Garbage Collector Machine with Instant Reward

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Abstract - Now a days, waste management is becoming a big issue. Due to improper waste disposal and management, society is facing environmental contamination problems which affects directly on human beings. Garbage separation is also a difficult task for the workers. People are not aware of these problems and do not dispose the garbage at proper places which leads to garbage accumulation at public places. So, to encourage people for proper garbage disposal this paper deals with the concept which will provide platform to dispose of waste in a more scientific and user-friendly. In return they will be rewarded in a cashless manner through means of digital payments and free coupons etc. The nature(wet or dry) and weight of garbage disposed in the machine will be sensed for segregating it in two section. The user will be rewarded according to the weight of garbage. Flow of the operations will be programmed in Arduino Uno micro-controller, sensors and GSM technology. This system leads to collection and segregation of waste at one place, for effective recycling and to reduce environmental. Also this will helps us to contribute in Swachh Bharat Abhiyaan scheme launched by the government of India.

*Key Words***:** waste management, garbage segeration and accumulation, Digital Payments, Arduino Uno, Micro-Controller, Swachh Bharat Abhiyaan

1. INTRODUCTION

Today main issue for pollution is Garbage Overflow. It creates unhygienic condition for the people and creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness. To avoid all such situations, we are going to implement a project called IoT Based waste management using smart dustbin.

Implementation is done with the help of IoT concept. The Internet of Things (IoT) is a concept in which surrounding objects are connected through wired and wireless networks without user intervention. Objects communicate and exchange information. In this system multiple dustbins are located throughout the city or the Campus, these dustbins are provided with a sensor which helps in tracking the level and weight of the garbage bins and a unique ID will be provided for every dustbin in the city so that it is easy to identify which garbage bin is full. When the level and weight of the bin reaches the threshold limit, the device will transmit the reading along with the unique ID provided. In order to avoid the decaying smell around the bin harm-less chemical sprinkler is used which will sprinkle the chemical as soon as the smell sensors detect the decaying smell. Once the bins are full then the user will not be able to access the bins. The status of the bin is accessed by the concerned authorities from their place with the help of IoT based app and an immediate action will be taken to replace overflowing bins with the empty bins.

1.1 Problem Statement

Now a days, waste management is becoming a big issue. Due to improper waste disposal and management, society is facing environmental contamination problems which affects directly on human beings. Garbage separation is also a difficult task for the workers. People are not aware of these problems and do not dispose the garbage at proper places which leads to garbage accumulation at public places.

1.2 Objectives

1) To design and manufacture IOT based garbage collection and segregation machine which gives instant rewards corresponding to the weight of the garbage disposed.

2) To design an innovative system based on Arduino programming which will help to collect garbage at one place and prevent improper waste disposal.

3) To separate dry waste and biological waste.

4) To design and manufacture the tilting mechanism along with load cell to separate the waste after being weighed.
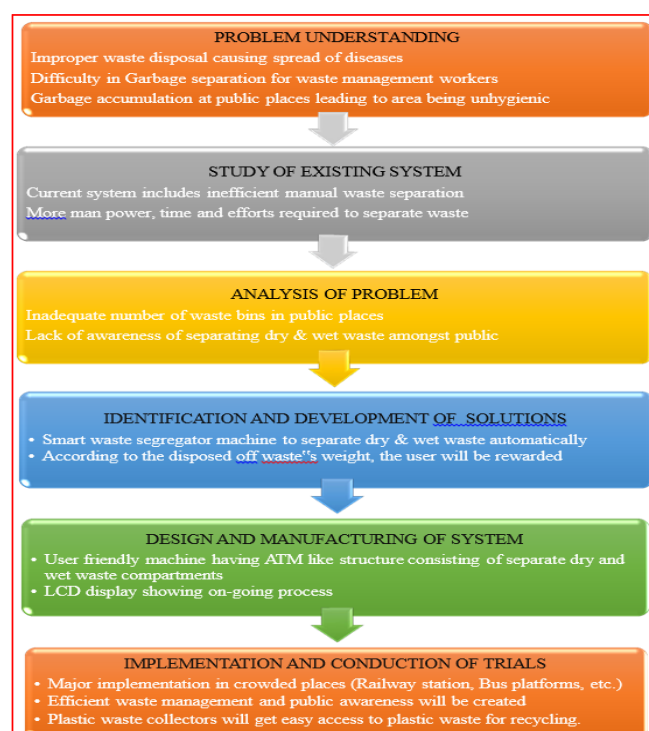
1.3 Flow Chart of Methodology

