International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 4, Issue 2, pp 64-68, February-2020

A Review on Waste Management System

[1]Mrs. M.Sudha, [2]Ms. M.Rubika

[1]Associate Professor, Dept of ECE, Paavai Engineering College, Paavai Nagar, NH-7, Namakkal, Tamilnadu-637018, India
[2]M.E, Dept of Communication Systems, Paavai Engineering College, Paavai Nagar, NH-7, Namakkal, Tamilnadu-637018, India

***Abstract* - The biodegradable waste comprises an organic matters like fruits, leaves, vegetables, etc., which can be decomposed into carbon dioxide, water molecules, methane or simple organic molecules by micro-organisms and other living things by composting, aerobic digestion, anaerobic digestion or similar processes. The solid waste management also includes some inorganic materials which can be decomposed by bacteria and micro organism lived in soil. Such materials have the characteristics of nitrogen and its by-products. The microorganisms are growing in deadly bodies, it cause disease and produce harmful gases which is create lungs problem to living organism. The non-biodegradable products such as plastic, glass and batteries are don't break easily, if not handled properly, these non-biodegradable waste can cause pollution like air pollution, water pollution and soil pollution, blockage of drainage system and harmful to animals. The most important equipment is image processing, obtained by camera which capture the image entering and then the image processing will compare it with the predetermined pictures. Thus directing the wastes to their respective bins.**

Keywords: Waste management; Image processing; Lab view; DC motor.

I. INTRODUCTION

Waste management is the process of handling the waste products from original to its final disposal. This process includes several procedures such as collection, transportation, treatment and disposal of waste together with monitoring, regulation and recycling. Waste collection methods are varied from one country to another. The local self government provides the domestic waste collection services in rural areas. Waste collection is the most common method of disposal in most countries, in which waste is collected at regular intervals by specialized trucks. Waste products are collected from households then it is transported to an appropriate disposal area especially in outside city. Waste collection methods in many countries are an on-going challenge because of rapid growth of population and many struggles due to weak institutions and urbanization.

II. TYPES OF WASTE

Waste products are unnecessary materials for environment. Waste is a substance which is discarded after primary consumption, defective and of no use. It is create unwanted disturbance to environment. Wastes are include municipal solid waste such as household waste, hazardous waste , wastewater such as sewage, which cause infections to human and surface runoff it leads to growing mosquito which can fever like dengue, malaria and radioactive waste and others. The garbage wastes are generated by various group of society can be classified based on their physical character. This classification is most important because, it facilitates for the recycling process. These solid wastes are mostly discharged by the urban municipalities which is comprises more hazardous materials, homogeneous load of industrial and hospital waste [1].

The different types of waste are described as follows:

Commercial Waste - Commercial waste consists of waste materials which are used for the business, trading purpose and for the purpose of sport, education or entertainment but excluding household waste, agricultural waste or industrial waste. This waste is almost used for recycling process.

Electronic Waste - Electronic waste or e-waste described discarded electrical or electronics devices. The used electronics products which are defined for reuse, resale, and salvage recycling through material recovery or disposal are also considered e-waste.

Green Waste - Another name of green waste is biological waste. Any organic waste material that can be composted it change into green waste. It is most usually composed of refuse from gardens such as grass clippings or leaves, and domestic or kitchen wastes. It can be used to increase the efficiency of many composting operation and can be added to soil to sustain local nutrient cycling.

Hospital Waste - The biomedical waste or hospital waste is any kind of waste containing infectious materials. It may be solid or liquid. These wastes includes discarded blood, expired pharmaceutical products, unwanted microbiological cultures

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and stocks, operated body parts, used bandages and dressings, discarded gloves and others.

Industrial Waste - The waste products are produced by industrial activities are called industrial waste, which includes several waste materials, they are segregated for useless during a manufacturing process in industries.

Organic Waste - The biodegradable waste comprises an organic matter such as fruits, leaves, vegetables and etc., which can be decomposed into carbon dioxide, water molecules, methane or simple organic molecules by micro organisms and other living things by composting, aerobic digestion, anaerobic digestion.

