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. Rapid surge in bulk and different types of solid and hazardous waste is serious issue due to urbanization and industrialization in the countries. Hence, we have proposed to segregate the waste materials collected into wet, dry and metal categories using PLC mechanism.

Also the aim of using PLC mechanism or any other type of separation of waste on a machine is to perform work. Rapid surge in population has led to improper waste management in metropolitan cities resulting in increased pests and spreading of diseases. Unclean environment is the result of littering of paper and plastic. Soil loses its fertility due to harmful chemical realized while dumping toxic waste. In that we use PLC mechanism with different sensor and segregate wet waste, dry waste & metal part etc.

Keywords—plc controller,wetsensor,hopper,permanant magnet,conveyor belt,pick & place robo arm.

I. INTRODUCTION

Waste management is a vital need for ecologically sustainable development in all nations, due to rapid urbanization and uncontrolled growth rate of population. In modern world of technology due to tremendous amount of waste generated not only by the industries and medical firms but also commercial activities, disposal of waste by proper means has become a serious concern. Traditional means of wastes disposal include dumping at landfill site. This conventional method takes heavy toll on the health of common people. Efficient sorting of waste is a major issue in today's society. Selective sorting is which often helps to improve recycling and reducing the waste in environment. When the waste is segregated into simple stream such as wet waste, dry waste or metal, it becomes easier to recycle them and reuse them .We aim in just doing that, separating this recyclable solid waste and putting them into individual bins in order to distinguish it and used separately. PLC helps us just doing that under harsh conditions. However, recently municipal workers collect the waste from street to street in order to dispose the waste by proper means. Hence devise a method so as to segregate the collected waste as per its proper categories. The collected waste is sorted into dry, wet

and metal waste by employing various sensors and relays with the help of PLC (6ED1 D52-1MD00-0BA5).

II. BLOCK DIAGRAM

Fig1: Block diagram of waste management using plc.

III. FLOW CHART

Fig 2: Flow chart

IV. HARDWARE DESCRIPTION

1. PLC Controller:

A programmable logic controller (PLC) or programmable controllers are an industrial digital computers adapted for the control of manufacturing processes. For e.g. assembly lines robotic devices, or for any activity with requiring high reliability, control, programming and also process fault diagnosis. They were initially developed in the automobile industry to provide flexible and easily programmable controllers and replaces hard-wired relays and timers. Since which provides high-reliability automation controllers suitable for harsh environment. A PLC is ideal for hard real-time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

In our project we use Siemens logo plc (6ED1 D52-1MD00-0BA5) for control and automation.

Fig 3: PLC controller

Features:

- Plc is compact and easy-to-use.
- Its operation is easy, anyone understands it's operation easily.
- We can easily modify functions without consuming more time.
- The controller can use in any ambient condition without damaging it.
- It has temperature range from $-40/-25^{\circ}\text{C}$ to $+70^{\circ}\text{C}$
- We can simulate the ladder logic using LOGO soft simulation.

Specifications:

1. Supply voltage: DC input of 12V or 24V
2. Digital inputs: Total 8, 4 are used for analog
3. Digital outputs: 4 digital outputs

4. Relay outputs: With inductive load - maximum 3A
With resistive load - maximum

2. Wet Sensor:

The WET Sensor is soil moisture sensor used to determine water conductivity of soil or any type of material. It determines three dielectric properties such as:

- Water Content
- Electrical Conductivity
- Temperature

Fig 4: Wet sensor

The wet sensor measures these three properties of material converts the measured dielectric properties of material into water conductivity. Generalized calibrations technics are commonly used in soil types. It also calculates pour water conductivity; the electrical conductivity of the water within the pours of the soil. Its calculations are based on a formula that minimizes the effects of probe contact and soil moisture on the readings. Generally Temperature is measured using a sensor which is built into the central rod of wet sensor. And the wet sensor is designed with the HH2 moisture meter.

Advantages of the WET Sensor:

- Rapid measurements (~5 seconds) of three parameters.
- Pour Water Conductivity measurements.
- Calibrations available for many soils media.

3. HOPPER:

A hopper is a in different shaped container used in industrial processes to hold particular material that has been collected. Hoppers are normally installed in groups

to allow for a greater collection. Normally hoppers are made of steel.

Fig 5: hopper

Mixed type of waste contains wet, dry and metal waste. This waste is supply through the hopper. In that permanent magnet is placed due to which metal waste attracted towards the magnet and stick to the magnet and dry and wet waste comes out from the opening end of hopper on the conveyor belt.

4. CONVEYOR BELT:

Fig 6: Conveyor Belt

Conveyor belt is a main media to carry the waste material. Waste from opening of hopper is drop over on conveyor belt. Conveyor belt is moving continuously and the speed of conveyor belt is control by using PLC. Weight of waste is depending on size of Conveyor belt.

5. MAGNET:

A magnet is a material that generates a magnetic field. This magnetic field is invisible but is responsible or defines the property of the magnet that attracts irons material.

To separate out metal waste from mixed waste we use permanent magnet which is place inside the hopper and due to these metal parts attracted towards the magnet inside the hopper and stick to the magnet.

6. PICK & PLACE ROBO ARM:

Pick and place robot arm we use in our project to pick the dry waste & place in dry waste bin by controlling through the PLC controller.

Fig 7: Pick & Place Robot Arm

V. FUTURE SCOPE

- Waste to Fuel, where the waste can be utilized to generate bio fuels.
- For further convenience transmitters could be placed at garbage dumping places to convey a message whenever the accumulation of garbage crosses its threshold limit along with its location.
- The use of PLC gives this project a vast scope for future. We can implement additional sensors to detect more objects.

VI. CONCLUSION

Automatic waste segregator can be accomplished with the help of PLC in order to sort out dry, wet and metal materials from the waste collected. Hence, it saves enormous human efforts and eventually less compromise with the health of civilians and municipal worker. To improvise this method of waste segregation one can attempt to sort mixed waste using conveyor sorting and to add to that one can implement logic for sorting plastic as well.

VII. RESULT

- Completed the concept design of entire waste management automation system.
- Ordered the required bought out material-sensor, actuators and control element.
- Completed electrical wiring and PLC logic and testing of the same is under progress.

- Completed preparation of waste transportation conveyor, pick and place robot arms and other control elements mounting brackets.

REFERENCES

- [1] “Waste segregation using programmable logic controller” by M .Dudhal, B. S. Jonwal and Prof. H. P. Chaudhari International Journal for Technological Research in Engineering Volume 1, Issue 8, April-2014.
- [2] “A Review on PLC based Automatic Waste Segregator” Subhasini Dwivedi ,Michael Fernandes, Rohit D’souza International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 5 Issue 2, February 2016
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