International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 05, May-2019

# Design and Development of Smart Dustbin Using IIOT

Naresh K S[1], A.I.Jayasimha Reddy[2], Ayaz[3], Guruprasad P N[4], Maheshreddy P[5]

[1] *Assistant Professor, Department of Mechanical Engineering, NHCE, Bangalore,*
[2,3,4,5] *Student, Department of Mechanical Engineering,*

***Abstract— Solid waste generated is an ever-growing problem at local regions or at global levels. There is proper disposal of solid wastes pollute all the components of the green environment (i.e., air, land and water) at regional and global levels. Since there is rapid increase in producing or consumptions, quantity of wastes generated by the urban society has increased. The problem is more faced in the developing countries than in developed countries, as the economic growth as well as urbanization is more rapid. The continuous flow of garbage in all places where public people move around creates the unhygienic situations. It may invoke several injurious diseases among the nearby people. To avoid such a situation and to improve the cleaning, 'Design and development of smart dust bin using IIOT' is proposed. In the proposed system, the completeness of waste in the dustbins is checked with the help of Sensors used in the system, and information is sent to the required control room through GSM/GPRS system. Arduino is used to communicate the sensor system with GSM system. It consists of compressing unit to compress maximum amount waste. This entire project will runs based on solar system.***

***Keywords- Smart dustbin, Smartbin, Monitoring Smartbin.***

## I. INTRODUCTION

Industrial Internet of Things (IIoT) is the new emerging technology which has vast applications. In internet of things all the devices are made to talk to each other. Any data shared using the real-world application can be viewed from any place at any time. This helps the user to make the decision in a suitable way. Ongoing days, numerous individuals are living in urban areas just for their benefit in every one of the ways and numerous individuals are originating from the provincial regions for the chances. Because of this there is gigantic development of populace in metro legislator Cities the waste percent is expanded to the tremendous dimension, the waste is flooding from the canisters lastly it drives a circumstance of general receptacle into smaller than usual dump yard in every single road. The development of the data innovation, the utilization of unavoidable processing innovation has occurred in numerous applications including waste administration. Reusing is one of the significant methodologies taken for overseeing waste. It is a procedure of gathering and preparing undesirable materials to be transformed into new items. At present, the reusing rate in Malaysia is low (5%) contrasted with different nations. The Ministry of Housing and Local Government intends to accomplish a reusing rate of 22% constantly 2020. In guaranteeing that the ideal objectives of the reusing program are accomplished, a powerful execution of the 3R (decreases, reuse, reuse) ideas and practices in strong waste administration is subsequently critical. Endeavor's to advance the 3R (lessen, reuse and reuse) program are expanding to energize the decrease of waste going into landfills for securing and preserving normal assets, condition and vitality. Along these lines, it's turned into a noteworthy issue for the city experts to clean that squander. They are unfit to clean that loss in time. Thus, to diminish this, in view of most recent innovation moving to savvy container. Up to now this technique isn't generally actualized in India. Strong waste created is a consistently developing issue at nearby locales or at worldwide dimensions. Squander is arranged at open spots. This causes diverse human wellbeing risks. There is no compelling framework to screen it, an opportunity to time.To develop commercial and economical garbage monitoring and controlling system. To track the status (Empty/Full) of the smart dustbin. To transmit signals to a monitoring unit to have appropriate clearance of waste from the bin. To reduce and avoid dumping of waste in public places and hence reduce human health hazards caused by it. To create cleaner and ecofriendly environmental livelihood and smarter cities. So, we propose 'Design and development of smart dust bin'. In the proposed system, the completeness of waste in the dustbins is checked with the help of Sensors used in the system, and information is sent to the required control room through GSM/GPRS system. Arduino is used to communicate the sensor system with GSM system. It consists of compressing unit to compress maximum amount waste. This entire project will runs based on solar system.

## II. MATERIAL SPECIFICATION

*2.1 Ultrasonic sensor:-*

Fig-2: ultrasonic sensor

TheHC-SR04 ultrasonic sensor utilizes SONAR to decide the separation of an article simply like the bats do. It offers superb non-contact go discovery with high precision and stable readings in a simple to-utilize bundle from 2 cm to 400 cm or 1" to 13 feet. The activity isn't influenced by daylight or dark material, albeit acoustically, delicate materials like fabric can be hard to distinguish. It comes total with ultrasonic transmitter and collector module.

*2.2 Arduino Board: -*

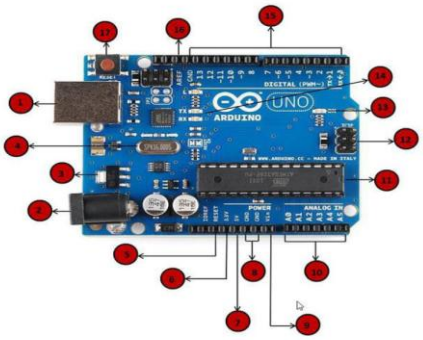


*Fig-2: - Arduino Board*

Arduino is an open source, PC equipment and programming organization, task, and client network that structures and fabricates microcontroller packs for structure advanced gadgets and intuitive items that can detect and control questions in the physical world.

