



Automatic approach to segregate the waste at source

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Abstract: A trend of significant increase in municipal solid waste generation has been recorded worldwide. This has been found due to over population growth rate, industrialization, urbanization and economic growth which have ultimately resulted in increased solid waste generation. Final destination of solid waste in India is disposal. Most urban solid waste in Indian cities and towns is land filled and dumped. Proposed project deals with the most blistering topic i.e. waste segregation. An efficacious management needs to be materialized for better planet to live in. Hence, cost effective project proposal; try to bring in the change. It deals with the minimization of blue-collar method utilization for exclusion of waste into an automated panache. An automation of this style not only saves the manual segregators of the numerous health issues, but also proves to be economical to the nation. Besides, this system utilizes low cost components for the successful segregation of most types of waste. When installed in apartments or small colonies, it proves to be beneficial in sorting the waste at the site of disposal itself. Here we propose the use of an Auto 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 moisture sensor for the segregation of wet and dry waste and inductive proximity sensor for the detection of metallic waste and an LCD display for displaying the result of segregation. It is evident from experimental reports that segregation of waste using AWS has been successful.

Keywords: Waste segregation, Solid waste, Water pollution etc.

I. INTRODUCTION

Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. It is a labour-intensive activity, accounting for approximately three-quarters of the total cost of solid-waste management [1]. Public employees are often assigned to the task, but sometimes it is more economical for private companies to do the work under contract to the municipality or for private collectors to be paid by individual home owners. The major problems affecting solid waste management are unscientific treatment, improper collection of waste, and ethical problems [2]. This in turn leads to hazards like environmental degradation, water pollution, soil pollution, and air pollution.

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 [3]. Then reduced final residue is then deposited scientifically in sanitary landfills. Major limitation of this method is the costly transportation of MSW to far away landfill sites. Thus Microcontroller (MC) based smart innovative technology would help the segregating of the waste at source.

The key objectives of the work include, the implementation of technologically simple and eco-friendly Smart Microcontroller based Smart Auto Waste Segregator (SAWS). The sensor based segregation of wet and dry waste and detection of metallic waste and an LCD display for displaying the result of segregation to minimize of blue-collar method utilization for exclusion of waste into an automated panache [4]. The resulted work will maintain a balanced sustainable solid waste management system which benefits the community and Geo environment to bring about an improvement in the general quality of life in the rural/urban areas, by promoting cleanliness and hygiene.

II. METHODOLOGY

A. Open Close Mechanism

The open close mechanism acts as a regulator to control the waste that falls on the belt. The open close mechanism can be implemented using microcontroller controlled geared motor which rotates in clockwise and anticlockwise direction as per the requirement. Using IR operated sensor, the waste fall is detected which in turn initiates the open close mechanism.



B. Inductive Proximity Sensor

Further to detect the buried conductive material, an inductive proximity sensor based on the eddy current principle has been adopted. Three 12V inductive proximity sensors are used to detect if the incoming waste is metallic or not. The output of this sensor is fed to microcontroller for future processing.

C. Slide Section

When the inductive proximity sensors detect a metallic waste, a slider movement is initiated which sweeps the waste away after it falls on the belt. Permanent magnet within the metallic bin helps us in sorting magnetic metals from non-magnetic ones.

D. Blower Section

Finally, dry and wet waste separation is done based on their weight. Due to its high density and weight, wet waste refuses to be blown off even in the presence of a high speed blower. A 12V relay coil is used to control the operation of high-speed AC blower. As blower blows, the belt halts and dry waste is thrown out in to the dry bin via a collecting chamber. Wet waste stays on the belt. It then falls off due to gravity at the end of the belt as it rolls.

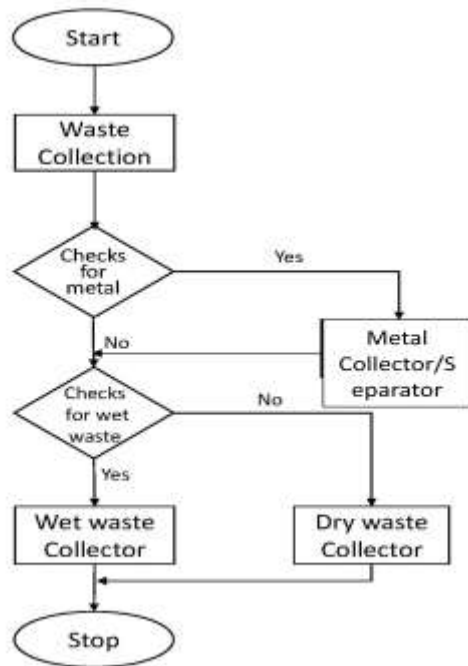


Figure 1. Process flow diagram

III. RESULTS AND DISCUSSION

The proto type of microcontroller non-biodegradable waste segregator has been fabricated and operation was tested successfully. The heart of this system is PIC microcontroller which is used to control the operation of motors. At the beginning, all dry type waste materials are blown away using a blower mounted near the funnel outlet. Further any metallic waste materials are segregated by the movable magnetic arm. The magnetic arm movement is adjusted using microcontroller.



Figure 2. Schematic diagram of the system



Figure 3. Working prototype of waste segregator

IV. CONCLUSION

The innovated non-biodegradable water segregator has efficiency of approximately 80%. The system would promise for the future utilization for the management of solid waste segregation unit in wider level. The Microcontroller based dry & wet waste segregator which is an affordable and easy to use solution for segregation, even, if there are large scales industrial waste and urban/rural households.

V. SCOPE FOR FUTURE WORK

The waste materials can be segregated into biodegradable, non-bio degradable and metals by using more sensors. The discarded things can be processed to extract or recover materials in an effective way and resources or convert them to energy as usable heat, electricity, or fuels. The large scale introduction of automatic waste management in villages, platforms, hospitals, industries, etc. can be segregated by real time monitoring and controlling of waste using IoT. A prediction system by analyzing the given data's to predict the variation in the amount of waste and to adjust the timing of management can also be implemented.

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