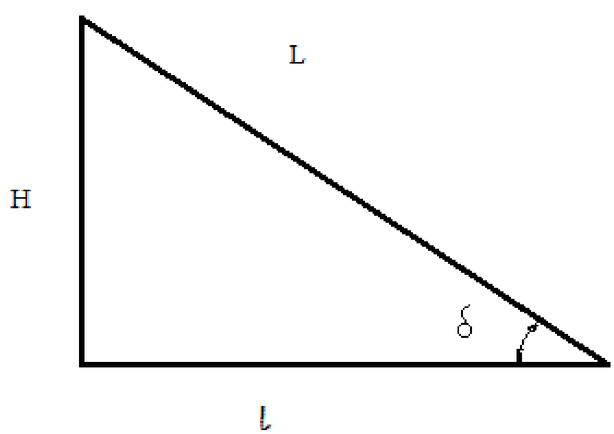
4.1. Conveyor System

4.1.1. Recommended Conveyor - Belt Conveyor

Belt conveyor system consists of two or more pulleys, with an endless loop of carrying medium – the conveyor belt

4.1.2. Design Of Belt Conveyor

Step 1:



Conveyer length (L) through which material is conveyed

Where ,

δ - Conveyor inclination in °,

H - Height through which material is conveyed in m,

l - Horizontal span of Conveyor in m,

L – Conveyor length in m.

We are designing a flat conveyer. Therefore angle of inclination (δ) is 0°.

Then , H = 0

Step 2:

Minimum belt width (Bmin)

Assumption, maximum belt width (B) as 1000 mm.

From P.S.G. Data book Page no. 9.20, table no. 3

Belt conveyor speed (v) = 1.25 m/s

From P.S.G. Data book Page no. 9.18,

Bmin = 1.11[{Q/cv}½ +0.05]

Where,

Q - Conveyor capacity, tonnes /hr

= 1.5 kg/hr =0.0015 tonnes/hr

c – Factor for the type of idler

= 240, for flat belt from P.S.G. Data book page no. 9.18.

v – Belt speed, m/s

= 1.25 m/s, from P.S.G. Data book Page no. 9.20,table no.3

Bmin = 1.11*[{0.0015/240*1.25}½ +0.05]

= 0.0579 m

= 57.9 mm

Standard belt width is selected as 400mm.

B = 400mm

Step 3:

Load per meter length of conveyor (q)

q = Q/ 3.6*v from P.S.G. Data book Page no. 9.26.

Where,

Q - conveyor capacity, tonnes /hr

v – belt speed, m/s

take Q = 60 kg/hr = 0.06 tonnes/hr

q = 0.06/3.6*1.25

= 0.013 kg/m length

Step 4:

Resistance to be overcome by belt (P)

From P.S.G. Data book page no. 9.18,

P = Wo + Wu

Where,

Wo – Resistance of the belt on the top run, kgf

Wu - Resistance of the belt on the bottom run, kgf

From P.S.G. Data book Page no. 9.18,

$Wo = C\ f\ L\ [(Gg + Gb) \cos^{\delta} + Gro] \pm H\ (Gg + Gb)$

$Wo = C\ f\ L\ [Gb \cos^{\delta} + Gru] \pm H\ Gb$

Here, H = 0.

C – Secondary resistance factor

= 9, from P.S.G. Data book graph on page no. 9.18 for corresponding 'L' value

f – Friction between idler and belt,

= 0.02 for standard belt conveyors, from P.S.G. Data book Page no. 9.18.

L – Length of the conveyor, in m

Gg – Weight of material to be conveyed per meter length, kgf/m

= q = 0.013 kgf/m [already calculated]

Gb – Weight of belt per meter length, kgf/m

[From P.S.G. Data book Page no 9.19, table 1]

Belt width is selected as 400 mm,

For that value Gb = 5 kgf/m
δ -angle of inclination of conveyor = 0°
Gro – Weight of toughing idlers on the top run/m length
[From P.S.G. Data book Page no 9.19, table 2]
Tube diameter, d = 100 mm
Bearing diameter, d^b =20 mm, are selected.
For the above values,
Gro = 29.9 kgf/ m
Gru – Weight of toughing idlers on the bottom run/m length
[From P.S.G. Data book Page no 9.19, table 2]
B = 400mm, d = 100 mm, d^b = 20 mm.
Gru = 21.3 kgf/ m
H – height through which material is conveyed, m
H = 0, [because it is a flat].
Wo = 9*0.02*1* [(0.013 + 5) + 29.9]
= 6.28 kgf
Wo = 9*0.02*1* [5 + 21.3]
= 4.734 kgf

P = Wo + Wu
= 6.28 + 4.734
P = 11.018

Step 5:
hp of drive
hp = P . v / 75
Where,
P – Total resistance of belt, kgf
v - Belt speed, m/s
hp = 11.018* 1.25/ 75
= 0.1836 hp
The next standard size drive is selected as
hp = 0.25 hp.