Figure 1.1 Flow Chart of Methodology

2. GARBAGE COLLECTOR

Arduino UNO is used to automate the entire machine. It simplifies the communication between the sensors and user input. The Smart Garbage machine starts with the basic process that is when the user enters its mobile number on the 4x4 keypad to start the process. GSM SIM900D module is used for the communication system. After entering the mobile number, the window placed on the frontal side of the machine will get opened with the help of SG90 micro servo motor from where the user has to drop the waste. The disposed garbage is channelized in such a way that it will fall on the central area of tilting mechanism which consists of Weight sensor with HX711 Module. This needs to be done because the load cell will give almost accurate output when weight is measured at the centre or at the close vicinity of the centre. If the weight is not properly calculated, then the reward might vary according to the errors in the output. A 2 probe Soil moisture sensor is placed on the tilting mechanism such that if any object dropped on it, the minute presence of moisture will make the mechanism tilt on the wet garbage side. To cross check the type of garbage, IR sensor is used too. The entire tilting mechanism is mounted on 12V DC Gear motor which is attached welded on inner side of front face of the machine. To avoid cantilever forces that can be developed by sudden dropping of garbage on tilting mechanism or after a long time of unsupported mechanism; a vertical support is given from the bottom. Then the intermediate process starts where the load cell calculates the weight of the disposed garbage and the moisture sensor detects the moisture content.

Through this the nature of the garbage is identified (whether wet or dry) and accordingly dumps the waste in respective wet or dry bin with the help of motor mechanism. Finally, the machine sends an SMS to the user and the corresponding reward points which can be further redeemed. After SMS is sent, the user will use automatic sanitizer dispenser which will avoid the spread of contagious diseases like novel coronavirus. The entire process can be tracked by user on the 16x2 LCD Display.

2.1 Design

For modeling of parts of Garabge collector CATIA Design software is used. Fig 2.1, 2.2, 2.3 shows the parts of garbage collector i.e. Garbage Bin with inclined base, Body Design with overhead compartment for electric components, Tilting Mechanism. Fig 2.4, 2.5 shows the rear and isometric of garbage collector respectively.
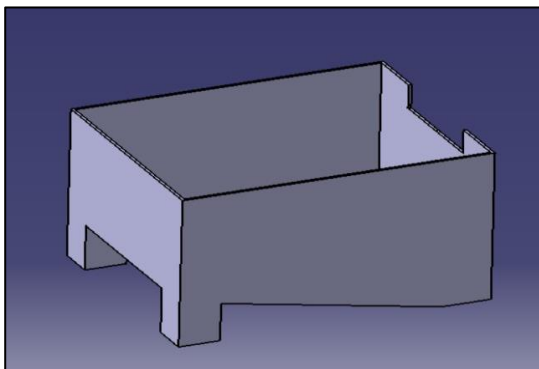

Figure 2.1 Garbage Bin with inclined base

The base is inclined to prevent the stacking of Garbage at one place. And the rectangular slot is provided on one side to fit roll bar handle.
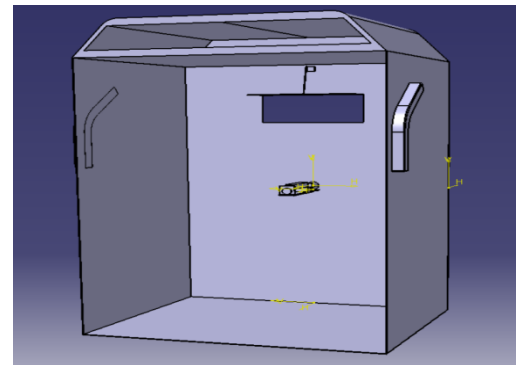

