Automatic Inspection of Product Dimension Using Programmable Logic Controller

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ABSTRACT

In this competitive market maintaining product quality is very important. Product dimension is one of the most important quality specifications and faulty product must be removed from the process at the earliest. For this different type of control strategy has been implemented in industries depends upon the types of product. In this project the product is passed on a conveyor belt, its height is sensed by sensors and the faulty one is removed from the process by using pneumatic system. A panel is designed to monitor the process and the entire system is controlled using Programmable Logic Controller.

Keyword: - *Programmable Logic Controller, Proximity Sensor, Pneumatic*

1. INTRODUCTION

Industrial Automation has gained importance owing to the ever-increasing demand for more productivity, better quality standard, optimum utilization of available resources and manpower. Designing system to maintain product quality uses different types of sensors, actuators, motors, pneumatic and hydraulic systems. Designing of Control system for the same will incorporate the following technical aspects; design of physical systems, selection of controller, sensors, control system components and interfacing of all the control components. Programmable logic controllers (PLCs) are widely used in industry and process control. The advantage of PLCs includes its capability of withstand vibrations, temperature, humidity, and noise; have interfacing for inputs and outputs already inside the controller, easily programmed and have an easily understood programming language. Optical proximity sensors are widely used in automated systems because they have been available longer and because some can fit into small locations. Pneumatic systems are operated using compressed gas. The advantage of pneumatic actuators is its long life and performs well with negligible maintenance requirement throughout their life cycle. In this project conveyor system, proximity sensors, pneumatic systems are used to detect the faulty product and removed from the process.

2. WORKING PRINCIPLE

A conveyor system is designed on which the product is allowed to move, optical proximity sensor is used to measure the product height, the product whose height is beyond the desired limit is removed by a pneumatic double acting cylinder. The faultless product is counted collected at the end of the conveyor or further process.

3. SYSTEM DESIGN

A conveyor system is designed having belt length of 30 inch. The belt is operated by 24V DC motor having 100rpm 1.2kgcm of torque, maximum load current of 300mA. LM2596 buck convertor is used to step down PLC output of 24V to 12V DC for operation of motor. Total 4 optical proximity sensors are connected with the conveyor at different locations. Two are used to measure product height, one is used to stop the conveyor when the product is faulty so that it can be removed from process and one is used to total number of faultless product passed through the belt. Pneumatic double acting cylinder is used to thrown the product out from the belt. Solenoid operated 5/2 direction control valve is used to control the flow of air to operate the cylinder. Allen Bradley Micrologix 1200 PLC is used as controller. Four 24V indicating lamp is used that indicates process status, conveyor belt motor status, product status that is faulty or faultless.

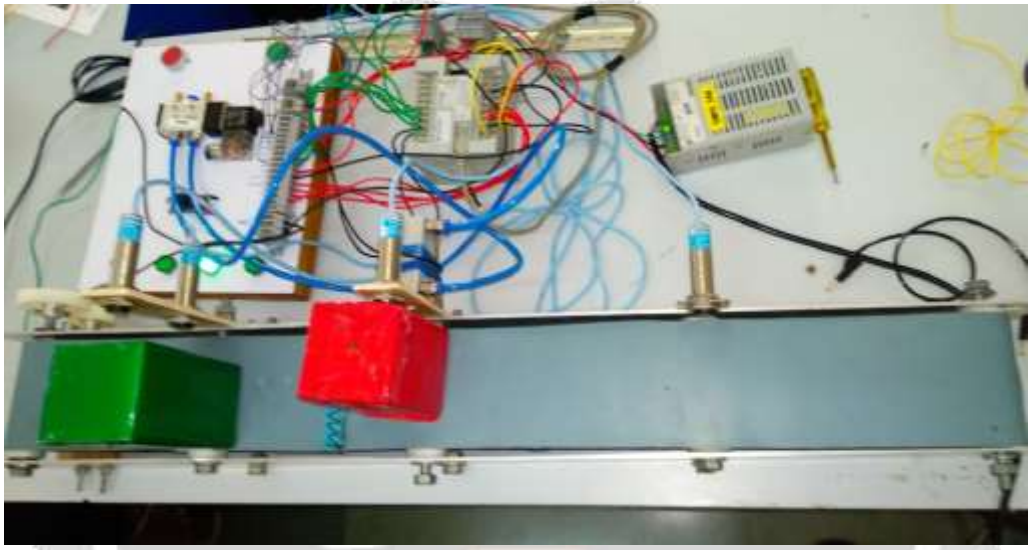

Fig -1System design

4. EXPERIMENTATION

The product whose height is less below 15cm is considered as faulty one. Green one and red one shown in figure is faultless and faulty one respectively. When the start button is pushed conveyor belt starts moving. If the product is sensed by first two proximity sensor as shown in figure it moved to the end of the belt and sensed by last proximity sensor and the counter in the ladder diagram increased by one. In only one of the first two proximity sensor sense the product, it stopped in front of pneumatic cylinder and thrown out by the piston and process continues.

5. RESULT

After number of experiments the system gave hundred percent results. All the faulty product removed from the system all the faultless product successfully collected at the end of the conveyor belt.

6. FUTURE SCOPE

The system can be better monitored and controlled using Supervisory control and data acquisition (SCADA) system and IoT based systems. A system is need to design collect the faulty product and smoothly moving the faultless product for further processing.

6. REFERENCES

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