

# Design and Development of Sensor Operated Walking Beam Conveyor System for Material Handling

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**Abstract:-** In the process or manufacturing industry, raw materials and products 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. For instance, walking beam conveyor system can be employed for easy handling of materials without human interface. The product to be handled as well as its maximum loading capacity in order ensure fast, continuous and efficient movement of materials while avoiding halt or fatalities during loading and unloading. This work generates design of an automated walking beam conveyor system. In this project we have to control the conveyor automatically by sensing the objects placed in the conveyor. This conveyor system involves extra features compared to conventional walking beam conveyor system, i.e. Sensor and Gear motors. Whenever the sensor detects the motion of objects (materials), it activates the system that moves the materials by one step forward. This involves one input one output method, i.e. if one object is entered into the system one will leaves from the system. The number of objects handled by the conveyor on the whole will be displayed simultaneously along with regulating the conveyor. By this system halting and gaps between materials and unnecessary continuous running of system can be reduced. This project will save the power of motor operating the conveyor by regulating the conveyor automation, i.e. the conveyor actuates only when an object is sensed.

**Key Words:** Walking Beam Conveyor, Sensors, Conveyor Automation, Count display

## 1. INTRODUCTION:

### 1.1 Introduction to Conveyors:

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 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.

#### 1.1.1 Types of Conveyors:

- Belt Conveyor
- Screw Conveyor
- Chain Conveyor
- Vibrating Conveyor
- Pneumatic conveyor

### ***1.1.2 Benefits of Conveyors:***

- Conveyors are able to safely transport materials from one level to another, which when done by human labor would be strenuous and expensive.
- They can be installed almost anywhere, and are much safer than using a forklift or other machine to move materials.
- They can move loads of all shapes, sizes and weights. Also, many have advanced safety features that help prevent accidents.
- There are a variety of options available for running conveying systems, including the hydraulic, mechanical and fully automated systems, which are equipped to fit individual needs.

### ***1.2 Introduction to Automation:***

Automation is the control of machines and processes by independent systems through the use of various technologies which are based on computer software or robotics. Industry implements automation to increase productivity and reduce labor costs. Industrial automation utilizes various industrial communication devices such as programmable logic controllers (PLCs), programmable automatic controllers (PACs) which are used to control the industry. In industries, control strategies use a set of technologies implemented to achieve the desired result, making automation systems necessary in industries. Industrial automation improves the rate of production through superior control of production. It helps to produce bulk by significantly reducing product processing time with better quality. Therefore, a given labor input it produces a large number of results. Since automation reduces human involvement, the possibility of human error is also eliminated. Due to automation, consistent and reliable product quality can be maintained with greater automation compliance by adaptively controlling and monitoring industrial processes at all stages, from the laboratory to the industrial level. The automation can completely reduce the need to manually check for various process parameters. Making the use of automation technologies, industrial processes automatically adjusts process variables to define values using closed-loop control techniques. The complexity of operating processes is reduced with industrial automation. The industrial automation decreases the level of personal safety by replacing it with automated machines working in harsh conditions.

#### ***1.2.1 Types of Automation:***

- Fixed automation
- Programmable automation
- Flexible automation

#### ***1.2.2 Benefits of Automation:***

- Stream lined material flow eliminating manual intervention and associated pilferages.
- Increased space utilization as Space chokes are eliminated.
- Higher Warehouse Productivity.
- Enhanced working environment eliminating tedious manual work.

### ***1.3 Introduction to Walking Beam Conveyor:***

A walking beam is a type of conveyor system which sweeps backwards and forwards, whereby the packages progress on the basis of the forward sweep. Parts shaped appropriately for the packaging and a servo-controlled drive unit ensure the accuracy of the positioning. A walking beam conveyor system can be used for all packages due to the interchangeability of the shaped parts. Walking beam conveyors can also be converted from a single line to a multiple line version. These features, in combination with a servo drive unit create a conveyor system that can move any package at any speed over any given distance. The walking beam conveyor is in first place on the list of hygienic conveyor concepts for packaging. The conveyor has an open and accessible construction, which makes it simple and easy to clean.

