

## Omni-Directional Conveyor Platform

Saudagar Salunke, Rushikesh Meshram, Abhishek Mendjoge, Shubham Pardhi, Dharendra Pathak, Ranjit Chauriwar,  
Prof. Satish Sonwane

Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

### ABSTRACT

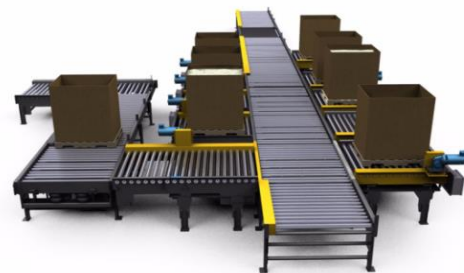
In this modern competitive industrial world one can get a step ahead of competitors by selection of appropriate material handling equipment. Material handling process is overhead for the production. A conveyor system is a common technique of mechanical handling equipment that moves material from one location to another location, many kind of conveying system are available and are used according to the various needs of industries. To purpose of this project is to reduce the footprint to move or transfer the product by using Omni-directional conveyor platform. This project help to improve the multi directional movement performed at a single omnidirectional platform, beyond the above improvement the conveyor system is expected to work.

**Keywords:** Automation, Sortation Systems, Material Handling, Conveyor Platform.

### I. INTRODUCTION

The Omni directional platform is capable of both receiving products from any direction and then sorting then in any direction at high rate within a compact footprint. Developed for zone picking ( also called pick and pass) operations, the sorter supports diversion of items to manual picking areas then merges batch on to the same conveyor. A single machine can also sort backwards; and position packages in rows and columns. Omnidirectional turner is used to move or rotate the package +90 and - 90 degrees left or right. Integrated products can also be alignment. it also helps to reduce footprint compact in size for up to 30% footprint saving. Turing and aligning operations perform combine in one machine.

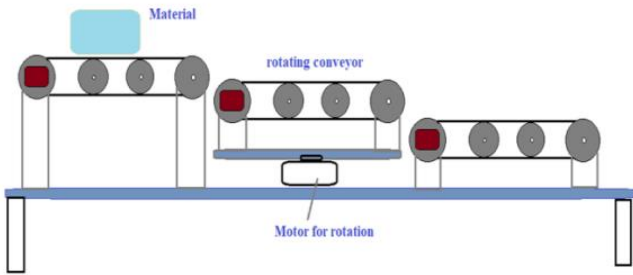
efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. They also have popular consumer applications, as they are often found in supermarkets and airports, constituting the final leg of item/ bag delivery to customers. Many kinds of conveying systems are available and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys.



### II. CONVEYING TECHNOLOGY

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and

Conveyor systems are used widespread across a range of industries due to the numerous benefits they provide.



**Figure 1.** shows the block diagram of omnidirectional conveyor platform

### 3. Design calculation

#### A. conveyor belt

Velocity of product conveying  $V = 0.013 \text{ m/s}$  .... (ref. no 2)

Dia. Of drum  $D = 0.01 \text{ m}$  (Drum) ... (ref. no 3)

#### 1. Product weight

**Product weight = 0.5kg**

Length of product = 150mm

Width of product = 80mm

Height of product = 50mm

Total weight of product = 0.5kg

#### 2. Rpm of required motor

**Actual torque:**

$$\begin{aligned} T &= f \cdot r \\ &= 0.5 \cdot 9.81 \cdot 0.013 \\ &= 0.0637 \text{ Nm} \end{aligned}$$

**• rpm calculation:**

$$\begin{aligned} v &= 2 \cdot 3.14 \cdot \text{rpm} \cdot d / 2 \\ 0.013 &= 2 \cdot 3.14 \cdot \text{rpm} \cdot 0.013 \\ \text{rpm} &= 9.556 \end{aligned}$$

#### 3. Calculated factors Of conveyor

Velocity of product conveying ' $V = 0.013 \text{ m/s}$

Dia. Of drum ' $D = 0.026 \text{ m}$

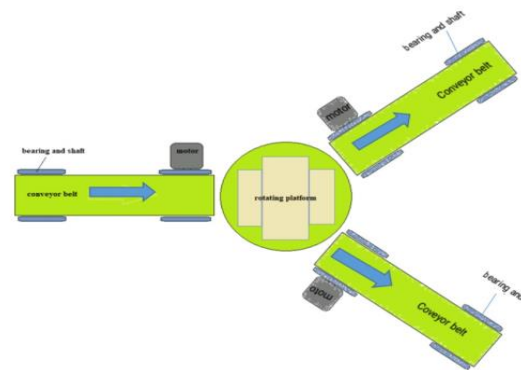
Speed of motor  $N = 10 \text{ rpm}$

Torque required  $T = 10 \text{ kgcm}$

Weight of product. = 0.5kg

Specification of component:

- 1) Motor - dc geared motor  
10 rpm  
10 kgcm torque
- 2) Power supply- 12 volt 5 amp
- 3) Ball Bearing- 6000zz OD- 26 mm and  
ID-10 mm
- 4) Conveyor belt- 100 width and 300 length
- 5) 3/4 Inches MS pipe is used for frame assembly
- 6) MDF sheet - 6mm thick
- 7) Servo motor- metallic gear servo motor mg995



**Figure 2**

#### B. component

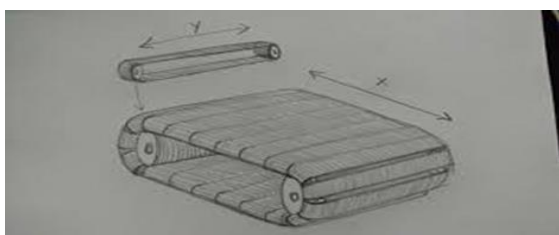
Components used-

- 1) Conveyor belt
- 2) Ball bearings
- 3) Rollers
- 4) Servo motor
- 5) 2 by 4 feet platform
- 6) 5mm acrylic sheet
- 7) Aluminum sheet
- 8) Cluster wheels
- 9) MS square pipe
- 10) MDF sheet.

