Design and Fabrication of Telescopic Conveyor

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Abstract

Requirements in material handling industry is pressed to find solutions to convey materials over a wide range of varying distances. In order keep up, significant technology advances have been required in the field of Material handling system designs and development. The application of traditional components into a mechanical assembly which can expand and retract would be a boon to the material handling industry so hereby we present a telescopic conveyor system that can be used over a wide range of distances.

Keywords: *Flexible conveyor,powered material conveying*

I. INTRODUCTION

Conveyor is one of the mainly used material handling equipment. Conveyors are a powerful material handling tool. They offer the opportunity to boost productivity, reduce product handling and damage and minimize labour content in a manufacturing or distribution facility. There is definitely an economic need not only to control the conveyor speed and the number of parallel machines, but also to find the optimum solution in reaching the maximum profit of a deterministic production quantity. We have a conveyance system designed to solve ever expanding bulk material handling needs over varying distances. Therefore, main focus of this presentation will be to develop sustainable designs for conveying material over a wide range with lesser number mechanical equipment.

The major idea is to stack two or more conveyor frames into one such that the length of the conveyor can be achieved as per the need. The major problem in Telescopic conveyor design is the maintenance of stable tension over the overall length of the conveyor system. The overall usable length of the conveyor will be approximately 75% of the actual length of the stacked conveyor frames.

A. *Vertical adaptability*

Occasionally material needs to be delivered at a certain angle and the conventional conveyors can handle materials only to angles around 16-18 degrees. But again, non-traditional variations of beltconveyors with the use of grip type belt have been quite successful at increased angles as well as straight up.

B. High angle conveyor (hac)

Some of the conveyor components handles materials in a non-conventional way. For example, a concept known as a sandwich conveyor has the material carried between two belts. The angle of transmission canbe increased upto 30 degrees by using grip-top type belt.

II. LITERATURE SURVEY

i. Alspaugh. M. A. "Latest Developments in Belt Conveyor Technology" Presented at MINExpo 2004Las Vegas, NV, USA. September 27, 2004. Horizontal curves and intermediate drives have changed and expanded belt conveyor possibility.
ii. Masood S.H. Abbas B.ShayanE.Kara A. DOI 10.1007/s00170-003-1843-3 International Journal - Advance Manufacturing Technology (2005) 25: 551–559 An investigation into design and mechanical conveyors systems for food processing.
iii. NazzalDima, Nashar Ahmed El "Survey of Research in Modelling Conveyor - Proceedings of the 2007 Winter Simulation Conference. Based Automated Material Handling System in Water Fabs.
iv. Rohini N. Sangolkar, Vidhyadhar P. Kshirsagar, International Journal of Technical Research and Applications **e**-ISSN: 2320-8163, www.ijtra.com Volume 3, Issue 4 (July-August 2015), PP. 178-181. Modelling and analysis of industrial belt conveyor system using creo parametric and ansys software.

III. TECHNICAL SPECIFICATIONS

- Conveyor Length – 2.5m
- Expandable length – 1m
- Conveyor width – 650mm
- Belt width – 400mm
- Material Of Construction – 2mm and 3mm thick M.S Sheet.
- Belt – 400X3mm thick (PVC) Rough Top.
- Motor – 0.5HP – 1No.

- Gearbox – W 63 (Worm gear 57 rpm)
- Head Pulley – Ø165x6mm Thick with Rubberized.
- Return Roller – Ø89mmPipe.

IV. DESIGN CALCULATIONS

W_0 = CfL[(G_g+G_b) cos□ +G_{r0}]±HG_g+G_b (minus for conveying down)

W_u = CfL[(G_g cos□ +G_{r0})∓ HG_b (plus for conveying down)

W_0- Resistance of the belt on the top run, kgf

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

C- Secondary resistance factor

f- Friction between idler and belt

L- Conveyor length, m

G_{g-} Weight of conveyed material per meter length, kgf/m

G_{b-} Weight of the belt per meter length, kgf/m

G_{r0-} Weight of straight idlers on the bottom run per meter length, kgf/m

H- Height through which the material is conveyed, m

A. Resistance of the belt on the top run:

W_0 = CfL[(G_g+G_b)cos□ +G_{r0}]±HG_g+G_b

=2*0.02*2.5[(1500+5)cos(0)+10.7]+0(1500)+5

=**115.7 Kgf**

B. Resistance of the belt on the bottom run:

W_u=CfL[($G_g$cos□+G_{r0})∓HG_b

=2*0.02*2.5[(1500(cos(0))+10.7)]+0(5)

