

# Smart Pneumatic Locking Conveyor.

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## Abstract

*The applications of conveyor are increasing day by day in the manufacturing industries due to its flexibility and accuracy in material handling. Industries like packaging and food processing uses conveyor for the rapid production and less power utilization in material handling. In general only a single type of object like bottles or trays are monitored and controlled on a single conveyor in pharmaceutical industries. The trays on the conveyor are to be stopped at the required station and material to be filled in the trays on conveyor. This can be done using the induction type proximity sensors and load sensors placed at different positions in the system. The IR sensor is used for safety as interlock. In given system we can do the Design & fabrication of indexing gravity roller conveyor used in the packaging & transportation system in pharmaceutical industries. The number of trays/boxes to be filled can be set in the indexing sequence using pneumatics stopping arrangements & proximity sensors. Trays/boxes after reaching the desired output the system will be automatically stopped/start flow of boxes on conveyor. The output packaging fixed can be easily altered in between the process too.*

**Keywords** – roller, double acting cylinder, flow control valve, pressure regulating unit, motor, etc.

## 1. Introduction –

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. They also have popular consumer applications, as they are often found in supermarkets and airports, constituting the final leg of item/ bag delivery to customers.

The Pneumatic Conveying is necessarily custom made conveying system & based on product characteristics, particle size, throughput capacity, number of sources and number of destinations. Each pneumatic conveying system is designed & customized as per the application popularly known as custom conveyor system. As the name suggests, a conveyor is a system helping conveying of various material from one (or more) input points to one (or more) outfeed points. With the growing automation, Arrowcon conveyor systems in India from Dynamic Industrial have now gained popularity in many industries, including the Loading Unloading Conveyors, Warehousing and logistics, automotive, agricultural, computer, electronic, food processing, food packaging, aerospace, pharmaceutical, chemical, textiles, Bakeries, woodworking and ply board manufacturing, bottling and canning, print finishing, packaging and so on. Although a wide variety of materials can be conveyed, some of the most common include packaged or unpacked foods, raw or processed, bottles and cans, automotive components, scrap metal, pills and powders, wood and furniture, cartons or bags, electronic or electricals etc.

## 2. Problem Statement –

The Gravity roller conveyor assembly normally involves the use of channels, rollers and shaft that are heavy by virtue of their structure and the material used as steel. There is only belt conveyor having indexing operating by

using electronics system but it consumes continuous power. To overcome this problem we can use Gravity roller conveyor with pneumatic indexing system.

### 3. General Information –

#### 3.1. Objective –

The pneumatic conveyor is a new design to replace conventional roller conveyor. Conventional roller conveyor uses motor drive and gives continuous motion. But in pneumatic conveyor system we are desired to achieve intermediate traverse of conveyor belt so as to achieve step by step feed with the help of pneumatic cylinder. In this project a prototype model is prepared where belt conveyor is placed on rollers. The shaft of one of the roller is coupled to sprocket and sprocket is rotated through power plate. The power plate is connected to pneumatic cylinder and is actuated by solenoid valve. So the intermediate rotation is achieved due to reciprocation of the pneumatic cylinder.

The following are important points regarding this objective of study –

Study existing roller conveyor system and its design.

1. Geometric modelling of roller conveyor.
2. Recommendation of new solution for optimization.
3. To reduce the power consumption during packaging.
4. To maintain the accuracy in production.
5. To develop automation unit, so that m/c can easily adopted in today's automated packaging plants.
6. To make a machine at low cost, low maintenance, low capital investment in less space.
7. To perform the most rigid operation with high speed packaging.

#### 3.2 Scope –

A Conveyor System is one of the most used & preferred equipment all over the world and can be used in wide range of applications. It is an equipment which is used to handle and transport materials within industry premises and used in several industries including automotive, manufacturing, retail, food and beverage, and transportation Conveyors system refers to numerous products such as belt conveyors, roller, and pallet among others. The use of conveyors system ensures handling larger volume of goods & efficiency. Moreover, Factors such as growing industrialization, need of automation to reduce manufacturing costs and waste and growth of e-commerce moving them towards adoption of conveyor systems, Fluctuating raw material prices, environmental regulations, as well as uncertainty of final products hampers the growth of the market significantly.

### 4. Construction

The pneumatic conveyor system having following main components this can be given below,

1. Rollers.
2. Supporting frame.
3. Double acting cylinder.
4. Solenoid direction control valve DCV.
5. Flow control valves.
6. Pressure regulator unit.
7. Electronics control unit.
8. Limit switch.
9. 12 Volt Transformer for DCV.

## 5. Working –

As shown in fig. the machine is consists of mainly roller type gravity conveyor & pneumatic indexing type box locking system. When we place box or container at inlet side then due to the gravity & inclination of the conveyor the box slide down from rollers to final end destination. When box reaches to final end destination it touches the limit switch gets OFF & that signal is passes to solenoid valve, so that the compressed air is flows through the to solenoid valve to double acting cylinder to lock the second successive boxes. After packaging goods in boxes when we dispatch first one box then limit switch is get ON & cylinder locking arrangement slide down the second one cylinder. That procedure is repeated continuously to manage packaging time.