**2. PROBLEMS IDENTIFIED:**

- Manual systems, i.e. they requires human inputs.
- Power consumption is more since it is continuously working.
- No count on number of objects transferred from the system.

**3. OBJECTIVES:**

- Our main objective is to design and development of conceptual model of sensor operated walking beam conveyor system which facilitates automation in conveyor system.
- No need of external inputs for operation.
- Speed rate will be automatically adjusted.
- Reduces halts and energy consumption.
- Increases safety of the workers since it is automated.
- Since it is automated the system is fast and efficient.

**4. MATERIALS REQUIRED:**

1. ACP Sheet
2. Fabrication
3. Electrical Equipments
  - a. Infra-red Sensors
  - b. 60rpm Gear Motors
  - c. Arduino uno & Cable
  - d. 12v 3A Adapter
  - e. Display
  - f. Others(DPDT Relay, Jumper wires, Push Button, LED Indicator(Red), 10k ohm Resistor, ON/OFF Switch, Wires)

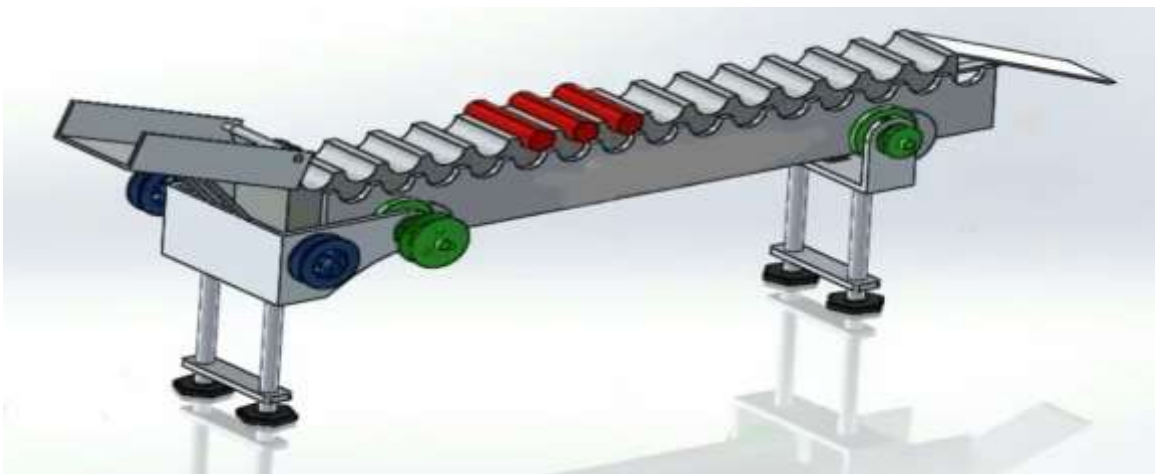
**5. MODLE OF CONVEYOR SYSTEM:**

Figure (1)

