Industrial Lifter Control using PLC

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Abstract: **With the advancement of technology, the researchers are working in this domain at a faster pace to eliminate various tiresome tasks of mankind to make life simpler. In the era of automation, among all kinds of industries, autonomous cost-effective sorting systems with better accuracy have become a necessity. We are designing a prototype- 'Industrial lifter control using PLC'. Generally, industries use manufacturing products which with some variations in height, shape and weight. Therefore, sorting plays an important role. In such cases instead of human efforts required to sort the packets, it can be done using a lift with the sorting functionality in it. It will reduce the risk of accident and work in order to make the system more reliable and trustworthy along with human friendly system. So, we would like to make the system more reliable and automated**

Keywords: **cost-effective sorting, Height, Shape, Size, Accuracy.**

1. Introduction

Due to automation a lot of manual work is reduced. It provides convenience and it is easy to handle. Because of advancement in technology and increase in production, handling the work manually has become difficult so here automation plays an important role. Our system is based on sorting of the products in accurate manner without any errors. A PLC is a digitally operated electronic system, designed for use in industrial environment, which uses a programmable memory for the internal storage of user-oriented instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic to control, through digital or analog inputs and outputs, various types of machines or processes. This will help in reducing time and also effective. In this way industry can increase its manufacturing rate and have a large number of productions with ease.

2. Motivation

Automotive industry is one of the fastest growing industries, irrespective of that there are many problems faced by this industry. Hence in order to increase the effectiveness, sorting of the products in accurate manner is required and therefore some smart system production must be taken into account. The main aim of the project is to make a system which is effectively programmable and will reduce human interference in the production environment and this would lead to avoidance of accidents in industry. So, we have decided to make a human friendly system using PLC and HMI.

3. Background

In many industrial applications there is need of sorting. Sorting can be done by using many ways like sorting of object according to their dimensions (height, length etc.), according to their colors, according to their weight, using machine vision (image processing), according to the material of an object etc. For example in Thermal Power Station electromagnetic sorting technique is used to sort ferromagnetic materials from coal.Over recent years, PLC has emerged as practical alternative to classical control schemes when one is interested in controlling certain time varying, non-linear process. As circuit became larger complexity of logic gate went on increasing so Microcontroller came into picture followed by PLC, DCS programming. Control of field signals is done using these devices as per signals coming from devices and complexity of process.

4. Literature survey

The following table shows the amount of research work done and all the papers we have referred to along with their title and methodology used.

Table 1
Literature survey

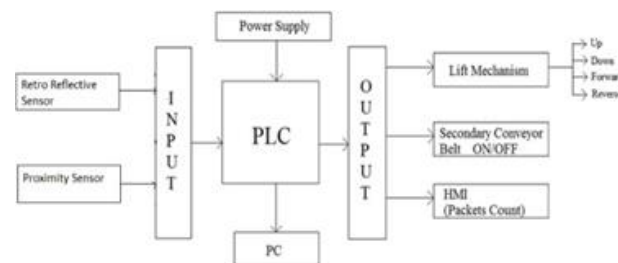| Title of the Paper	Methodology Used	Conclusion
PLC Based Object Sorting Automation.	Recognition, PIC Microcontroller, Postal Automation.	It can sort the load using the sensors, without the human intervention.
Automatic Sorting in Process Industries using PLC.	Conveyor, Human Machine Interface, High Voltage Alternating Current, Programmable Logic	we are using the automated process which is used to sort the materials which are of different sizes.
Lift Automation and Material Sorting using PLC.	Conveyor belt, linear actuator, camera, open CV.	The automated system outlined above provides cost effective, low time consuming.

5. Methodology

Fig. 1. Block diagram for industrial lifter control

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The above figure consists of following blocks,

PLC: A PLC is a microcontroller system with dedicated operating system.

Retro-reflective sensor: Retro-reflective mode is the second primary mode of photoelectric sensing.

Capacitive proximity sensor: Capacitive proximity sensors use the variation of capacitance between the sensor and the object being detected.

DC motor: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

HMI: HMI stands for Human–Machine Interface, i.e., it allows for interactions between human operators and machines.
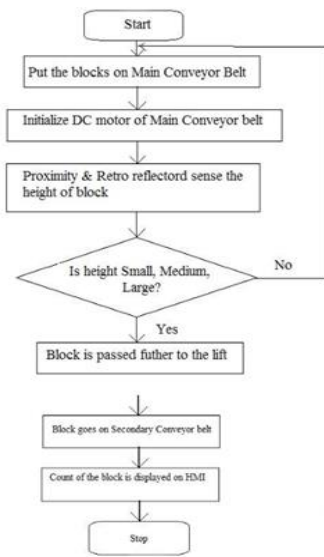
A. Flowchart

Fig. 2. Flowchart of process

6. Advantages

Advantages of proposed Industrial Lifter Control are as follows: -

- Manual work is reduced
- Accuracy is increased
- Increase in efficiency and production
- User friendly system.

7. Applications

Applications of proposed Industrial Lifter Control are as follows:

- *Brick Manufacturing Process:* In brick manufacturing Process the quality of bricks considering their height as a Parameter can be checked. If the height is more or less from the original size then the defective bricks can be sorted out.
- *Luggage sorting at Airports:* The parcels at airport which has to loaded in cargo planes can be sorted accordingly to reduce the load of the plane.

- *Quality checking of solid objects:* If the height of the solid material is taken as a criterion in quality check of that object then this system can be used effectively.
- *In food processing industries:* The food packing of the foodstuffs of different sizes can be sorted in such type of Industries where various quantities of packed food are running on a single line.

8. Conclusion

The system would segregate objects based on their type i.e. whether the packet is small, medium or large. Use of PLC with the frame of logic gates will make program modification easy and thus, we can modify the system according to the requirement. Limitations will be there due to the practical difficulties. This setup can be further improved to a sorting system that will sort the material on the basis of other physical consideration.

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