SMART WASTE MANAGEMENT WITH Bio-Gas PRODUCTION

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Abstract—in this project presenting a waste-to-energy conversion system to produce biogas for cooking. Waste is the main problem of our earth.In most of the cities the overflows garbage bins are creating an unhygienic environment. This will further lead to arise of different types of unnamed diseases. This will degrade the standard of living. To overcome these situations an efficient smart garbage management method has to be developed. Due to rapid population growth, disorganization of city governments, a lack of public awareness and limited funding for programs, garbage management is becoming a global problem. Due to the lack of care and attention by the authorities the garbage bins are mostly seem to be overflowing. Waste processing technologiescan play a significant role in an integrated waste management system by treating waste, generating power/energy and reducing the waste volumes for disposal.That's what this project involves garbage management idea with bio-gas generation.It contains Ultrasonic sensor sensors and load cell connected to the garbage tank. Garbage bin is full can be detected when garbage level reach near to ultrasonic sensor, similarly when garbage weight reach to defined weight level tells that garbage level in bin is full value, at that time we can use this garbage for the boigas to produce gas.We keep waste to generate biogas for further use as a fuel.

This paper presents the smart waste management system of the garbage system that identifies fullness and level of the waste bin and storing the waste in the container to produce biogas so that we can use that gas as fuel in kitchen. This project will inform the information about fulness of bin to the authorized person for the cleaning of the waste bin in time. By using here we use Raspberry-Pi as the embedded Linux board.The board architecture is designed based on the arm microcontroller architecture.

Keywords—Environment,Raspberry-Pi,Load Cell, Ultrasonic Sensor,Bio-gas generation.

I. Introduction

The process of making things automatic is being abused in all the real fields of life. Making things automatic reduces load on the human. The cost and exertion utilized as a part of physically controlled items is significantly higher than the computerized frameworks. Considering the reality, that the issue of proficient waste administration is one of the significant issues of the advanced circumstances, there is a most extreme need to address this issue. The best possible waste administration framework is must for the sterile society by and large and for world in general. Strong waste which is one of the sources and reasons for ecological contamination has been characterized under Resource Conservation and Recovery Act as any strong, semi-strong fluid or contained vaporous materials disposed of from mechanical, business, mining or rural operations and from group exercises. Strong waste additionally incorporates junk, development flotsam and jetsam, business won't, and ooze from water or waste treatment plants or air contamination, control offices and other disposed of materials.

So as to shield human wellbeing and nature from the potential dangers of postponed squander transfer and ecological contamination a methodically regulated and controlled treatment of these squanders is must. The sort of squanders which constitute natural contamination and which this work underlines on is residential decline comprising of degradable nourishment squander s, leaves, dead creatures and non-degradable ones, for example, plastics, bottles, nylon, therapeutic and doctor's facility squanders, produced in family units, doctor's facilities, businesses and business focuses. The objective of the proposed system is that the proposed a system which can accurately manage the garbage from the city.

Biogas is produced from biomass through the process of anaerobic decomposition. Anaerobic bacteria—bacteria that live without the presence of free oxygen—occur naturally in soils, in water bodies such as swamps and lakes, and in the digestive tracts of humans and animals. These bacteria eat and break down, or digest, biomass and produce biogas. Biogas is composed mostly of methane and carbon dioxide. Methane (CH_4) is the same energy-rich compound found in natural gas. The composition of biogas varies from 40%–60% methane to 60%–40% carbon dioxide (CO_2), with small amounts of water vapour and other gases.

I. Related works

In literature, the problem and the previous techniques of smart cities detection is described and biogas plants related work in India.

Biogas is one of the viable alternatives to the burning energy question. In 2014-15, about 20,700 lakh cubic meters of Biogas is produced in the country which is equivalent to 5% of the total LPG consumption in the country. The Government is also extending substantial subsidy for setting up of new Biogas plants.

A) Development and Optimization of a Smart System for Biogas Production Using Animal Waste

This work studies the development of a waste-to-energy conversion system using the anaerobic digestion of animal waste to produce biogas for cooking, generation of electrical energy and organic fertilizers for households and on farms.

