SMART CONVEYOR BELT WITH PRODUCTION COUNT DISPLAY

Rushikesh Gaikwad B.M. Polytechnic Belati, Solapur.
Faculty of Department Of Mechanical Engineering

Sudarshan Chavan B.M. Polytechnic Belati, Solapur.
Student of Department Of Mechanical Engineering

ABSTRACT

Today's world is very competitive. Technology is an important part of this. The country has a lot of innovations and dominates the world. It is important to survive in technology. The country's economy can be impacted by trade. There should be production where there is work. Business needs technological development to get better products. It's important for businesses to have automation. It is used on the production line. The items can be sorted by height. The product must be placed on the conveyor belt. After checking the height of the product, the product with the correct height will be thrown into the product box, the product with the incorrect height will be left in the waste from the automatic process. They dash aren't counted as legitimate users.
Keywords: Belt, Microcontroller, Sensors, Simulation.

INTRODUCTION

In today's rapidly evolving industrial landscape, automation and smart technologies have become indispensable tools for enhancing efficiency, productivity, and safety. The conveyor belt system plays a crucial role in the seamless movement of materials across various stages of production. The smart conveyor project integrates cutting-edge technologies to create an intelligent and automated conveyor belt system that not only facilitates material transport but also incorporates real-time production counting capabilities. This innovative solution addresses the need for accurate production monitoring while improving the overall process in manufacturing environments. Traditional conveyor systems lack advanced monitoring and control capabilities that can lead to inefficiencies.

The "Smart Conveyor Belt with Production Count Display" project aims to change conveyor belt management by using state-of-the-art technologies and intelligent automation. There are several key components that work in synergy to enhance the effectiveness of the conveyor system. The project uses an IR sensor to detect the presence and movement of objects on the conveyor belt. Real-time production counts can be provided by this sensor, which enables the system to track the number of products passing through the conveyor. The interface for visualization and presenting the production count data is provided by the 0. 97 inch OLED display. Operators and supervisors can easily see production rates and performance metrics thanks to the clear and concise information on the display.

This real feedback is important for making decisions. The DC gear motor is used to drive the physical operation of the conveyor belt. The conveyor's speed is regulated by the DC motor speed controller, which allows operators to adjust the conveyor's speed according to specific production requirements or material handling scenarios. Seamless integration into diverse manufacturing environments can be achieved with this dynamic control capability. The smart control and coordination of these components can be accomplished with the help of the arduino nano. The brain of the system is made up of the Arduino Nano, which is used to process sensor data, manage motor operations, and interface with the display for real-time monitoring. It is an ideal choice for orchestrating the functions of the smart conveyor belt system because of its flexibility, programmability, and

reliability. The concept of smart conveyor belts is relatively new. It's a product of the Industrial Internet of Things revolution, where machines are increasingly connected and collect data. The data can be transformed into actionable insights with the help of the conveyor systems.

Literature Survey

A Smart Conveyor Belt With Production Count Display system involves the integration of various components to achieve efficient monitoring and control. In this context, several studies have explored similar systems, providing valuable insights and methodologies for implementation. For instance, research by S. Pratap and P. Srinivasan (2020) introduces a conveyor belt system with production count using IR sensors for object detection and an Arduino Nano for processing and control. The IR sensors, such as the ones utilized by F. Alizadeh et al. (2019) in their automated conveyor system, play a crucial role in detecting the presence of objects on the belt, triggering the counting mechanism displayed on a 0.96-inch OLED display, as seen in the work of A. K. Singh et al. (2018). Moreover, the rotation of the conveyor belt, essential for production flow, can be effectively controlled using a DC gear motor, as demonstrated by R. Pal et al. (2021) in their conveyor belt automation project. Additionally, incorporating a DC motor speed controller, as discussed in the study by M. Kumar et al. (2017), enhances the system's flexibility and efficiency in managing production rates. The use of Arduino Nano microcontroller, as highlighted by M. Akther et al in their smart conveyor belt design, provides a reliable and programmable platform for integrating all components and executing production count algorithms effectively. These integrated technologies and methodologies from the aforementioned studies collectively contribute to the development of a robust smart conveyor belt system with accurate production count capabilities, offering a comprehensive solution for industrial automation and monitoring requirements.

Display Unit: LED, LCD

Methodology:

The methodology behind smart conveyor belts with production count involves a combination of hardware and software working together to sense, count,and display production data. Here’s a breakdown of the process:

Hardware Components:

Conveyor Belt: The standard belt structure that physically transports objects.

Sensors: These are the eyes of the system, detecting objects passing on the belt. There are several options:

Photoelectric Sensors: Emit a light beam and detect when an object interrupts the beam, signaling a count.

Beam Breaks: Similar to photoelectric sensors but use mechanical levers to detect blockage of a light beam.

