

# Degradable And Bio Degradable Waste Segregation Using Smart Monitoring System

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**Abstract-** *The rapid growth in the population has also led to a surge in the volume of waste being generated on a daily basis. This increase in the generation of waste due to continuous growth in the urbanization and industrialization has become a severe problem for the local and the national government. It is also posing a serious problem for the local authorities to manage the wastes being dumped everywhere as landfill. To ensure minimal risk to the environment and human health, it is necessary to take meticulous measures while segregating and transporting waste. Segregation of waste in a proper manner brings to the limelight the actual economic value of the waste.*

*The traditional method used for segregating waste in India is through rag pickers which is time-consuming and can have adverse effects on the health of the people who are exposed to such wastes. Here we propose the use of an Automated Waste Segregator (AWS) which is cheap and also an easy to use solution for segregation of household waste. It is designed to segregate the waste into three categories viz. metallic, dry and wet waste. The system makes use of an inductive proximity sensor for the detection of metallic waste and a moisture sensor for the segregation of wet and dry waste.*

**Keywords-** Inductive Proximity Sensor, Moisture Sensor, NodeMCU, Servo Motor, Ultrasonic Sensor

## I. INTRODUCTION

These days the increasing in amount of waste generated by human's and limited landfill sites for dumping waste, recycling it is one of the novel approaches to manage the waste effectively. Presently in India, about 960 million tonnes of solid waste is being generated annually. Rapid increase in the population has led to improper waste management in metro cities and urban areas which has resulted in spreading of diseases.

The key to efficient waste management is to ensure proper segregation of waste at source and to ensure that the waste goes through different streams of recycling and resource recovery.

The common method of waste disposal is by unplanned and uncontrolled dumping at landfill sites. This harmful method of disposal of waste can contaminate surface and ground waters and can harbor disease vectors which can spread harmful diseases and can degrade the aesthetic value of the natural environment. This method is hazardous to human health, plant and animal life. When the waste is segregated into basic streams such as dry, wet and, metallic, the waste has a higher potential of recovery, and then, it can be recycled and reused.

Thus, we have proposed a cost effective "Automated waste segregator" for proper management of waste. Automated waste segregator categorizes the waste as wet, dry and metallic. The wet waste is converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas can be used as a source of energy. The metal waste could be reused or recycled.

Even if there are large scale industrial waste segregators present, it is always feasible to separate the waste at the source itself. The benefit of doing so is that the occupational hazard for waste workers is reduced. Also, the separated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant.

### [1] Microcontroller Based Automatic Waste Segregator

**Authors:** M K Pushpa, Aayushi Gupta, Shariq Mohammed Shaikh, Stuti Jha, Suchitra V

**Published in:** International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, Vol. 3, Issue 5, May 2015

The proposed system uses a conveyer belt mechanism to segregate waste into dry, wet and metallic waste using 8051 microcontroller.

### [2] Automatic Waste Segregator and Monitoring System

**Authors:** Aleena V J, Kavya Balakrishnan, Rosmi T B, Swathy Krishna K J, Sreejith S, T D Subha

Published in: Journal of Microcontroller Engineering and Applications, 2016; 3(2): 1–7p.

The proposed system would be able to monitor the solid waste collection process and management of the overall collection process using a conveyer belt mechanism. It gives an effective method of segregation of waste into dry, wet and metallic waste using Arduino Uno microcontroller

[3] Waste Segregation Using Smart Robotic Arm

Authors: V V Joshi, Rohan Ghugikar, Bhagavat Bhise, Pradip Bhawar, Shivam Kakade

Published: International Research Journal of Engineering and Technology (IRJET)

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The robotic arm will able to sort out the three different materials like paper, glass and metals. When the sensors are triggered the motor-powered arm is actuated and the materials are dispensed onto its proper bins.

Motivation

Waste management is a great problem in poor developing countries as waste is scattered all over the roads due to improper methods of collection and dumping thus polluting the environment.

As there exists basic problems regarding the primary task of waste management like proper disposal, collection, sorting, recycling etc.

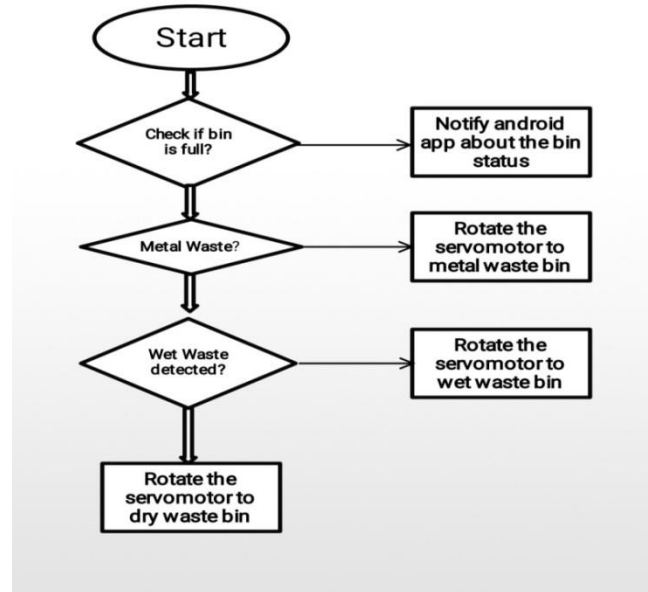
Problem Statement

The common method of waste disposal is unplanned and uncontrolled dumping of garbage at landfill sites. This harmful method of disposal of waste can contaminate surface and ground waters and can harbor disease vectors which can spread harmful diseases and can degrade the aesthetic value of the natural environment.