B) Gobar Gas and Biogas Plants in Maharashtra

'Green Elephant' a German Company, under Indo-German Development Partnership has set up commercial bio gas production plant in Satara (Maharashtra). It has capacity to generate 25,000 cubic meter biogas per day from 600 cubic metres of sugar waste. 80 percent of the gas generated from the plant is upgraded to compressed biogas (CBG) which is an clean alternative fuel to CNG, diesel and petrol.

C) Gobar Gas and Biogas Plants in Gujrat

A biogas plant of 5,000 cubic meter per day capacity became operational in 2015 in Sundarpur village of Umreth taluka in Anand district of Gujrat. The capacity of the plant can be expanded upto 10,000 cubic meters.

D) Gobar Gas and Biogas Plants in Punjab

A biogas bottling project of 600 m3/day capacity has been commissioned in 2011 in Village Kalatibba, Tehsil Abohar, District Ferozepur (Punjab). The project is developed by Anand Energy. Raw material such as cattle dung, poultry waste and kitchen waste is used in this biogas facility. It is responsible for generation, purification/enrichment and bottling of biogas.

E) Gobar Gas and Biogas Plants in Karnataka

A biomethanation plant based in the "Nisargruna" technology of BARC was commissioned in 1011 by Mangalore City Corporation near Urwa Market. The plant has the capacity to process up to two tonnes of biowaste per day to produce 100-160 cubic metres of methane gas and up to 200 units of power.

F) Gobar Gas and Biogas Plants in Tamilnadu

In Chennai and Tuticorin cities of Tamilnadu at least 5 biogas plants are under construction. All these plants are based on the Nisargruna technology of BARC for biomethanation of waste into biogas.

Swachh Bharat Abhiyaan is a national battle started by the Government of India, which covers 4,041 urban areas and towns, to clean the lanes, streets and foundation of the nation.The primary proverb of the mission is to cover all the rustic and urban ranges of the nation. With multiplication of Web of Things (IoT) gadgets, for example, Smartphone sensors, this paper portrays the powerful dry what's more, wet earth gathering utilizing Embedded System. The principle witticism of the application is gathering of dry and wet waste independently which is set in a transport line on which the dry waste gathered clean containers are put left side and wet waste gathered receptacles on right side. The framework will get the contribution through the tidy gathering individual through switches and sends flag to the Micro controller unit utilizing RF innovation and that influences the H-to scaffold to turn transport line. At the point when the belt begins pivoting clockwise the clean containers cover is naturally shut, all the while the waste is dumped into the underground waste compartment put at the ground floor. Here IoT module is utilized to control and screen the waste and the data will be sent

to the specific association and the normal man. The portable application demonstrates the gathering of waste and the specific date and entry time of the vehicle [1].

Brilliant Waste Management utilizing Internet of Things: A Survey At introduce strong waste administration is a noteworthy worry in the metropolitan urban areas of the creating what's more, created nations. As the populace is developing, the waste is likewise expanding. This colossal unmanaged gathering of waste is dirtying the earth, ruining the excellence of the territory and furthermore prompting the wellbeing danger. In this period of Internet, IOT (Internet of Things) can be utilized successfully to deal with this strong waste. In this paper, we have talked about the meaning of Internet of Things and its components, testing and prototyping apparatus cooja test system lastly the investigation of different writings accessible on savvy squander administration framework utilizing IOT [2]. This paper proposes a savvy ready framework for refuse freedom by giving a ready flag to the civil web server for moment cleaning of dustbin with appropriate check in view of level of waste filling. This process is helped by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of refuse filled in the dustbin and sends the caution to the metropolitan web server once if waste is filled. In the wake of cleaning the dustbin, the driver affirms the undertaking of purging the waste with the guide of RFID Tag. RFID is a figuring innovation that is utilized for confirmation process and likewise, it likewise improves the savvy junk ready framework by giving programmed recognizable proof of waste filled in the dustbin and sends the status of tidy up to the server avowing that the work is finished. The entire procedure is maintained by an installed module incorporated with RF ID and IOT Facilitation. The constant status of how squander gathering is being done could be observed and followed up by the district expert with the guide of this framework. Notwithstanding this the important therapeutic /interchange measures could be adjusted. An Android application is produced and connected to a web server to insinuate the alarms from the microcontroller to the urban office and to play out the remote observing of the cleaning procedure, done by the laborers, in this manner decreasing the manual procedure of observing and confirmation. The notices are sent to the Android application utilizing Wi-Fi module [3]. A Survey on Smart Garbage Management in Cities utilizing IoT As the populace is expanding step by step, the earth ought to be perfect and clean. In most of the urban areas the flooded waste containers are making an unhygienic domain. This will further prompt emerge of various sorts of anonymous maladies. This will corrupt the way of life. To defeat these circumstances an effective shrewd refuse administration strategy must be created. As the extent of IoT is creating step by step successful techniques can be discovered effortlessly. Different outlines were proposed and have favorable circumstances and additionally impediments. This paper is an overview based on Smart Garbage Management in Cities utilizing IoT. This study includes different shrewd trash administration thoughts that can be effectively implemented [4].