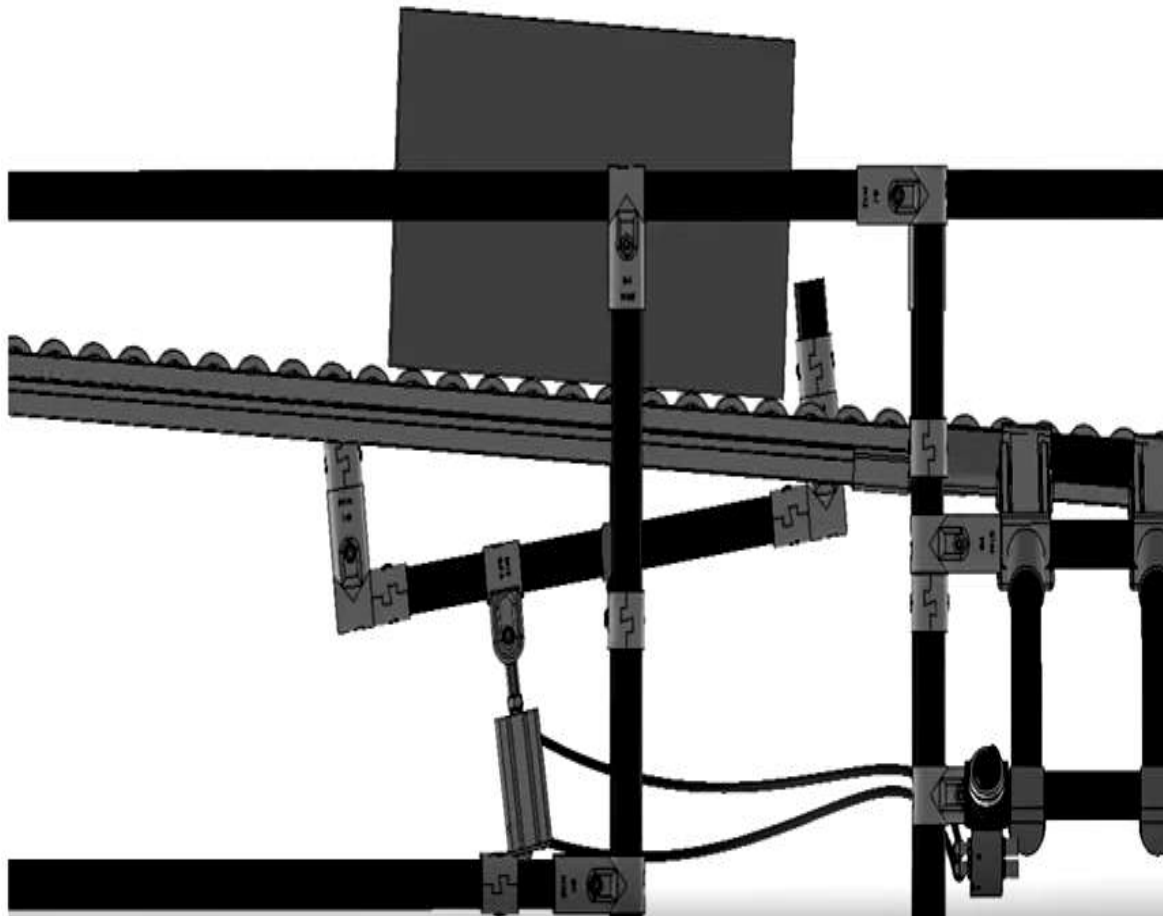


Fig. Pneumatic indexing conveyor.