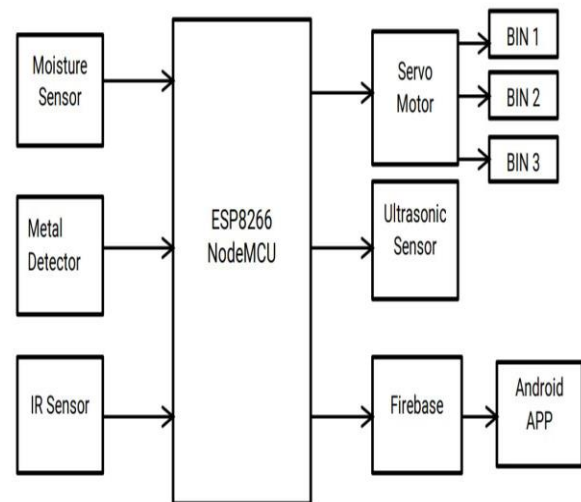
People are not segregating waste in spite of awareness. People not using two separate bins for dry waste and wet waste. Due to the unauthorized garbage throwing habits, our environment is getting polluted every day. To avoid this, waste has to be segregated at the source itself. Segregated waste can be easily recycled and reused.

II. METHODOLOGY

The main goal of the project is to design and develop a sorting system that sorts the waste automatically into three categories namely dry waste, wet waste and metal waste. It works as shown in the below flow diagram.



Once the input waste is dropped into the waste bin, the segregator will first check for the presence of metal waste. If it is not metal waste, then, wet waste presence is checked. If it is neither a metal waste nor a wet waste, then, it is dry waste. According to the sensor output, the waste will be segregated. The waste accumulated in the bins will be monitored and its status is sent to the real-time database and that value will be seen in the android app.



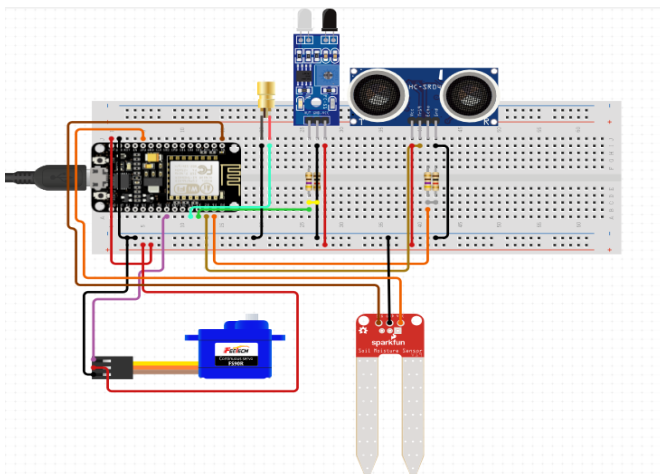
The above figure shows the block diagram of the Automated Waste Segregator.

### System Flow

- In this method, the waste is first sensed by the inductive proximity sensor to detect metals. If the waste is metallic, it is sent to the first bin.
- If it is not metallic, it is sensed by the moisture sensor to detect wet waste. If it is wet waste, it is sent to the second bin.
- If it is neither a metal waste nor a wet waste, it is sent to the third bin containing the dry waste.
- It also checks the waste accumulated in every bin and sends the real-time data to the firebase database.
- The accumulated waste height can be seen over the android application.
- The whole system is controlled by NodeMCU development Board. Each and every component is interfaced to the NodeMCU board.

### Sensor Interfacing

- In the below diagram, sensors and actuators are connected to the microcontroller NodeMCU development board.
- IR sensor detects the presence of the waste in the container and sends the value to the controller.
- Ultrasonic sensor senses the level of the accumulated waste inside the bins and sends the data to the controller.
- Proximity sensor senses the metallic content present in the waste and sends the value to the controller.
- Moisture sensor senses the moisture content of the waste and sends the value to the controller.



## III. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

### ADVANTAGES

1. Makes recycling easier.
2. Segregated waste is easier to dispose.
3. Keeps the environment clean and reduces pollution.
4. Wet waste can be turned into compost and used as a fertilizer.

### DISADVANTAGES

1. We cannot segregate all types of wastes.
2. Recycled products are often of lesser quality.
3. Needs more global buy-in.

### APPLICATIONS

1. This automated waste segregator machine can be used in houses to segregate household waste.
2. It can also be used in public places like railway stations, bus stands, shopping complexes, etc.
3. It can also be used in schools and colleges.

## IV. CONCLUSION

Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automated waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention, and also no hazard to human life makes the system far more accurate, cost-effective and also easier to install and use at a domestic level. Segregating all these wastes at a domestic level will also be time-saving.

## REFERENCES

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