Nuclear Waste - Nuclear waste is a type of hazardous waste that contains radioactive materials are usually a by-product of nuclear power generation and other applications of nuclear fission or nuclear fusion or nuclear technology such as research and medicine.

Recyclable Waste - The recyclable waste that can be used in the process of transformation or recycling into other elements.

III. SOLID WASTE MANAGEMENT

Solid waste management is the process of collecting, transporting, treating and clearance of solid materials that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste that is dumped into the low-lying areas can create unsanitary conditions and these conditions in turn can lead to pollute the environment and to outbreaks of vector-born disease that is, disease spread by rodents and insects. The solid waste management is a complex task today due to the over growing population in many countries. So we need to concentrate on wide variety of administrative, economic and social problems to protect our environment.

Basic principles of solid waste management:

For solid waste management the 4Rs play an important role. They are given by,

4Rs: Refuse, Reduce, Reuse and Recycle

Refuse - To say that you do not want to do or accept something. For example, plastic covers, bottles, etc.,

Reduce - Reduce the amount of non biodegradable products and alter our lifestyle so that minimum garbage is generated.

Reuse - It is the process of reusing the product once again and it makes the secondary use of different products.

Recycle - It is the process of converting waste products into new usable products and objects. It is the best method compared to others. Recycling of non biodegradables like plastic, glass will help to reduce the environmental pollution.

Based on the above principles, an ideal solid waste management is representated as,

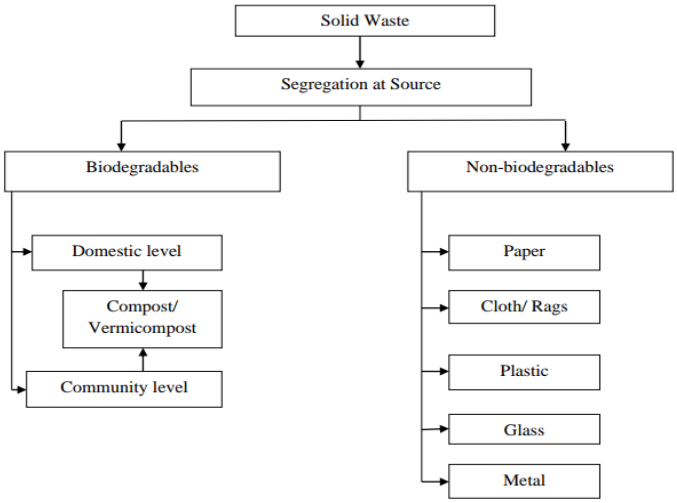

Figure 1: Ideal Solid Waste Management

TABLE 1
Total composition of waste in India (in percentage)

S. No	Composition	By Weight (%)
1.	Organic or Biodegradable	41%
2.	Inert	40%
3.	Paper	6%
4.	Plastic	4%
5.	Textiles	4%
6.	Glass	2%
7.	Metals	2%
8.	Leather	1%

The segregation process is used to store organic or biodegradables and inorganic or non bio-degradable solid waste in different bins. Then it is supplied to recycling process with minimum labor and cost.

IV. AVAILABLE SMART GARBAGE COLLECTION ARCHITECTURE REFERENCE MODELS FOR WASTE MANAGEMENT SYSTEM

The many automation technologies were developed for maintain the garbage system. Automation is the technology associated with application of mechanical, electronics and computer based system to operate and for the production control. Due to technological development we have seen automation in several things. To tackle the issue of waste