#### Conveyor belt-

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums),

with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and more



**Figure 3**

#### **Ball bearing-**

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races.

The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

Bearing size-

ID-10mm

OD-26mm

**Bearing Safety Factor.** The bearing safety factor, or safety modulus  $f_s$ , is the ratio of the basic static load rating  $C_0$  or the equivalent load  $P$  on the bearing. When the use conditions are normal operation, a safety factor of 1.0 is typical.

**Radial Ball Bearings Basic Dynamic Load Rating,  $C$ .** The basic dynamic load rating of a bearing with rotating inner ring and stationary outer ring is that load of constant magnitude and size which a sufficiently large group of apparently identical bearings can endure for a basic rating life of one million revolutions.



**Figure 4**

#### **Rollers-**

Rollers are used in conveyor system to provide support for long distance.



**Figure 5**

#### **Servo motor-**

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.



**Figure 6**

This motor is having a torque of 15 kgcm.

#### **Dc motors-**

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

A DC motor is a rotary electrical machines. It convert direct current electrical energy into mechanical energy. DC motor has a rotating armature winding and a permanent magnet or static field winding. The speed of DC motor can be controlled using either a variable supply voltage or by changing the strength of current in its field winding. According to soil condition the motor is ON/OFF. It is controlled from our relay boards or Micro controller using DC motor Drivers.

Other types of DC motors require no commutation.

#### **Homopolar motor –**

A homopolar motor has a magnetic field along the axis of rotation and an electric current that at some point is not parallel to the magnetic field. The name homopolar refers to the absence of polarity change. Homopolar motors necessarily have a single-turn coil, which limits them to very low voltages. This has restricted the practical application of this type of motor.

#### **Ball bearing motor –**

A ball bearing motor is an unusual electric motor that consists of two ball bearing-type bearings, with the inner races mounted on a common conductive shaft, and the outer races connected to a high current, low voltage power supply. An alternative construction fits the outer races inside a metal tube, while the inner races are mounted on a shaft with a non-conductive section (e.g. two sleeves on an insulating rod). This method has the advantage that the tube will act as a flywheel. The direction of rotation is determined by the initial spin which is usually required to get it going.



**Figure 7**

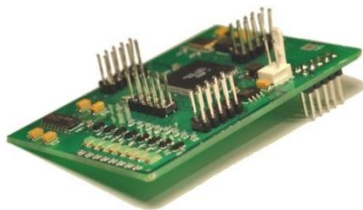
#### **Electronic circuit-**

An electronic circuit is composed of individual electronic components, such as resistors, transistors, capacitors, inductors and diodes, connected by conductive wires or traces through which electric current can flow. To be referred to as electronic, rather than electrical, generally at least one active component must be present. The combination of components and wires allows various simple and complex operations to be performed: signals can be amplified, computations can be performed, and data can be moved from one place to another.

Circuits can be constructed of discrete components connected by individual pieces of wire, but today it is much more common to create interconnections by photolithographic techniques on a laminated substrate (a printed circuit board or PCB) and solder the components to these interconnections to create a finished circuit. In an integrated circuit or IC, the components and interconnections are formed on the same substrate, typically a semiconductor such as silicon or (less commonly) gallium arsenide.

An electronic circuit can usually be categorized as an analog circuit, a digital circuit, or a mixed-signal circuit (a combination of analog circuits and digital circuits).

Breadboards, perfboards, and stripboards are common for testing new designs. They allow the designer to make quick changes to the circuit during development.



**Figure 8**

### III. OPERATION

The module contains Omni-directional wheels, which are individually and selectively controlled by an electric motor. The special arrangement of the wheels as well as selective control of the drives enables the logistics operator to move and position several objects simultaneously and independently on any track.

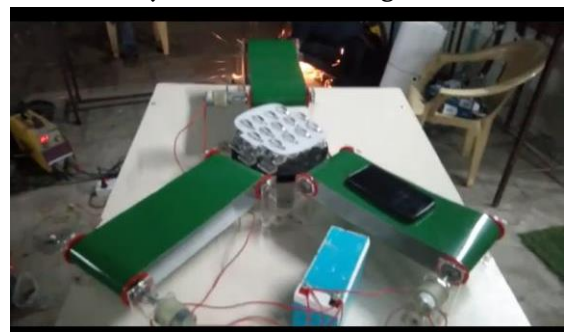
The manufacturing product is to be transfer on the conveyor belt that product is to be check by using quality control machines and then machines gives the output that is ok or not means accepted or rejected piece. The Omni-directional conveyor platform is

made of no. of rollers, that are arranged in such a way that they operate any direction to transfer the product as your requirements.

These rollers or wheels rotate continuously forward direction and also oscillate in +90 and -90 left or right as your requirement.

The platform is made of a closed box type at the bottom side, the dc motor is used to rotate the wheel or roller and other motor is used to oscillate the roller assembly to achieve the directional movement. The quality check machine sends the feedback as the product is accepted or rejected ,then the oscillation of rollers depend on the product goes through the direction as required.

That platform helps to the sort the products and move or transfer in any direction (360 degree).



**Figure 9.** actual system of omnidirectional conveyor platform

### IV. CONCLUSION

This product can be fully automated and produced at a lower cost to acceptance will be unimaginable presently there are no competitors for such a kind of product in our market. The system which we developed which can successfully reduce the material handling time on production floor. The system which consist sensor, electric motor, microcontroller makes the system more efficient and its made system fit to use.

## V. REFERENCES

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