Figure 2.2 Body Design with overhead compartment for electric components.
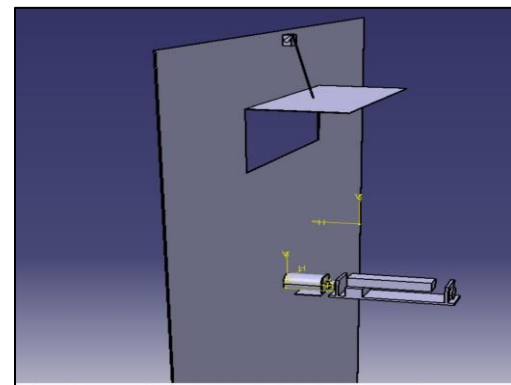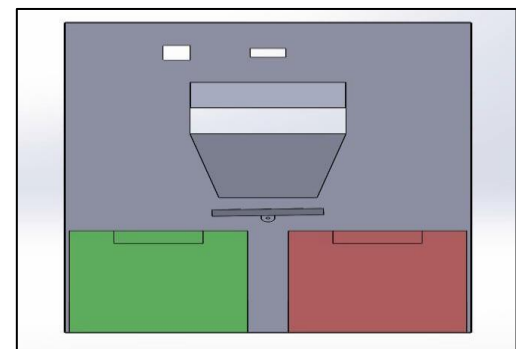

Figure 2.3 Tilting Mechanism
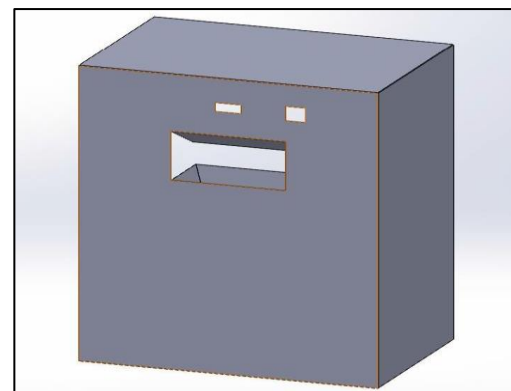

Figure 2.4 Rear View

Figure 2.5 Isometric View

3. SURVEY OF GARBAGE COLLECTOR

Before designing the machine we made a brief market study of various garbage segregator machine available in the market, from those differences between this machine and available machines.

Table -1: Comparison sheet

Sr No.	Specification	Capacity	Quantity	Dry waste collection Kiosk	Garbage ATM- Instant reward on Garbage Disposal
				YES/NO	YES/NO
1	Separate Compartments for Dry & Biological Waste	80L	2	YES (But only for dry)	YES
3	Separate compartments for Metallic and Biomedical waste	80L	2	YES(Only for metallic)	YES
3	Automatic Shredder	2Kw	2	NO	YES
4	GSM system with Keypad		1	NO	YES
5	Coupon System			NO	YES
6	Weight Sensor	10kg	1	NO	YES
7	LCD Display		1 per machine	YES	YES
8	Electricity Meter		1 per machine	NO	YES
9	Sanitizer Machine	5 litre	1 per machine	NO	YES
10	App based on Cloud Server			YES	YES

We conducted a small survey to understand public's opinion and following are the outcomes. We have considered some of the ideas from the survey, whereas few ideas can be implemented in the future due to some limitations such as time constraint and cost constraint.
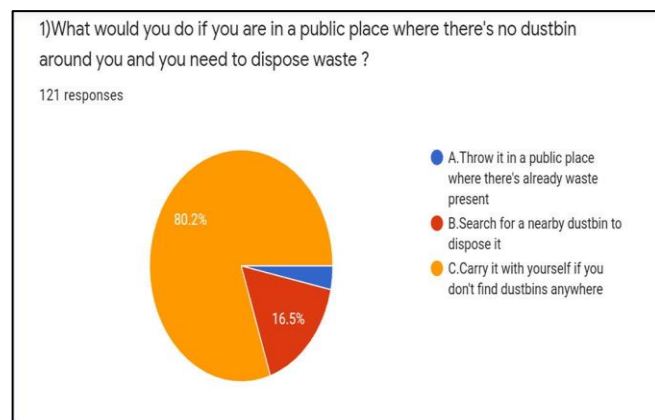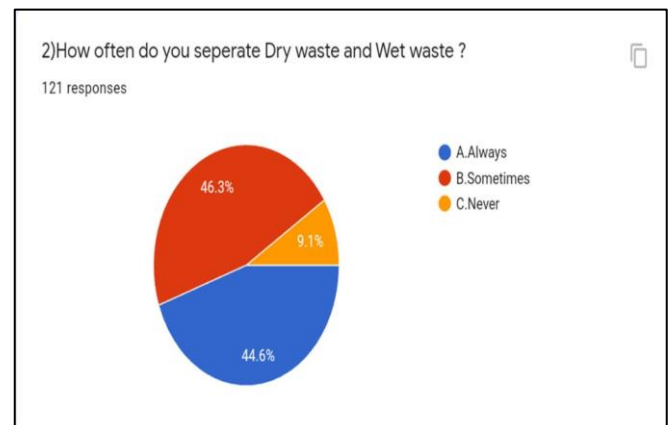