Step 6:
Tensions in the belt (T1 , T2)
From P.S.G. Data book Page no 9.18,
T1 = P * [e^μπ/ e^μπ-1]
Where,
α – Angle of lap, rad
= 180 = π rad [for flat belt d1 = d2]
μ - co-efficient of friction
= 0.3
T1 = 11.018 * [e^0.3* π / e^0.3*π-1]
= 29.9 kgf
T2 = T1 – P
= 29.9 – 11.018 = 18. 932 kgf

Step 7:
Number of plies (i),
i = T1 / B. f
Where,
T1 – Maximum tension in belt, kgf
B – Belt width, m
f – Working tension of belt for 1 mm width, kgf/mm
= 0.54, from P.S.G. Data book Page no 9.21, table 5
i = 29.9/ (400*0.54)
= 0.13 ≈ 1

Step 8:
Standardize the number of plies
From P.S.G. Data book Page no 9.21, table 4
imin = 3
imax = 5
We selected, i = 3 plies.
For the above requirements **M 24** belt is selected.

Step 9:
Length of the belt required (L)
Lbelt = π/2* (d1 + d2) + 2*x + (d1 + d2)^2/ 4* x
Where,
d1 - diameter of larger pully, mm
d2 - diameter of smaller pully, mm
x - center distance between centers, mm

Lbelt = π/2* (100 + 100) + 2* 1000 + (100 + 100)^2/ 4* 1000
= 2324.16 mm
Lbelt = 2.324 m

4.1.3. Belt

Belt specification:
M 24 Grade
Material = synthetic rubber
Width = 400 mm
Length = 2.324 m

4.1.4. Roller

Roller specification:
Material = stainless steel
Roller diameter = 100 mm
Rod diameter = 20mm

4.1.5. Bearing with Block

Specification
Size of rod = 20 mm
Base length = 112 mm
Base width = 28 mm

4.1.6. Frame

Specification:
Material = Mild Steel
Overall length = 1.8 m
Overall width = 600 mm

4.2. Collecting Tray

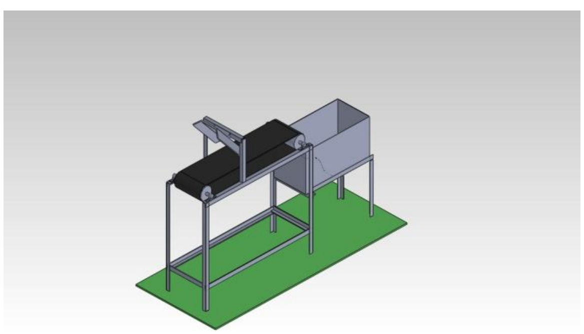
In this design the metal contact between the new work piece coming to the tray.
So that the scratches on the work pieces are reduced Rectangular box – 700mm * 500mm * 400 mm with thickness of 2mm.

4. 3. Stopper

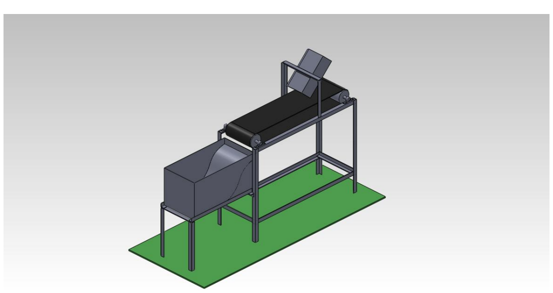
It is made up of rubber and it is stickled on one rectangular plate by suitable medium. It attached on the top of the belt at particular 40° to 45° angle of inclination with the base. This attached in the base at 700mm distance from the material entrance of the system.
Specification:
Material - rubber
Length = 450mm
Width = 300mm

4.4. Assembly Views Of The System

4.4.1 Assembly View 1:



4.4.2. Assembly View 2



V. COST ESTIMATION

5.1 Material Cost

SL. NO.	CONTENT	MATERIAL	QUANTITY	AMOUNT (RS)
1	HALLOW PIPE FOR ROLLER	MILD STEEL	2 nos.	300
2	CIRCULAR ROD FOR FOR ROLLER	SYNTHATIC RUBBER	2 m	200
3	L ANGLE	MILD STEEL	10 m	1500
4	BEARING WITH BLOCK	ALUMINIUM	4 nos.	600
5	SHEET METAL	ALUMINIUM	20 m²	500
6	RECTANGULAR PLATE FOR STOPPER	STEEL	600 mm²	200
7	RUBER PAD	RUBBER	600 mm²	300
8	AC. SYNCHRONOUS MOTOR	-	1 no.	2500
9	COUPLING	STEEL	1 no.	200
10	PLATE FOR L – BRACKET	MILD STEEL	300	200

TOTAL = Rs. 6500

5.2 LABOUR COST:

Drilling, Welding, Grinding, Power Hacksaw, Gas Cutting, Sheet Metal Tray Fabrication:
Cost = Rs. 3000

5.3 OVERHEAD CHARGES:

The overhead charges are arrived by "Manufacturing cost"
Manufacturing Cost = Material Cost + Labour cost = 6500 + 3000
= 9500
Overhead Charges = 20% of the manufacturing cost
= 1900

5.4 TOTAL COST

Total cost = Material Cost + Labour cost + Overhead Charges
= 6500 + 3000 +1900
= 11400
Total cost for this project= **Rs. 11400**

VI. CONCLUSION

The new material handling system was very much effective in the handing process. The rate of rejection was reduced in the production. The handling of the work pieces was improved by the new design. The quality of parts was increased and the rate of rejection was reduced. The above advantages were achieved by the new material handling system.

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