=**101.07 Kgf**

C. Total resistance force:

P= W_0 + W_u

= 115.7+101.07

= **216.77 Kgf**

D. Belt Speed:

Capacity = 20ton/hr

400mm = 20kg

2400mm = 120kg

4800mm = 240kg

2400/120 = x/20000

v=0.11m/s

E. Power of the motor:

HP= Pv/75

=216.77*0.11/75

=0.32HP ≈ **0.5HP**

F. Angular Velocity:

φ*r = v= 0.11

r= 165/2 mm from data book

φ= 1.34rad/s

πDN/60= 0.88

N= 168rpm= **2.8rps**

M_t =P*60/2πn

= **1.313N/m**

τ=2.58*10^{-3}N/mm^2(Including tension)

Assuming factor of safety to be 1.7

τ= 4.386*10^{-3}N/mm^2

G. Diameter of the head shaft:

$M_{t=}$ (π/16)*τ*d^3

d^3= 16717.6

Head Shaft diameter, **d= 24.5mm**

V. CAD MODELLING

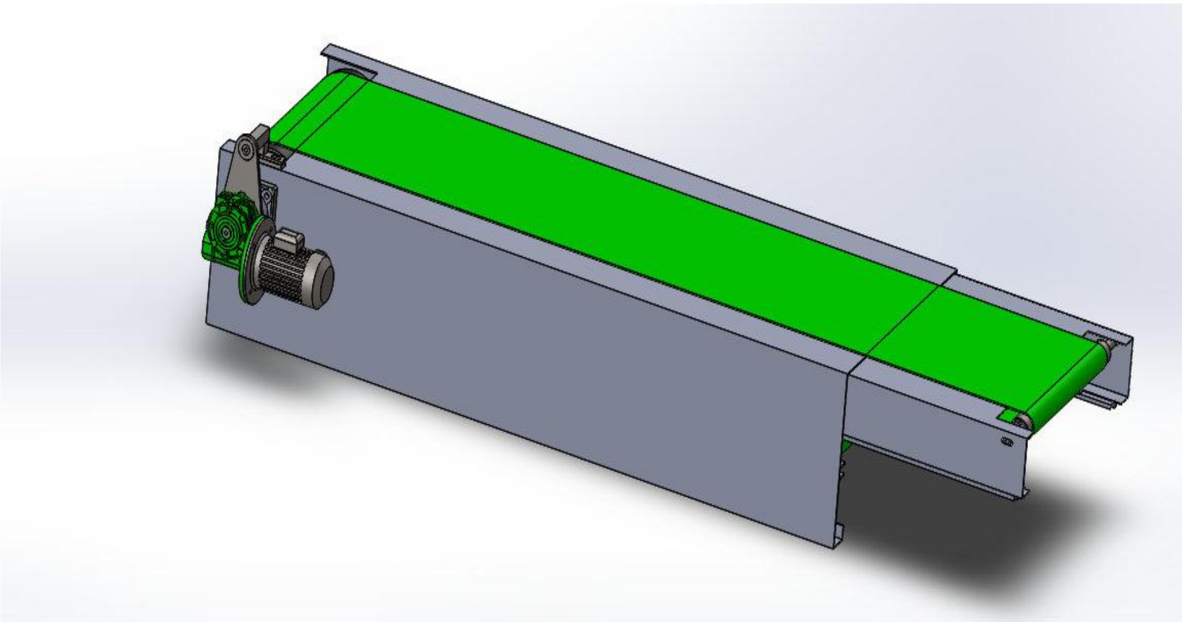
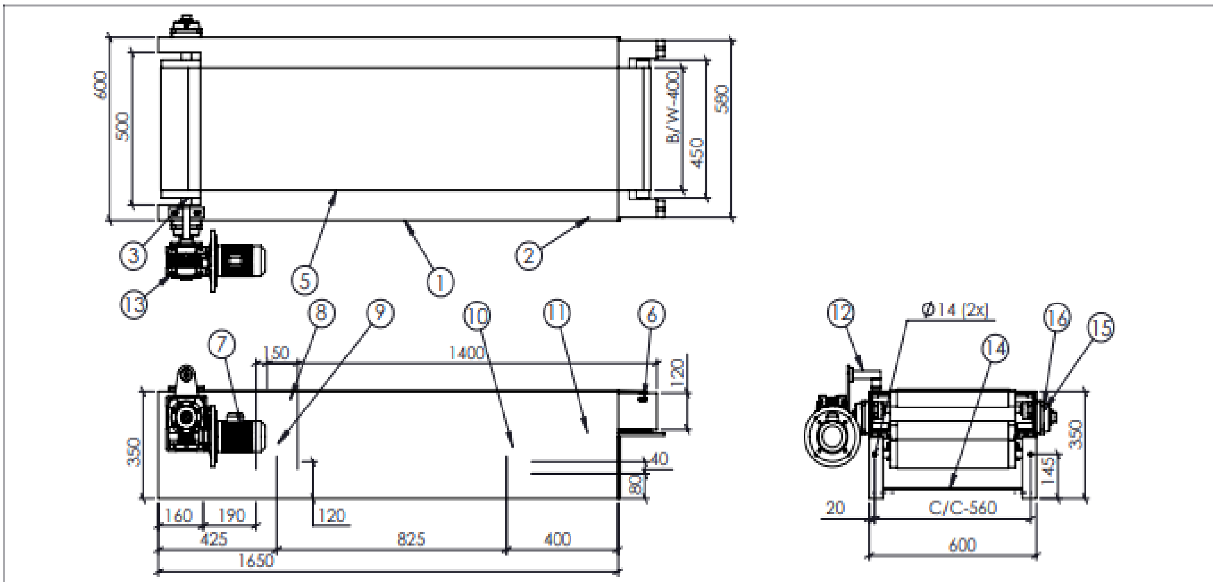