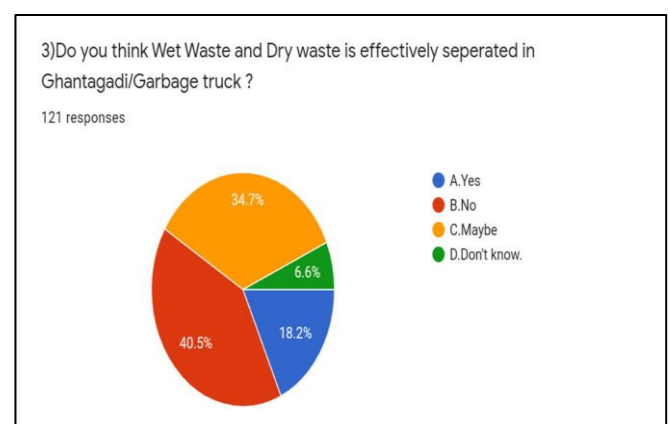Figure 3.1 Poll 1

Figure 3.2 Poll 2

Figure 3.3 Poll 3

Here 40% people think that garabge is not effectively separated in Garbage Collecting Car and few were unsure about it.
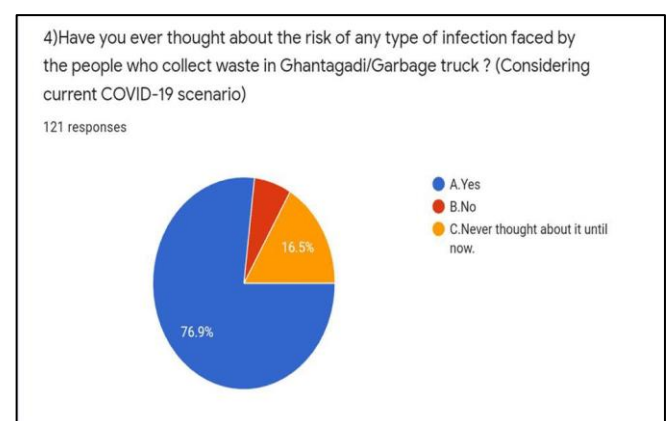

Figure 3.4 Poll 4

Considering the health of the workers, 77 % of the people think about the risk associated with the waste management system. Also considering current covid scenario, it's important to maintain hygiene and for which this machine will be effective where in Garbage Collecting Car workers have to collect waste from bins where waste is previously saturated.
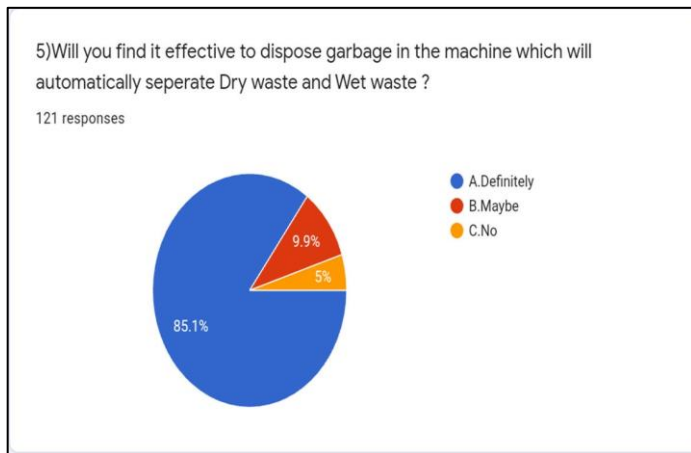
Figure 3.5 Poll 5

So it was observed that almost 85% people found it interesting.

4. CONCLUSIONS

By successful implementation from design to lean manufacturing of our project, garbage will be collected at a particular place rather than being dumped in public places. Further, due to the feature of instant reward, more and more people will utilize the machine which will ultimately reduce the accumulation of garbage on roads and create awareness amongst people regarding "Swachh Bharat Abhiyaan". Efficient and effective solid waste management will take place and the biological waste from the machine can be used as manure by the farmers or also in landfills.

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