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management, first we have to follow proper waste collection method, so we need to develop more efficient waste management techniques. Thus we are proposing an automated garbage collection system using GSM module and also developing the use of Image Processing to improve the waste management [2]. Introduction of plastics or the products which is unable to broken is problem for environment is pollution that causes fickleness, instability, dangerous to our ecosystem. Now days, there are so many techniques, which are used for collection and management of the solid wastes. Zigbee and GSM technologies are not only latest trends but also one of the best combinations are use to managing the wastes and controlling the pollution. Set of sensors which are used to monitor the present status of garbage bin. The smart garbage bin comprises various types of sensors such as ultrasonic sensor, gas sensor and moisture sensor. Ultrasonic Sensor is used to detect the garbage quantity. The ultrasonic sensor is placed inside the garbage bin and the gas sensor is used to sense the toxic gases produced by waste and moisture sensor will sense moisture condition in bin then that indication will give to PIC micro-controller. The controller will send indication alert message to the cleaning authority and needs urgent attention for cleaning. By using GSM technology the pic-microcontroller will manifestation by sending SMS. These Dustbins are placed with the central system showing present status of garbage in Dustbin on GUI [3].

With help of image processing and GSM module we are going to design an automatic garbage collection and information collecting system. Here a camera will be placed at each and every garbage collection point along with load cell sensor at bottom of the garbage can. The camera will take continuous photographs of the garbage can. A threshold level is set which is used to compares the output of camera and load sensor .The comparison is done with help of microcontroller. After analyzing these pictures we get an idea about level of waste in the garbage bin and the load cell sensor is used to measure the weight of waste products. As a result, the information is processed that is controller checks if the threshold level is exceeded or not. With the help of GSM module the controller sends a SMS to garbage collection local central office to notify that garbage can is exceeded its capacity and clearance of waste is required. Accordingly the authority sends the garbage can collecting vehicle to collect the garbage, which is done with the help of robot mechanism [4]. With increasing population, the scenario of cleanliness with respect to garbage management is degrading to a very great extent. The overflow of garbage in public areas creates the unsanitary conditions in the nearby surrounding areas. It causes several serious diseases amongst the nearby people. It also degrades the valuation of the area and creates more pollution in whole city. To avoid this problem and to enhance the cleaning, 'smart garbage management system' is proposed in this paper. In the given system, with the help of sensor the quantity of garbage in the dustbins is detected, and sending information to the authorized control room through GSM module. Microcontroller is used to as joining the sensor system with GSM system. A GUI is also developed for observing the desired information related to the garbage bin for different selected locations. This will help to manage the garbage collection efficiently [5].

Nowadays, various IoT (Internet of Things) based solution for solid management are implemented to improve the garbage environment for healthy life with greater efficiency [6][7][8]. An IoT based cost-effective system that can be used to monitor the garbage everyday and this solid waste management system which enables garbage bin monitoring dynamic scheduling and routing of garbage collector trucks in a smart city [9][10]. A review of existing IoT enabled solutions in smart cities waste management is done here to bring together the state of the art solution for example in term of self powered solution [11][12]. Waste management is one of the major problems that the world faces irrespective of the case of many countries like developed and developing countries. The major problem in the waste management is that the garbage bin several places gets overflowed well in advance before the beginning of the next cleaning process. It in turn leads to various hazards such as bad odor, air pollution, irritations, ugliness that is the quality of being unpleasant to that place which may be the root cause for spread of various diseases. For avoiding any hazardous situation and maintain public cleanliness and health this work is mounted on a smart garbage system. The main objective of the work is to develop a smart intelligent garbage alert system for a proper sewage management .This paper is to design a smart alert system for garbage bin, that is based on level of waste filling in the garbage an alert signal is send to the municipal web server for immediate cleaning of dustbins with proper verification. This process is done by the help of ultrasonic sensor which is adjoined with Arduino UNO to check the quantity of garbage filled in the dustbin and sends the alert message to the municipal web server once if garbage reached its full capacity. After cleaning the dustbin, by providing automatic identification of garbage filled system such as garbage alert system the task of emptying the garbage it also enhanced and also it sends the present status of cleanliness indication to the server publically that the work is done. The whole process is taken by an embedded module with Internet of Things facilitation. The real time scenario is how the waste collection is being done could be monitored and followed up by the municipality authority with the aid of this system. In addition to this the need of alternate measures could be adapted. An Android application is developed and it