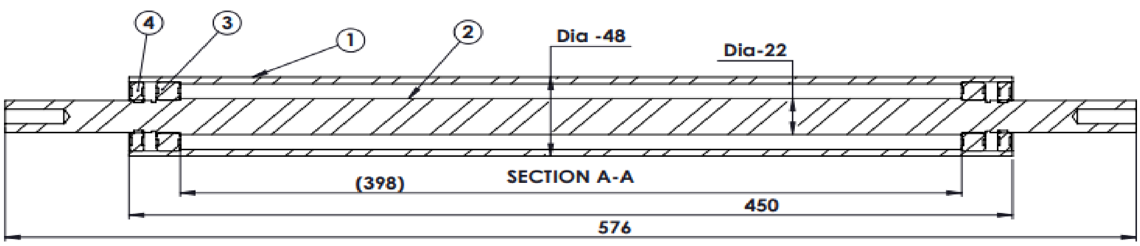
Fig5.1: 3-D Model



ITEM NO.	DESCRIPTION	QTY.
1	Outer Folding Sheet - 1650x350x600mm	1
2	Outer Folding Sheet - 1400x120x580mm	1
3	Head Roller - Ø165x450mm	1
4	Tail Roller - Ø89x450mm	1
5	Belt - 400x3mm-6100mm-PVC Plain belt	1
6	Top Return Roller - Ø48x450mm	1
7	Return Roller Assembly - Ø48x450mm	1
8	Roller Assembly - Ø76x4x450mm	1
9	Drive shaft with sprocket assembly	1
10	Non drive shaft with sprocket assembly	1
11	Linear Arrangement	2
12	W63 Gearbox arrangement	1
13	W63 P80 (ratio-25) with 0.75HP Motor	1
14	AS16 P40 P63 with 0.25HP Motor - Mounting	1
15	UCF206mm bearing	2
16	UCF206mm bearing mount plate	2
17	UCFL 204mm bearing	2
18	UCFL 204mm bearing mount	2

Fig5.2: 2-D Assembled View

Return Roller-1 A



1) MS Pipe-Dia 48x4mmx450mm-1No
2) MS Shaft-Dia 22x576mm-1No
3) Bearing -6004zz-2No's
4) Oil Seal-2 No's

PROJECT TITLE: **TELESCOPIC CONVEYOR 2.5M**

Student's name and Register number: ABHIJITH TJ (714015114002), AJITH C R (714015114005), ARAVIND V (714015114011)

