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Material Segregation & Waste Management using PLC

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ABSTRACT

This paper deals with the problems faced while segregation of waste in urban and rural areas. With the growing population rate, the amount of waste being produced is also increasing at a very faster rate. It is also posing a very serious problem at the municipal level to manage the wastes being dumped everywhere as landfill waste. So, it is very crucial to have some system to manage waste automatically which is currently not there. Prime Minister Modi's mission of Swatch Bharat Abhiyan can also be successfully implemented by the proposed system. The paper proposes a novel method where the provision is given to separate out metallic and plastic waste into respective bins by the sensing of different sensors incorporated along the conveyor belt. In this system the metal material is recycled. We are using programmable logic controller (PLC) as main component and proposed system is simulated using DELTA PLC.

Keywords
DELTA PLC, Motor, Pneumatic cylinders, pneumatic valves, sensors,

INTRODUCTION

The purpose of this project is to segregate the metal and nonmetal waste for the industrial and domestic use. Due to the environmental aspect as well as increasing prices for raw materials, scrap separation is a global topic. The advantages of scrap separation system are to improve the results in energy savings, better environmental performance, minimize raw materials wastage and reduce manufacturing costs. These benefits also categorized as to improved scrap management systems. The advantage of PLC is the automation with a relatively small amount of cabling and a low error rate. Productivity, flexibility and efficiency with using only a few contactors specify the controller.

Basically the use of this system in small scale industries such as cold drink plant, farma industries for segregation purpose.

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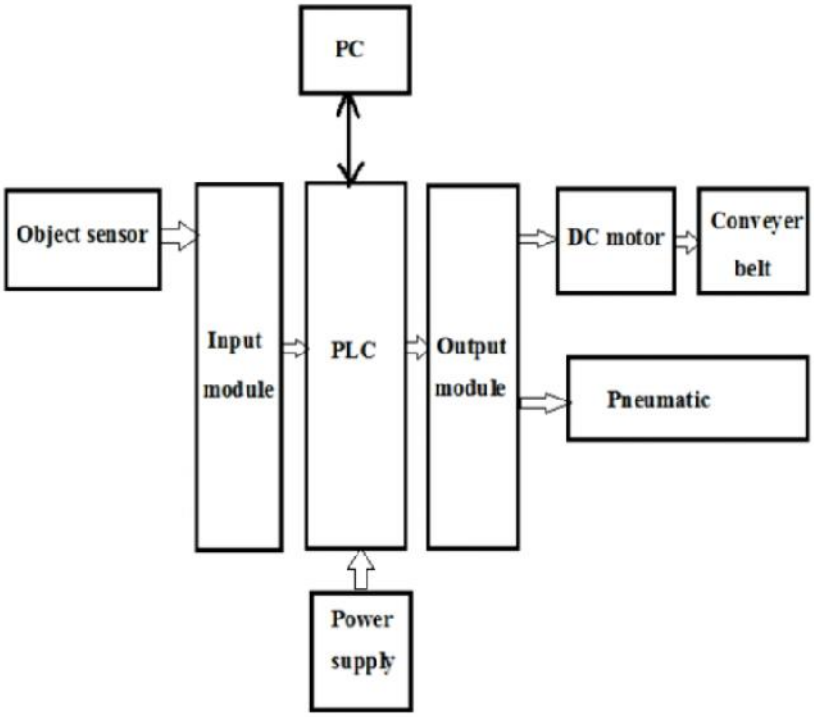
BLOCK DIAGRAM



Block diagram of waste management using plc.

HARDWARE DESCRIPTION

1.PROGRAMMABLE LOGIC CONTROLLER

A programmable logic controller (PLC) are an industrial digital controllers used to the control manufacturing processes. For e.g. assembly lines robotic devices, or for any activity with requiring high reliability,control, programming and also process fault diagnosis. Basically PLC is used to control a big plants in automobile industries. In our project we use DELTA DVP16ES2 PLC. This Plc has eight inputs and outputs, both are digital.

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Features:

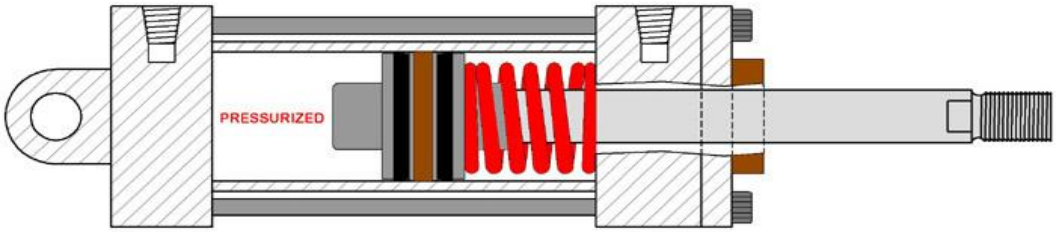
1. It has eight digital inputs and eight digital outputs.
2. It adopts 32-bit CPU.
3. Program capacity: 16k steps.
4. Data register: 10k words.
5. Execution speed: 0.35μs.

