

Automated Dry-Wet-Metal Separator Using Microcontroller

Mansi Shedame¹, Pawan Madavi², Nilima Maske³, Mayuri Tabhane⁴, Mrudula Kalamkar⁵

Assistant Professor, Department of Electrical Engineering¹

UG Students, Department of Electrical Engineering^{2,3,4,5}

Nagpur Institute of Technology, Nagpur, India

Abstract: The rapid increase in population and modernization lead to large waste of garbage. The waste segregation makes it simply reuse and recycle. The proper management system is not available for segregation of dry, wet and metal waste and Proper disposal of waste is not followed in crowded areas. Waste garbage affects in environment management, segregation and transportation. Technology always helps in making humans life easier. These papers purpose an automated waste segregation for households and It is designed to sort out the different waste For separating metal and dry waste into their respective bins by different sensors along with the use of conveyor belt. This system can be used in industries for the employees to use daily segregation of waste at dump yards is time consuming and can be recycle. These garbage waste can be reuse and recycle.

This technology is particularly significant in recycling and waste management industries, where it enhances the recovery of valuable metals and minimizes environmental impact. The integration of dry and wet processes in metal separation offers several advantages. It increases the overall efficiency and purity of metal recovery, reduces energy consumption, and allows for the processing of a wide range of materials, including complex electronic waste and mixed recyclables. Additionally, the wet process aids in the removal of contaminants and non-metallic impurities, resulting in higher-quality end products. Overall, the dry-wet metal separator represents a significant advancement in recycling technology, providing a comprehensive solution for the effective and sustainable recovery of valuable metals from waste streams. Its application is crucial for improving resource efficiency and supporting environmental conservation efforts

Keywords: garbage waste

I. INTRODUCTION

The automation of garbage separation and monitoring system is achieved by the use of microcontroller. The increasing population which lead to improper management of waste in rural area and also in urban areas.

The waste garbage mainly divided into three categories .

- 1) dry waste
- 2) wet waste
- 3) Metal waste

The garbage segregation is the process in which different types of waste are separated this will help to sort various elements into different types of waste system.

The IR Sensor is use for monitoring waste collection process which sense the object.

In India the population is increasing day by day. The common method of waste disposal is biogas production and vermicomposting to keep a clean environment. This method is dangerous to animal , plant and human being. Garbage disposal is huge problem in World. This project is to design with user friendly system which segregates wet,dry and metallic waste using suitable sensors in respective bins. Wet waste is converted into compost through automatic composting process. Biogas can be used for the generation of electricity.

Recycling of metal helps to reduce amount of waste, Which is sent to landfill areas and it helps to conserve natural resources.

The advantage is improve in better environmental performance and energy saving, decrease material wastage and reduce manufacturing costs.

Waste separation of dry, wet and metal using microcontroller represent significant advancement in recycling technology. Both dry and wet separation techniques play a important role in recycling operations, allowing for the efficient recovery of valuable metals and contributing to environmental sustainability by reducing waste and conserving natural resources. The monitoring system Helps to monitor waste segregation process.

II. LITERATURE SURVEY

"The efficient management of waste in urban areas is crucial for maintaining cleanliness and reducing pollution. Many existing smart waste management systems utilize sensors and RFID tags to monitor and control waste levels in garbage bins. In a study by Insung Hong, it was found that implementing Smart Garbage Sensors (SGS) instead of traditional RFID systems can significantly improve energy efficiency by up to 16% and reduce food waste. These sensors, installed in Smart Garbage Bins (SGBs), help control energy consumption within the system.

Another innovative approach discussed in a research paper involves the design of an electronic device equipped with biosensors, weight sensors, and height sensors to detect waste overflow and monitor pollution levels from toxic gases emitted by the bin. This device, incorporated with a GSM module, alerts the municipality about bin overflow, facilitating timely waste disposal.

Additionally, the use of mesh networks, as suggested by FachminFolianto, enables the efficient transmission of data from the bins to the network. When bins reach capacity and require cleaning, the system directs bin collectors to the location.

Furthermore, Vikrant Bhor proposed a system that utilizes IR sensors, GSM modules, and microcontrollers to ensure timely cleaning of bins when filled to capacity. If bins are not full, the system alerts the appropriate authorities. This approach not only promotes a clean environment but also reduces the number of garbage collection trips required.

In conclusion, it is clear that effective waste management strategies, such as the use of separate bin sections and advanced monitoring facilities, can greatly improve existing waste management practices in India. By implementing organized waste segregation plans and utilizing innovative technologies, the challenges associated with waste management can be significantly alleviated."