**6. ACTUAL WORKING:**

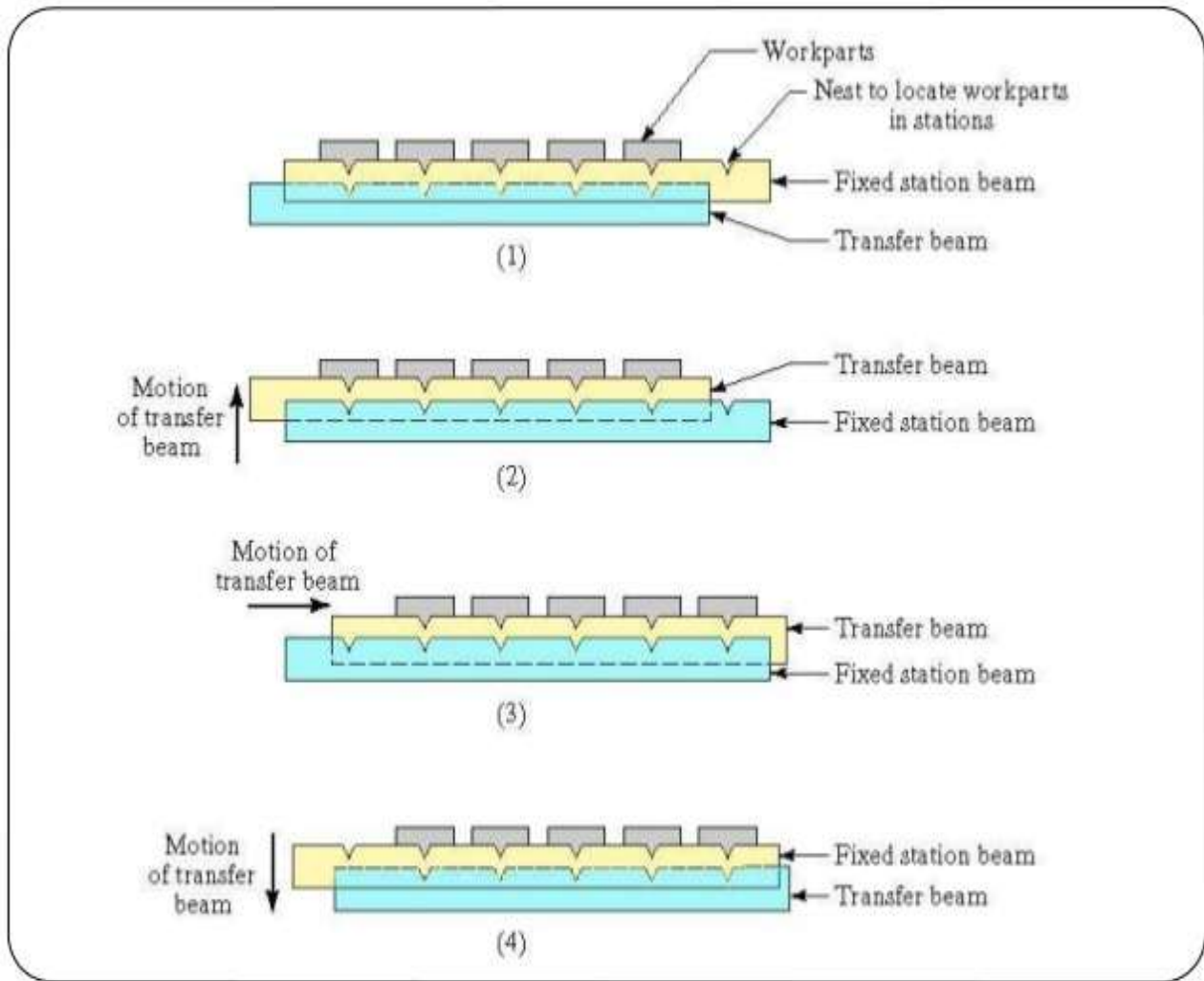


Figure (2)

Walking Beam Conveyor system transfers the materials by lifting them from their initial position and it moves the material by some distance with the help of lifters as shown in the Fig(2), So that materials moves step by step. Here we installed sensors at materials entering section so that, when the materials enters the sensor detects the materials entry. The entered material is now in the conveyor initial position. The sensor will send the signal to the controller system then it initiates the conveyor system to move the materials one step forward and displays the number of materials shifted. So that initial position is now free because the material is shifted to the next position and it continuous whenever materials enters. When materials reaches end of the conveyor materials are exited one by one. I.e. if one material enters the system from one end another will leaves the system at the another end.

If the material entering is stopped, The system is provided with a button, when it is activated the materials remaining in the system will be moved continuously till no materials remains in the system.

### **7. RESULTS AND CONCLUSION:**

This Conveyor System for material handling improves the speed of material handling. And this system automated, it reduces the human effort. This system is capable for showing number materials transferred by the system. The workers are eliminated and the ultimately the operation cost is reduced and profit get increased. This system is beneficial and safety for the material movement.

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