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# PLC CONTROLLED ROLLER CONVEYOR

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**ABSTRACT:**

Material handling systems are important in today's manufacturing and warehousing industries. Manual handling results in time loss, errors, and safety hazards. This paper presents the PLC-controlled roller conveyor system, which is used for automatic transfer and sorting of materials based on sensor input. This system uses programmable logic controllers, proximity sensors, and actuators to control the movement and stopping of items on a roller conveyor.

The aim is to increase speed, accuracy, and safety during handling operations. This design can be scaled, is energy efficient, and is flexible to different types of industrial applications. It illustrates the benefits of industrial automation and lays the groundwork for additional integration with IoT and SCADA systems. Automation with PLC provides highly accurate executions, is fault-tolerant, and delivers high productivity for smart factories.

## INTRODUCTION: -

Material handling is at the core of logistics in manufacturing systems. Conventional conveyor systems are generally manned, which makes them labor-intensive and slow, and even unsafe. PLC-controlled roller conveyor provides an automated solution, which eliminates chances of human error and increases efficiency.

A roller conveyor generally consists of a number of cylindrical rollers placed parallel to each other in such a way that the items are moved in a smooth way. The use of the PLC makes it possible to control these movements accurately and to synchronize these movements with the movements of other machinery.

- Average items handled include:
- Boxes and packaging material
- Raw materials for assembly
- Finished products for dispatch
- Automation in conveyor systems is ever more being brought about by:
- PLC programming
- Proximity sensors
- Pneumatic actuators
- Relay logic circuits

The developed system is a proof-of-concept for small to medium scale industries looking to integrate Industry 4.0-ready material handling solutions.

## LITERATURE REVIEW: -

Many researchers and engineers are now automating conveyors using industrial controllers as well as sensors.

### *PLC-Driven Conveyor Systems*

Verma et al. (2022) presented an automated factory conveyor, thereby improving warehouse operations by 30% through the application of a Siemens PLC. This scheme relied on relay logic for detecting packages and subsequently activating the respective actuators.

### *Sensor Integration for Automation*

Kumar (2021) presented papers that entailed the adoption of inductive and photoelectric sensors for automating assembly line conveyors. As indicated in the work, automation through the use of sensors yields more accurate object recognition to enhance coordination.

***SCADA for Conveyor Control***

According to Rana (2020), this feature could be utilized in the SCADA systems that integrate PLC-controlled conveyors for real-time monitoring and fault analysis during remote operations.

***Industrial IoT in Material Handling***

Singh (2019) extensively studied using IoT to gather performance data on conveyors to predict when maintenance would be required. Their work indicated decreased downtime and operational costs.

***Safety in Conveyor Automation***

This year's focus in Das (2018) relates to safety concerns for relays and stop buttons in an automated conveyor. There is also emphasize and the need for fail-safe mechanisms in PLC-controlled devices used in industries.

## 3.NOVELTY OF THE WORK

The major contributions of this project include the following:

- Fully automated conveyor system using PLC and roller actuators.
- Intelligent object detection using proximity sensors for sorting control.
- Custom ladder logic program for dynamic speed and directional control.
- Integration of feedback from sensors for precise stopping at predefined locations.
- Low-cost, modular, and scalable design suitable for educational and industrial applications.
- Potential for integration with IoT and SCADA systems for advanced automation.

## 4. SYSTEM COMPONENTS

***Programmable Logic Controller (PLC)***

- It serves as the central processing unit of the conveyor system. It takes inputs from sensors and controls the actuators as per the programmed logic.

***Roller Conveyor***

- The primary means of transporting materials. Smooth and consistent operation is imparted by mechanical rollers driven by motors or belts.

***Proximity*** Sensor

- Detects the presence of objects on the conveyor. It is a non-contact sensor which works through electromagnetic fields or infrared signals.

***DC Motor with Driver***

- This is used to drive the rollers. It can be PWM controlled by the PLC for variable speed control using relay circuits.

***Relay Module***

- Relay module acts as an interface between low voltage PLC and high power motor circuit. It allows safe switching.

***Power Supply Unit***

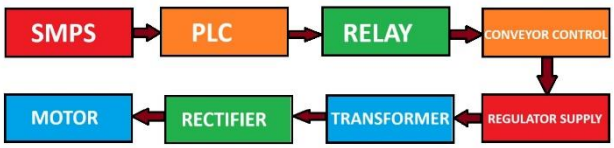
- Power Supply Unit is meant for providing regulated power to the system as a whole, usually converting AC mains into the DC voltage required by PLC and sensors.

## METHODOLOGY

- Placement of Objects: Initially, item placements are done at the input of the roller conveyor.

- Detection of Objects: Come moving objects up to proximity sensors detecting them.

- The Signals to PLC: The sensors send signals to the PLC, therefore the object has reached.
- Decision Logic of PLC: According to the program, whether to stop the motor or change the direction of the conveyor.
- Sorting of Items: If at all incorporated, integrate diverters or actuators for sorting items on the basis of feedback shown from sensors.
- Re-start the conveyor: Next, sort bottom so that the conveyor moves on to the next item.
- Monitors: Everything will be logged for maintenance or analytics (for SCADA or IoT option).




**Block Diagram of Automatic Waste Segregator**

## WORKING PROTOTYPE


## CONCLUSION

The project exhibits a low-cost effective PLC roller conveyor application, which has minimized human effort and maximized safety. The system is most beneficial to small-scale industries, warehouses, and educational labs.
Further development will comprise IoT-enabled monitoring, incorporation with SCADA dashboards, and synergetic machine learning-based sorting for the intelligent factory. Gradually heading toward Industry 4.0 aspirations, this approach enhances material handling.

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