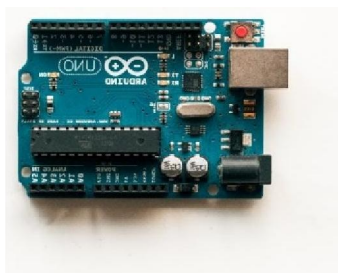
III. METHODOLOGY

Proposed solution

Waste segregation plays a crucial role in efficient waste management, yet its implementation faces challenges, particularly in urban and rural areas. The project seeks to address this issue by introducing a smart and convenient solution. By utilizing smart sensors and actuators, the system will notify the municipality when garbage bins reach capacity, prompting timely waste collection. The primary focus of this initiative is to promote waste segregation from the start, facilitating a more streamlined waste management process. A detailed breakdown of the key components and schematic diagram for this innovative project are provided below."

Arduino Uno

Arduino Uno microcontroller is based on the ATmega328 chip. It has 14 input/output pins. Arduino provides a USB connection for programming ,a power jack, reset button, etc. Arduino serves as the backbone of the project,providing essential functionalities for seamless operation.



IR Sensor

The waste detection system utilizes an IR Sensor to detect the presence of waste. The IR Sensor has light sensor to detect the wavelength. An LED is used to emit light when sensor operation performed, the intensity of light is measured. Any reflection causes significant change in intensity, indicating the presence of an object. The sensor outputs a logical 1 when an object is detected and a logical 0 when no object is present, which is then sent as input to the microcontroller.



Raindrop sensor

The Raindrop works based on the dielectric permittivity. The dielectric permittivity of water substances, resulting in a voltage that is proportionate to water content in the waste. The capability allows sensor to identify whether it is wet or dry, which not only detects the presence of waste but also measures the waste level. Once the waste level exceeds a certain threshold, this data is transmitted to the microcontroller.



Gear Motor:

Gear motors used in the various projects due to speed adjustment by employing gears. Gear motor is connected with motor shaft and main motor, through a secondary shaft. The gear motor is mounted on the main dustbin and enables movement in both clockwise and anticlockwise



Motor Driver:

Motor drivers serve as amplifiers for current, boosting the current signal to efficiently drive the motor. They have the ability to provide bidirectional drive voltage between 5V and 36V, with high noise resistance and safeguards against

overheating. When dealing with gear motors that need a 12V power source, the L293D driver comes in handy. This driver enables the Arduino Uno, which has a maximum voltage of 5V, to meet the required 12V output for optimal performance.

Inductive Proximity sensor :

Inductive proximity sensors are commonly used for non-contact detection of metallic objects. They function based on a coil and oscillator system that creates an electromagnetic field around the sensor. When a metallic object, referred to as an actuator, enters the sensor's detection range, it disrupts the oscillation amplitude. A threshold circuit then identifies these changes in the oscillation pattern and adjusts the sensor's output accordingly. Factors like the shape, size, and material of the actuator impact the sensing distance of the sensor, ultimately influencing its operational range.

IV. ACKNOWLEDGEMENT

We extend our gratitude to the management for their unwavering support throughout the completion of this project. Special thanks are due to Dr.Jagdish Chaudhari, Head of the Electrical Department, for his invaluable guidance and encouragement. We are also grateful to our mentor, Ms. Manasi B. Shedame, Assistant Professor, whose expertise and assistance were instrumental in our success.

REFERENCES

- [1] Dodke, A., Argelwar, R., Dani, B.S., Muley, S.P. "Comparison of cuk and buck converter fed electronically commuted motor drive" *International Conference on Electrical, Electronics, and Optimization Techniques, ICEEOT 2016*, 2016, pp. 4292–4297, 7755529
- [2] Dodke, Amit, R. G. Shriwastava, and K. N. Sawalakhe. "Design and control of CUK converter FED Brushless DC Motor Drive." *Journal of Network Communications and Emerging Technologies* 3.2 (2015).
- [3]. High Voltage Generation by using Cockcroft-Walton Multiplier Nikhil M. Waghmare, Rahul P. Argelwar *International Journal of Science, Engineering and Technology Research (IJSETR)*, Volume 4, Issue 2, February 2015
- [4] Wireless Speed and Direction Control of Dc Motor by Using Radio Frequency Technology AnkeshN.Nichat1 , Sheikh Kadir Ali2 ,Yogesh D. Solanke 3 , Amit M. Dodke 4 *International Journal of Engineering Trends and Technology (IJETT)* – Volume 20 Number 2 – Feb 2015
- [5.]Raman, R. S., Kumar, S. V., Reddy, U., Dodke, A., Kumar, A., Jayronia, S., & Adnan, M. M. (2024). Design and CFD Simulation of Supersonic Nozzle by Komega turbulence model for Supersonic Wind Tunnel. In *E3S Web of Conferences* (Vol. 507, p. 01024). EDP Sciences.
- [6.]Argelwar, Rahul P., and V. S. Nandawar. "PFC zeta converter fed BLDC motor drive forfan applications." *International Journal of Research in Advent Technology* 2.2 (2014)