## 6. Methodology –

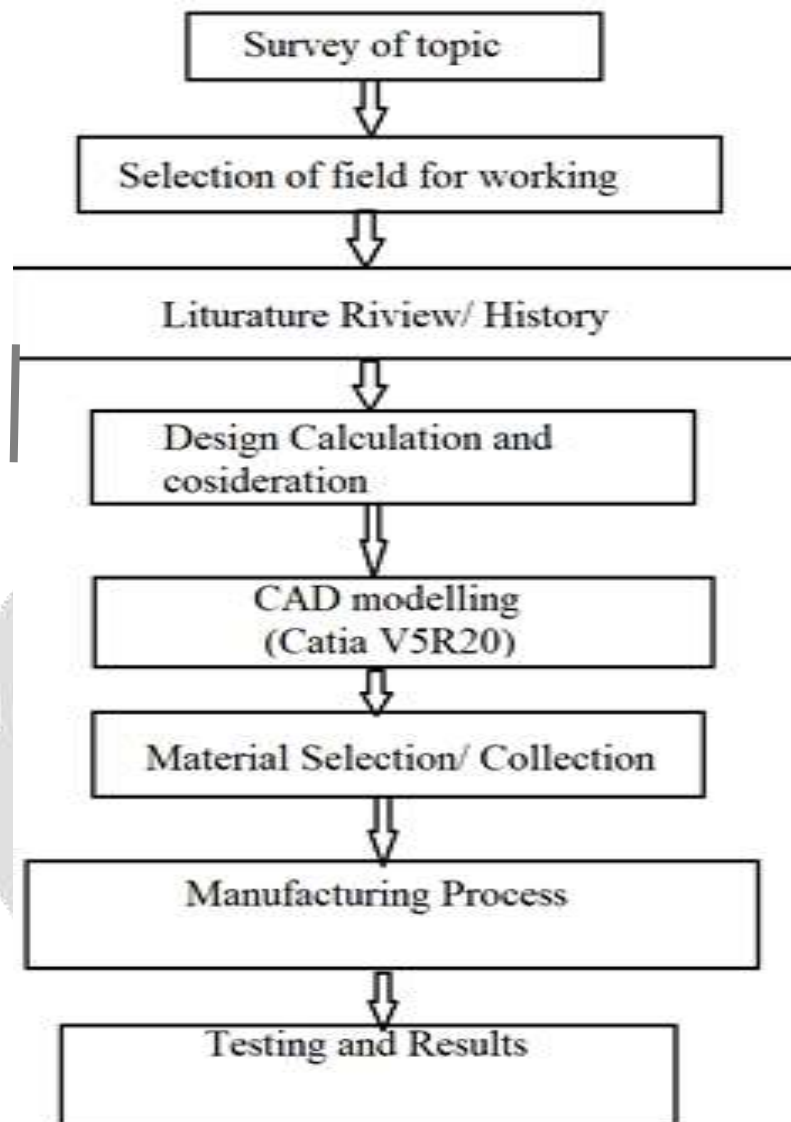


Fig- Methodology

## 7. Application –

This conveyor can use in packaging industries where indexing time can be handle by worker packaging efficiency ex. In pharmaceutical industry for box packing in replacement of belt conveyor.

## 8. Advantages-

1. It can handle only one job at packaging destination with prepared tome limits.
2. Machine work on the low power consumption as compare to the old machine.

3. The operation of the new machine is well controlled, Well balanced system.
4. It approximately matches the efficiency of old packaging machine in low cost application machine.
5. Machine packaging time is less depending on operator speed.
6. Only simple support structures are required Design & fabrication is easy.
7. It is a faster process.
8. Initial investment is low.
9. More accurate and economical in mass production packaging.
10. It minimizes misalignment & less floor space is required.
11. It increases the safety and working condition.

### 9. Disadvantage-

1. Maintenance cost is high
2. System is bulky

### 10. Conclusion –

The main aim of project to save time & man-power. The new system is economical and user easy than previous system. Easy to operate , smooth running , safe working for workers, high accuracy

### References –

1. S.S. Gaikwad, E.N. Aitavade, “Static Analysis Of A Roller Of Gravity Roller Conveyor For Structural Strength & Weight Optimization” PG student, Prof, Mechanical Engineering Department, Tatyasaheb Kore Institute of Engineering and Technology, Warananagar, Tal.-Panhala, Dist.Kolhapur-416113, India, International Journal of Advanced Engineering Technology Vol./IV,Oct-Dec.,2013.
2. D.K. Nannaware, R.R. Kharde, “Design and Optimization of Roller Conveyor System”PG student, Pravara Rural Engineering College,Loni, India, Professor, Pravara Rural Engineering College,Loni, India, International Journal of Scientific & Engineering Research, Volume 5, Issue 7, July-2014.
3. Suhas M. Shinde, R.B. Patil, “Design and Analysis of a Roller Conveyor System for Weight Optimization and Material Saving”Jawaharlal Nehru College of Engineering, Aurangabad, (M.S.) International Journal on Emerging Technologies Vol.3 Issue 25 April, 2012.
4. Pawar Jyotsna, D.D.Date, And Pratik Satav, “Design And Optimization Of Roller In Belt Conveyor System For Weight Reduction” PG Student, Terna Public Charitable Trust College Of Engineering Osmanabad, India, Associate Professor, Terna Public Charitable Trust College of Engineering Osmanabad, India Proceedings of 10th IRF International Conference, 01st June-2014.
5. Mr. Rajratna A. Bhalerao, Dr. R.J. Patil, “Transient and Mode Shape Analysis of Gravity Roller Conveyor for Weight Reduction” Department of Mechanical Engineering. International Journal of Innovative Science, Engineering & Technology (IJSET), Vol. 1 Issue 5, July 2014.

6. Shirong Zhang, Xiaohua Xia “Modeling and energy efficiency optimization of belt conveyors”, Department of Automation, Wuhan University, Wuhan 430072, China Department of Electrical, Electronic and Computer Engineering, University of Pretoria, Pretoria 0002, South Africa ‘www.elsevier.com/locate/apenergy’ 16 March 2011.

7. Daniel J. Fonseca, Gopal Uppal, Timothy J. Greene, “A knowledge-based system for conveyor equipment selection” Department of Industrial Engineering. The University of Alabama, Tuscaloosa 35487, USA, Expert Systems with Applications 26 (2009) 615–623.

8. [www.google.com](http://www.google.com)

9. [www.youtube.com](http://www.youtube.com)