ISSN (online): 2581-3048
Volume 4, Issue 2, pp 64-68, February-2020

is linked to a web server for intimating the alerts from the microcontroller to the urban municipal office and to perform the remote monitoring of the garbage cleaning process, done by the workers, it will used to reduce the manual process of monitoring, verification and also time consumption. The notifications are sent to the Android application using Wi-Fi module [13]. India is the second largest population country whole over the world, so collecting treating and disposal of waste plays an important role in our daily life. This work proposes a clean city concept using Smart bin and its application though a proper communication and networking with one device to many devices. It presents, with the help of ultra-sonic sensors and pressure sensing resistor a novel waste collection method and interaction is done through a Smart bin which is developed using ARM LPC 2148. The proposed system also provides the web page interactions to the terminal side with effective data base management and alert system according to the function of the bin. HTML web page is developed to show various levels of every garbage bin located in each ward with various levels of trashes. A GSM transmits an alert to the terminal of the particular bin. RFID were incorporated for the authentication [14].

V. INITIATIVES TAKEN BY VARIOUS ORGANIZATIONS

Around the world, waste generation rates are increasing. In 2016, the world's cities generated 2 billion tones of solid waste, amounting to a footprint of 0.74 kilograms per person per day. By rapid growth of population, urbanization and technological development, the annual waste generations are increased day by day. Most people in developing nations, especially the urban poor people, are more severely affected by unsustainably managed waste because of they are not handling waste management properly. In low-income countries, over 90% of wastes are dumped into the low lying areas or openly burned. These practices create serious health issues and environmental consequences. Poorly managed waste serves as spreading diseases to both human and animals and also contributes to global climate change through methane generation, various green house gases and can even promote urban violence. Managing waste properly is important for building sustainable and livable cities, but it remains a challenge for many rural and urban cities in developing countries. Effective waste management is expensive, often comprising 20%-50% of municipal budgets. Operating this essential municipal services are required the systems that are efficient, sustainable, and socially supported. For providing better solid waste management projects, the World Bank also give finances and advises which including traditional loans, results-based financing, development policy financing, and technical advisory to both developed and developing countries. The World Bank financed for solid waste management projects and also helped for entire treatment of solid wastes such as collection and transportation and disposal.

The UNEP International Environmental Technology Centre (IETC) in Japan supports the implements systems. Its work also concentrates on the proper treatment of special wastes such as electronics, agricultural biomass, and plastics products in developing countries. IETC aims to enhance the management of solid waste by involving all stakeholders in the process.

VI. CONCLUSION

To achieve the smart cities, waste management becomes an important element in achieving sustainability, efficiency in public participation, improving urban mobility and protecting natural resources. The study found that most of the hazardous waste produced from industries and home were generally nourishment trash and plastics, which were fundamentally put away in uncovered plastic compartments and arranged without partition. Thus, by implements the proper solid waste management system we can make a contribution towards the enhancement of smart city project, there by the making the dream of CLEAN INDIA GREEN INDIA come true.

VII. SUGGESTION FOR FUTURE IMPROVEMENT

The future policy options available with the policy makers for solid waste management are to promote either/ all of the existing alliance between private-public enterprises, private-private enterprises and private to public community. The quantities of solid waste products are increasing due to many reasons. Plastics waste plays an important role at the total Municipal Solid Waste (MSW). Recycling of plastics are used to reduce the pollution level and keep clean environment. So newer technique related to recycling and reuse of plastic can be adopted. The image processing algorithm could be improved upon without any constraint in processing hardware, since that would be used only in the central server. The system may also encompass a broad domain of use-cases. It can particularly be used for nuclear-waste collection, where human presence is unsafe. It is primarily proposed for a "smart city". Apart from this, it also may be implemented in moon and planet rovers, for discovery and surveillance purposes. Our system, if implemented properly can be scaled up successfully.

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ISSN (online): 2581-3048
Volume 4, Issue 2, pp 64-68, February-2020

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Citation of this Article:

Mrs. M.Sudha, Ms. M.Rubika, "A Review on Waste Management System" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 4, Issue 2, pp 64-68, February 2020.

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