2. OBJECT SENSORS

Object sensors are used to sense the object. In our project inductive proximity and proximity IR sensors are used. Inductive proximity sensor sense metallic object and proximity IR sensor sense all objects. The output of sensors is given to input module of Programmable Logic Controller. With the help of these outputs of the PLC are organized.

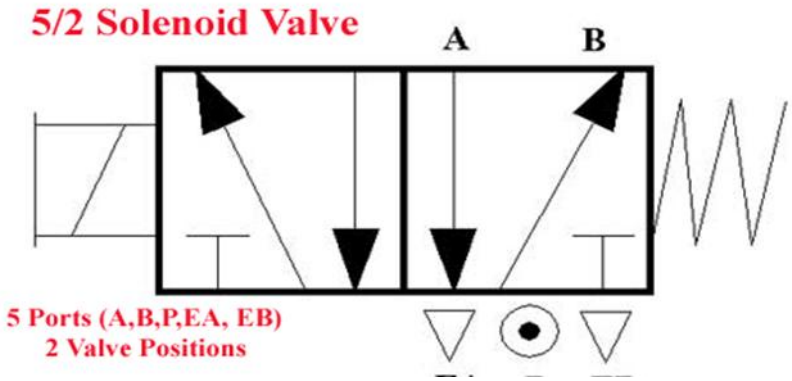
3. PNUMATIC CYLINDER

In our project pneumatic cylinder is used for crushing the material. In this system we uses single acting and double acting cylinder. The cylinder works on air pressure with the help of solenoid valves.



4. PNUMATIC SOLENOID VALVES

A solenoid valve has two main parts: the solenoid and the valve. The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically. A Direct Acting valve has only a small flow circuit, shown within section E of this diagram (this section is mentioned below as a pilot valve). This Diaphragm Piloted Valve multiplies this small flow by using it to control the flow through a much larger orifice.



5. DC MOTOR

In our system dc gear motor is used for the rotation of conveyer belt. In this we used 12DC motor having 60RPM.The dc motor gives very precise control.

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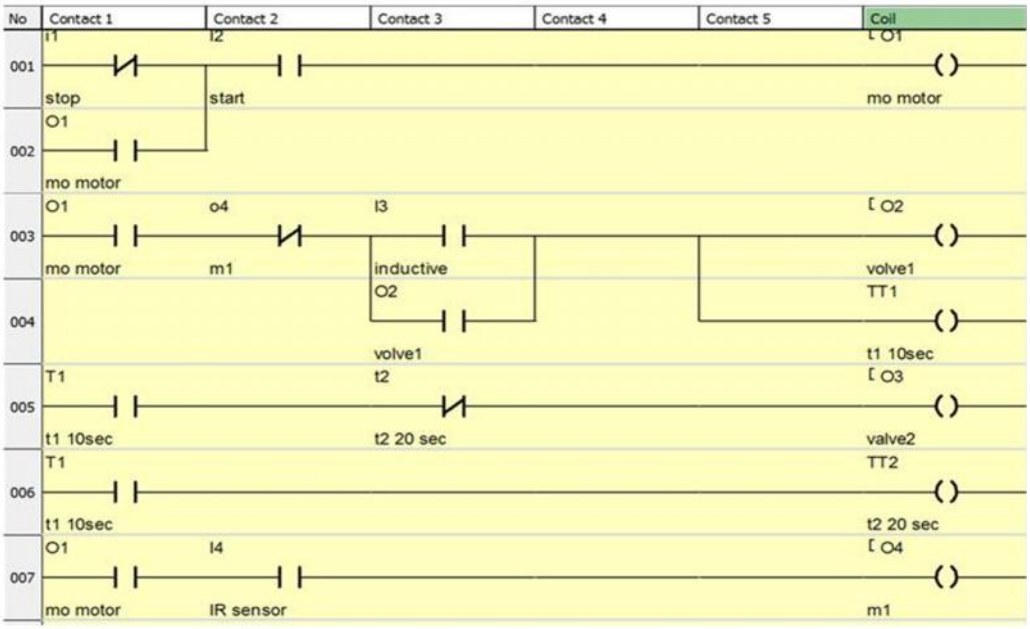
LADDAR PROGRAM



CONCLUSION AND FUTURE SCOPE

In this we proposed an automatic waste segregating system using the PLC. The system Separates out the metallic and non-metallic waste along with detection and separation. This system can be implemented in some small scale industries to segregate out the metallic, plastic, glass and paper wastes more efficiently at an affordable cost. Use of PLC has added advantages like reduction in manpower with improved accuracy and speed of waste management, also avoiding the risk of working at hazardous places. In Future, the work can be implemented by making use of a robotic arm to pick and place certain materials which can be re-used. Also, limit sensors can be placed at the top of each of the collecting bins to unload them when they are full.

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