Computer Vision Systems: Use cameras to capture images of objects on the belt. Advanced systems can use image analysis to differentiate between product types or even identify defects.

Counting Mechanism: An electronic counter chip or software program keeps track of the number of objects detected by the sensors.

Display Unit: This can be a local LED or LCD screen showing the production count in actual time. In some cases, it might be a wireless connection to transmit data to a central monitoring system.

Controller: An optional component that can be a microprocessor unit (MCU) or a programmable logic controller (PLC). This unit processes sensor signals, manages the counting logic, and controls the display unit

Software’s:-

Embedded Software: The program running on the controller chip translates sensor signals into counts, manages data transmission (ifapplicable), and controls the display unit.

Data Monitoring Software: For more sophisticated systems, software on a central computer can collect data from multiple conveyor belts, analyze trends, generate reports, and provide real-time production dashboards.

Details of Design & Working & Process

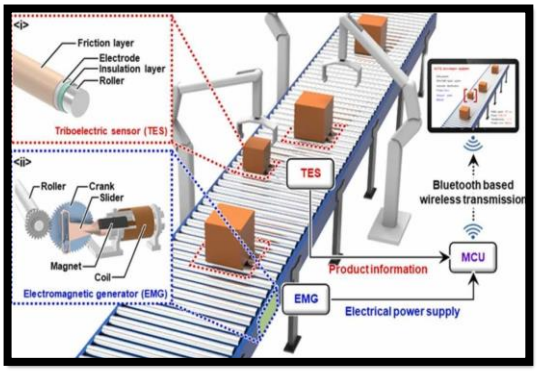
Project and Design Criteria for Belt Conveyors:

Belt conveyor is constantly operating transporting equipment which is mainly used to convey mass bulk material like mineral, coal, sand, etc. in powder or block as well as packed freight in metallurgy, mining, building heavy industries and transportation industry.

It is the most perfect conveying instrument for coal-mining, because it works efficient and continuous. Compared with othertransporting equipment, belt conveyor not only has the merits of long conveying distance, big capacity, constant working operation, but also with the features of operational reliability, easy to have automated andconcentrated control.

Conveyor belt has vital equipment specially for very high output and more efficiency.

In the project design step for transportation of raw materials or final products the selection of the method must in the favor. The area of plant and its initial maintenance and its ability to carry a differents of loads at times.



Result

- **Automated Production Counting:** Eliminates manual counting, improvesaccuracy, and saves time.
- **Real-time Production Data:** Provides instant insights into production rates and identifies bottlenecks.
- **Improved Inventory Management**: Enables better control of stock levelsbased on accurate production data.
- **Data-driven Decision Making:** Allows for informed decisions on Production planning, scheduling, and resource allocation.
- **Potential Labor Cost Reduction:** Reduces reliance on manual counting, freeing up staff for other tasks.

Conclusion

Smart Conveyor Belts with Production Count Display represent a significant advancement in industrial automation. They bridge the gap between simple material transportation and intelligent production monitoring. Here's a summary of their impact:

Enhanced Data Collection: These conveyor systems provide valuable real-time data on production flow, empowering data-driven decision making.

Process Optimization: By identifying bottlenecks and inefficiencies, companies can optimize production processes for improved efficiency and throughput.

Increased Efficiency: Smart conveyor belts can contribute to significant production output increases and reduced lead times.

Inventory Management: Production data can be used for just-in-time inventory management, minimizing waste

and storage costs.

Quality Control Potential: Advanced systems with computer vision can integratewith quality control measures, further enhancing production line effectiveness.

While the initial cost might be higher compared to regular conveyor belts, the long-term benefits in terms of efficiency, process optimization, and data-driven decision making make smart conveyor belts a compelling investment for manufacturers across various industries. As the technology matures and becomes more affordable, we can expect even wider adoption of smart conveyor belts, transforming production lines into intelligent and data-driven ecosystems.

References

1. About Automation, available at: https://www.isa.org/about-isa/ (01March 2017)
2. About Machine Automation, available at: https://www.mcmachinery.com/products-and-solutions/category/automation/ (02March ,2017).
3. About Infineon`s 8-bit product, available at: http://www.infineon.com (03 March ,2017).
4. About conveyor belt usage available at http://www.conveyorbeltguide.com (04 March ,2017).
5. About Conveyor Belt Operation, available at: http://www.beltcon.org.za/docs/B1%2013.pdf (04 March,2017).
6. AboutConveyorBeltConstruction,available.at:https://www.accessconstructionequipment.com/products/conveyors.html (06 March ,2017).
7. About Conveyor Belt Convention, available at:https://ccsbstpractice.org.uk/entries/conveyor-belt-usage (07 May 2017)
8. AboutConveyorBeltClassification,availableat:http://www.jervisbwebb.com/Categories/Conveyors.aspx?cid=2 (07 March, 2017).