A Smart Waste Management and Monitoring System utilizing Automatic Unloading Robot In our city, dustbins set at open spots are overflowing. It makes unhygienic conditions for the individuals. Likewise it makes offensiveness to that place. In the meantime awful stench is additionally spread. These days, there are number of systems which are intentionally utilized are being develop for well administration of trash or strong waste. We will actualize an undertaking called A Smart Waste Management also, Monitoring System with programmed Unloading Robot to maintain a strategic distance from circumstances of this sort. To give a short depiction, at

general society puts, the sensors are set in the regular refuse canisters. At the point when the refuse achieves the level of the sensor, at that point that sign will be given to PIC microcontroller. Robot used to gather the losses in the wake of achieving high wastage level. To move the robot from waste region and empty the wastage by Using DC Motor. The waste filling level and air contamination level is sent as message through GSM modem interface to the microcontroller. The result of this strategy is effective and insightful and can be utilized to mechanize any strong waste canister administration process [5]. Idea, Design and Implementation of Automatic Waste Management System One of the principle worries with our condition has been strong waste administration which what's more to irritating adjust of the earth additionally effectively affects the strength of the society. The discovery, checking and administration of squanders are one of the essential issues of the present period. The conventional method for physically checking the losses in squander canisters is a complex, awkward process and uses more human exertion, time and cost which aren't good with the present day innovations in any capacity. This paper proposes a propelled technique in which squander administration is robotized. Radio recurrence recognizable proof (RFID) is a standout amongst the most encouraging and expected innovations as of late. The framework makes utilization of radio recurrence (RF) labels and web bolster. This work introduced here unquestionably gives a novel approach in taking care of and arranging off the everyday strong squanders in an effective and simple way. The framework comprises of four principle subsystems to be specific Smart Trash System (STS), Local Base Station (LBS), Smart Vehicle System (SVS) and Smart Monitoring and Controlling Hut (SMCH). The proposed framework would have the capacity to computerize the strong waste checking procedure and administration of the general accumulation process. The advances that would be utilized as a part of the proposed framework are sufficient to guarantee the down to earth and culminate strong waste gathering process checking and administration for green environment [6]. In many spots, it can be seen that the Municipal junk receptacles are flooding and they are definitely not cleaned at appropriate time. Because of which the results are extreme. It incorporates flood of rubbish which brings about land contamination, spread of sicknesses. It likewise makes unhygienic conditions for individuals and offensiveness to that place. There ought to be a framework that can screen the container and can give the data of filling of the receptacle to the region utilizing remote sensor organize so that the canister can be cleaned on time and the earth can be defended. This paper introduces the Brilliant waste administration framework that recognizes completion of the canister utilizing a remote sensor organize (WSN) and installed Linux board and educate the approved individual for the cleaning of the canister. The framework gives a web interface to the cleaning expert with the goal that they can screen and clean the trash canister. In this paper, Raspberry Pi is utilized as an inserted Linux board which is composed in view of the arm 11 microcontroller designs. Inserted Linux board makes the correspondence with all circulated sensor hubs set in the tried zone through ZigBee convention and itself go about as a planned hub in the remote sensor organize. The objective of facilitator hub is to gather the parameters like level of the container and scent remotely. Every sensor hub comprises of level sensor furthermore, gas sensors and one ZigBee RF radio wire gadget for correspondence with the organizer hub. Raspberry Pi stores gathered information in the database and investigates the put away information. The board has an Ethernet interface and runs the basic information web server. Thus organizer gathers the information over ZigBee remote correspondence convention and enable client to screen the

