

AUTOMATIC WASTE SEGREGATION USING EMBEDDED SYSTEM

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ABSTRACT

Now a day's large amount of waste is produced in cities, so segregation of waste plays important role in order to keep our city clean and maintain hygiene. We have used mechanical assembly for segregation of waste into wet dry and metal. The segregation, handling, transportation and disposal of waste are to be properly managed so as to minimize the risk to the environment [1].

INTRODUCTION

The economical value of waste is best realized when it is segregated[1]. The main goal of this paper is to design and develop a segregation system which sort wastes automatically into wet, dry or metallic. Mechanical assembly used here includes conveyor belt, high speed blower and electromagnet. The segregation wet and dry waste can be distinguished based on their weight. A high speed blower is used to blow off the dry waste out of the belt while most of the wet waste remains and collected later. Whereas metal can be separated by using electromagnet. This system can be used in cities and colonies

DESIGN PROCEDURE FOR WASTE SEGREGATION

MICROCONTROLLER PIC16F877A

Microcontroller used is the fully static design which have low power consumption, inbuilt ADC, with high operating speed. This 40 pin IC is used for commercial and industrial applications.

Specifications:-

- a) Operating Frequency : 20MHz
- b) Data Memory : 368(bytes)
- c) Operating Voltage : 2.0V to 5.5V
- d) In-Circuit Serial Programming via two pins

POWER SUPPLY

Power supply is used to step down AC supply voltage to 230 V 50Hz to 5Volts regulated DC mainly. It supplies 3.3V to micro controller and up to 12V it get expanded. . In our system we used LRPS for supply voltage. Power supply having blocks are transformer rectifier, filter and regulated IC which provides p perfect regulated DC voltage.

CONVEYOR BELT MECHANISM

Belt conveyor is a machine transporting material in a continuous way by friction drive, it can be a slide and be controlled by the force of gravity[2]. It is rubber or textile structure with a belt shape close ring, with a metallic joint, used for material transportation. It is composed by to end point pulleys and a closed conveyor belt. The pulleys that drives conveyor belt rotating is called as drive pulley.

In this system the belt is driven according to the instruction given by microcontroller. When pulley start to rotate blower turns on and electromagnet charges.

BLOWER

Blower is the machine whose primary function is to provide large flow of air for various processes. This is achieved by rotating number of blades, connected to hub and shaft to drive the motor. A blower is another name of fan that operates where the resistance to flow is primary on the downstream side of fan.

For our system blower is valuable aspect which is used for dry and wet waste segregation. When the air is forced on waste the dry wet is blown away and wet waste is gathered on another side of conveyor belt.

Specification:

- a) Specific ratio: 1.11 to 1.20
- b) Pressure rise: 1138-2066

ELECTROMAGNET

Electromagnet is a type of magnet in which magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off. This consists of a coil of insulated wire wrapped around an iron core. A core of ferromagnetic material like iron serves to increase the magnetic field which is created [4]. The strength of the magnetic field generated is proportional to the amount of current through the winding.

In this system, when the conveyor belt starts rotating, the electromagnet energizes and a magnetic field is generated. When metal pieces come in contact with the electromagnetic field, the metal pieces are attracted towards the electromagnet due to the magnetic field.

BLOCK DIAGRAM

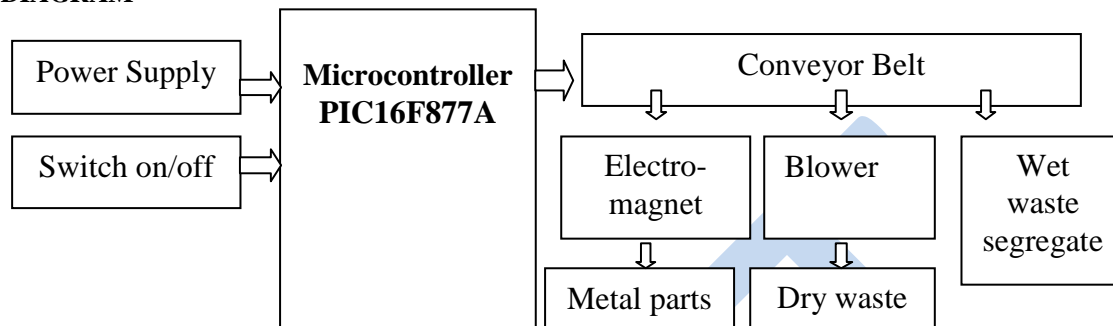


Fig.1. Block Diagram of Automatic Waste Segregation Process Model

This system starts when the waste is splattered on the conveyor belt, the segregation process begins. The power supply is used to convert 230V 50Hz AC supply to 5V regulated DC supply. This 5V supply is given to the microcontroller PIC16F877A, which gives instructions to the DC motor and blower. According to instructions, the DC motor rotates and the conveyor belt pulleys are driven. As instructions are denoted in coding, the blower gets on and dry waste is segregated among the collected waste. While the conveyor belt is in motion, the electromagnet energizes and generates a magnetic field continuously. Metallic parts are attracted to that electromagnet due to this continuous magnetic field. The last part is wet waste segregation, which is effortlessly done only with the help of the conveyor belt in motion. As shown in the block diagram, automatic waste segregation is done by electromechanical techniques.

METHODS OF WASTE SEGREGATION

DRY WASTE SEGREGATION

This system consists of three segregation parts of waste: wet, dry, and metal pieces. In this section, the part of dry waste segregation is elaborated by using a blower. When the waste is splattered on the conveyor belt, it starts rotating. As the microcontroller PIC16F877A gives instructions to the blower, it is switched on. At that time, the part of dry waste segregation gets started, as the blower blows high-pressure air on the collected waste, only the dry waste material is thrown out on the other side of the blower fan. After that, the segregated dry waste gets collected for disposal.

METAL WASTE SEGREGATION

In this part of metal waste segregation, the first step is to detect the metallic pieces, and those metallic pieces get attracted towards the electromagnet. The electromagnet is the parameter referred to electro-mechanics, which creates a temporary magnetic field. On the conveyor belt, there is a special arrangement for the electromagnet. The electromagnet energizes and generates the magnetic field, because of that magnetic field, metallic pieces are detected and collected from all collected waste.

WET WASTE SEGREGATION

Wet waste segregation is a very accessible and uncomplicated process. Where the other two segregation parts are done by using a blower and electromagnet. In the first part of the system, the blower is used for dry waste segregation; after this, metal parts segregation is done by using an electromagnet. While done with these two segregations, only wet waste stays on the conveyor belt. Then it falls off due to gravity at the end of the conveyor belt as it rolls in continuous motion [3].

RESULTS

IMAGES OF IMPLEMENTATION



Fig.2. Results of Conveyor Belt Segregation Assembly

TABLE FOR WASTE SEGREGATION:

Object	Type of waste segregated
Paper	Dry
Metal balls	Metal
Plastics	Dry
Cucumber Peel	Wet
Safety pins	Metal
Metallic can	Metal
Food waste	Wet

CONCLUSION

Design of this system results to automatic waste segregation using electromagnet, conveyor belt and blower like systems. These electromechanical devices used to segregate waste as dry, metal pieces and wet waste separately from all collected waste. This system gives advantages to less hardware circuitry and less efforts for implementation in small amount of time. This can be applicable to smart city mostly to make city as clean, tidy and hygiene.

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