PART NAME: ROLLER 1 A; MATERIAL: MILD STEEL; QUANTITY: 1 NO

PLOT SCALE: 1:3

ALL DIMENSIONS ARE IN mm

Fig5.3: Design of head roller assembly

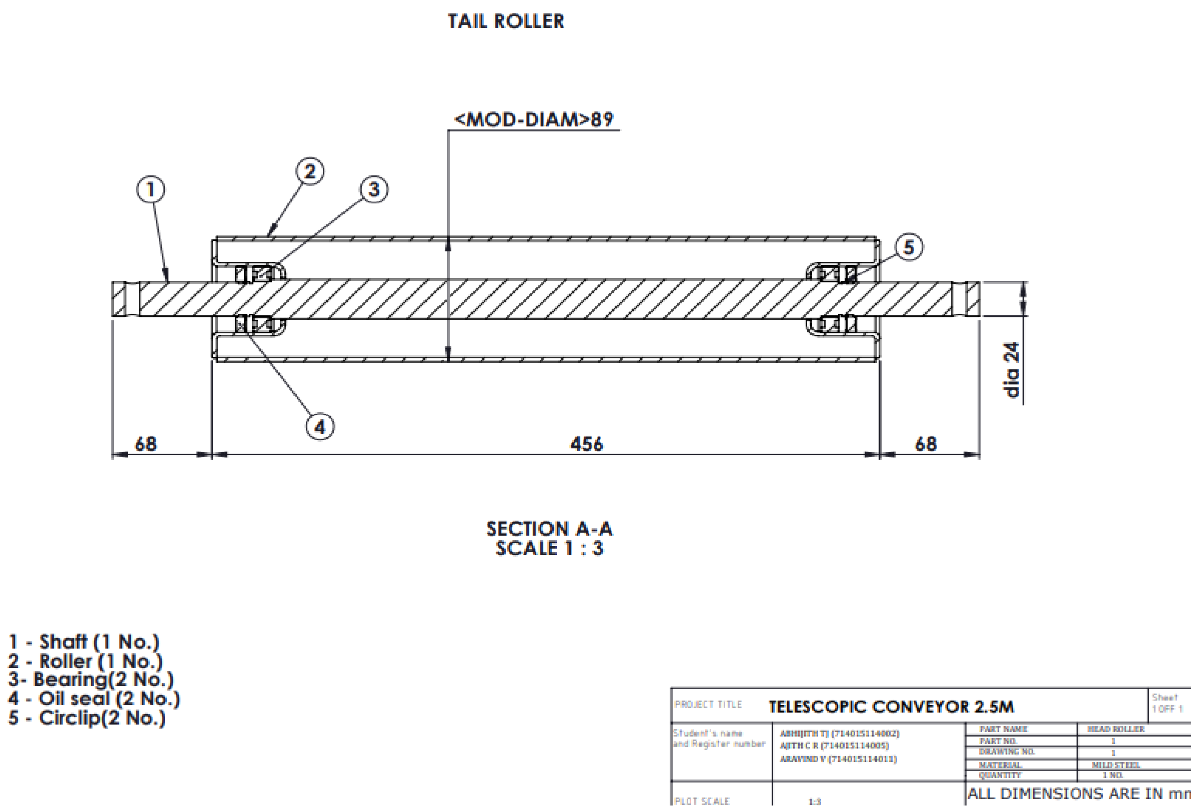


Fig5.4: Design of tail roller assembly

VI. COMPARISON OF PROPOSED SYSTEM WITH MANUAL AND CONVENTIONAL MATERIAL HANDLING

A. Space requirment

Due to the stacking nature Telescopic Conveyor will be very useful in workplaces having space constraints. The mobile conveyor can be easily carried and taken away to any position or place as and when required.

B. Lesser number of conveyors

One telescopic conveyor can be used at different places which requires two or more conventional conveyors. E.g. Loading and unloading in a large container.

VI. CONCLUSION

The telescopic conveyor is designed with 2.5m length and 0.65m width and we conclude that the proposed system works within the specified working ranges (1.4m – 2.5m).The system is very compact that the space required for the storage of telescopic conveyor system is 62% less than that of the conventional conveyor system.

VIII. FUTURE SCOPE

Further on the conveyors can be made even more compact and light weight by increasing the usable area and high strength material for fabrication of the frame respectively.

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[1] Alspaugh. M. A. “Latest Developments in Belt Conveyor Technology” Presented at MINExpo 2004Las Vegas, NV, USA. September 27, 2004.

[2] Masood S.H. Abbas B.ShayanE.Kara A. DOI 10.1007/s00170-003-1843-3 International Journal - Advance Manufacturing Technology (2005) 25: 551–559

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