information from a web program. Cleaning expert can gather the waste on time [7].

In the present day situation, ordinarily we see that the Garbage canisters or Dust containers set at open puts in the urban areas are flooding because of increment in the waste each day. It makes unhygienic condition for the general population and terrible scent around the surroundings this leads in spreading some lethal maladies and human disease; to stay away from such a circumstance we want to plan Garbage Monitoring Framework utilizing IoT. In this proposed framework there are different dustbins situated all through the city or, then again Campus, these dustbins are furnished with minimal effort gadget which helps in following the level of trash receptacles and an one of a kind ID will be accommodated each dustbin so it is anything but difficult to distinguish which refuse container is full. At the point when the level achieves edge confine, the gadget will transmit the level along with the one of a kind ID gave. These subtle elements can be gotten to by the worry experts from their put with the assistance of Internet and a prompt activity can be made to clean the dustbins [8]. In the present day circumstance, regularly we see that the refuse canisters or Dust compartment are put at open places in the urban groups are flooding a direct result of addition in the waste every day. It makes unhygienic condition for the all inclusive community and makes terrible stench around the surroundings this leads in spreading some risky infections and human malady, to avoid such a situation we are aiming to design "IoT Based Waste Management for Smart Cities". In this proposed System there are distinctive dustbins arranged all through the city or the Campus, these dustbins are outfitted with negligible exertion embedded contraption which helps in following the level of the waste canisters and a unique ID will be suited every dustbin in the city so it is definitely not hard to perceive which garbage container is full. Exactly when the level accomplishes beyond what many would consider possible, the device will transmit the level nearby the extraordinary ID gave. These unobtrusive components can be gotten to by the stress pros from their place with the help of Internet and a snappy movement can be made to clean the dustbins [9]. The Main point of this paper is to build up an insight canister which can screen squander through sensors and gives the data in definite which are associated with web. At first every one of the sensors from various area are associated through Internet in each area sensors will quantify

and figure the waste and data will be sent to the server. At Server it will Process the data and sent it to the worry Authorities to make essential move. By This approach we can get data of receptacle by utilizing an android application also [10].

III. Proposed Architecture Used For Smart Waste Management System

Garbage system will transmit the garbage bin data from bin to End device. The wireless communication here we use is based on the Wi-Fi protocol which uses 2.4 GHz wireless link. The web server is designed on Raspberry- Pi for monitoring the status of the waste bin. We use any devices which have the capability to access the web service. Here for monitoring the data we use PC, laptop etc.

c) **Load cell**

a) **Raspberry Pi**

Fig.1- Raspberry-Pi

In this paper we use as the controller for the coordinator node. Raspberry Pi is the small, inexpensive minicomputer that enables people of all ages to explore computing, and to learn how to program in languages. It's job in this paper is it continuously collects the informations send by the sensor nodes via ZigBee, and it will process the large quantities of data timely and is available for users to view at the instant. It is the core of the wholesystem.

b) **Ultrasonic**

Fig.2 Ultrasonic Sensor

The Ultrasonic sensors here we use are to detect the level of the waste bin. There is three ultrasonic sensors will be placed at each angle of 120 degrees from each other so that the whole area of the waste bin can be covered. The waste bin have a protecting box at the top center where the ultrasonic sensors will be placed. According to the size of the waste bin the range of the Ultrasonic sensor will change. Considering all the parameters, including size ,things on it, the specifications of the ultrasonic sensors can be implemented.

Fig.3- Load cell

The Load cells are placed at the 4 corners of the waste bin in the bottom. The load cell can be u sed as a secondary sensor. If there is any problem in the ultrasonic sensor, it will not send the output to the municipality. In this situation we can use this as a backup plan. The load cells are god for the keeping of the sensor which we can use it as the secondary storage.

IV. System Operation

We use the waste bin for the system to apply. Here we are using alert system to aware to remove the waste from the waste bin because of two reasons. One is the waste bin is full and the other one is the weight of bin is too much. By this alert one can remove the garbage from bin and can add this garbage to the biogas chamber for gas generation.
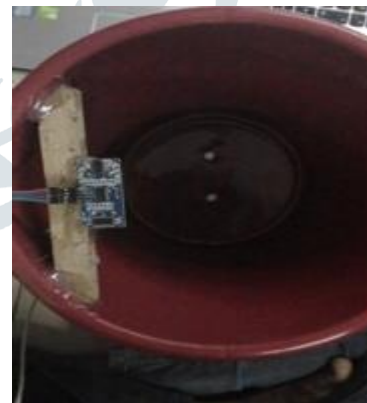

Fig.4 Empty Container

Fig.5 Container assemble with component

In this project we are using waste to produce gas for the kitchen use. With bio-gas generation method can generate the gas which is useful as the fuel wherever we can use normal LPG gas.

Steps:-

1) **Chose the Correct Container.**

Took a correct size container which will act as a digester tank. This must be the air tight container.

Fig.6-Biogas container

2) **Step 2: Make Holes**

Make holes in the tank for Inlet and outlet.

3) **Step 3: Fix the Inlet and Outlet Pipes**

Fixed the Inlet pipe and the Outlet pipe with Glue gun.

4) **Making the Gas Holder**

The tank cover is overturned and fixed with a valve used for plumbing purposes.

5) **Time to Mix the Cow Dung !**

Mixed the garbageand added water to make a fine slurry. Then slurry is transferred to the digester tank.

6) **Last step**

Plant takes 10-15 days for the first time to get output. For the first 2-3 time, the gas in the tank didn't burn. It burned for the 4th time.

The end products of this system are:

1) Methane : (Can be used as a fuel)

2) Slurry   : (the spent slurry is exellent manure)

3) Carbon Diaoxide.

Fig.7-Biogas Chamber 2

fig.8-Output in the form of Gas

Fig.9 -Container filled with Waste

V. Advantages

- Can track the status of waste.

- Can use waste for the generation of fuel gas.

- one can track garbage/bin location, load, missing/stolen bins.

- Biomethanation plant, digesting the waste reduces land fill and provideclean environment and Green energy. This plant also reduces city level pollution in terms of solid waste, air and water.

- Biogas plant produces green and renewable energy. It reduces Green House effect.

- This Plant has its direct impact on cleanliness and simplifies housekeeping of the market and surrounding area. No more foul smell is observed in the area.

- Waste is now turned in to high quality Fertilizer which can be used in landscaping or farming.

- This is the most cheaper and liable technology. It also produces cheapest energy. This plant is simple and easy to operate.

- The energy produced is used to illuminate the streets through street lights and reduce the usage of fossil fuels.

- Biogas plant played an important role in elevating the rank of Bhopal city in Swach Bharat mission

VI Future Scope

- We can send this data to the government so that they can collect garbage in correct time.

- The beauty of a home unit is that instead of some big company providing you with gas, you are in charge of your own energy production.

- A small home biogas unit in an urban or city environment can produce useful amounts of biogas from just a 1Kg or so of organic waste per day.

- It is very easy and cost effective to build (only 2-3 dollars) and gives many useful products.

VII. Conclusion

A garbage management system is a step forward to make the manual collection and detection of wastes automated in bin. This automation of waste also reduces the human effort and consequently the cost of the whole process.

Biogas could be the most successful models of renewable energy.Biogas could uplift the socio-economic status of its users because of its multiple benefits to the households, community and the country.It has direct impact on health, environmental and agriculture.

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