*2.3 GSM Module: -*

*Fig-3: - GSM Module*

GSM Modem can acknowledge any GSM arrange administrator SIM card and act simply like a cell phone with its own exceptional telephone number. Preferred position of utilizing this modem will be that you can utilize its RS232 port to impart and create installed applications. Applications like SMS Control, information exchange, remote control and logging can be grown effectively utilizing gsm. The modem can either be associated with PC sequential port straightforwardly or to any microcontroller through MAX232. It very well may be utilized to send and get SMS or make/get voice calls. It can likewise be utilized in GPRS mode to associate with web and do numerous applications for information logging and control.

*2.4 Solar panel and Power Controller: -*

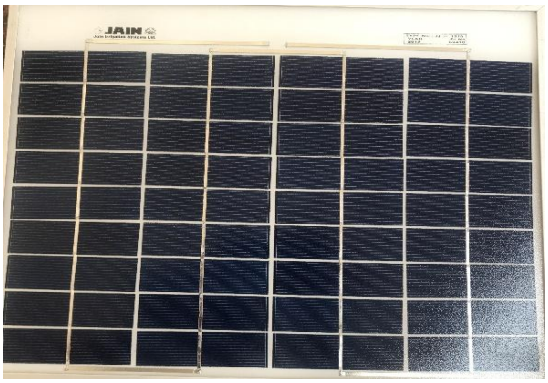

*Fig-4: Solar Panel*

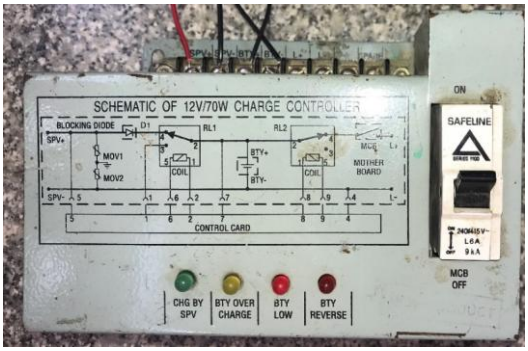


*Fig-5: Power Controller*

Solar panel of size 30*35 cm, which can produce 10Watts, 16.4 Volts @ 25.0°C. Photograph voltaic sun-oriented boards ingest daylight as a wellspring of vitality to create power. A photograph voltaic sunlight-based board is a stuffed module

with an associated gathering of photograph voltaic sun powered cells. Controller used to transmit power from solar panel to battery, it can power down till 12V/70W. It has four led lights each indication has separate working

- Green colour Led indicates Charging by solar panel
- Yellow colour led indicates Battery over charged
- Red colour led indicates Battery Low
- Dark Red colour led indicates battery Reverse charged.

*3.3 Relay: -*


*Fig-6: Relay*

A relay is an electrically operated switch. Many transfers utilize an electromagnet to precisely work a switch, however other working standards are additionally utilized, for example, strong state transfers. Transfers are utilized where it is important to control a circuit by a different low-control signal or where a few circuits must be constrained by one sign. The hand-off is the gadget that open or shuts the contacts to cause the task of the other electric control. It recognizes the deplorable or bothersome condition with an allocated region and gives the directions to the electrical switch to detach the influenced region. Along these lines, shields the framework from harm.

*3.4 Battery: -*

Battery is a stored power supplying device which gives the power to all the devices to function. The battery used in this project is a portable one, which is very light to carry and easily accessed. We are using panel and battery capacity of 60W, 12V,7.2Ah to operate our entire system.

Voltage Regulation: -

- Cycle use: 14.5 - 14.9V
- Standby Use: 13.6 – 13.8V
- One full battery charge can used for 20 Hrs.

*3.10 Stainless steel: -*

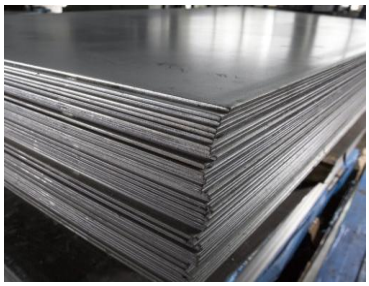

*Fig-7: Stainless Steel*

Frame is made of stainless steel, Tempered steels don't endure uniform erosion, similar to carbon steel, when presented to wet conditions. Unprotected carbon steel rusts promptly when presented to the blend of air and dampness. The subsequent iron oxide surface layer (the rust) is permeable and delicate. Since iron oxide involves a bigger volume than the first steel this layer extends and will in general chip and fall away uncovering the basic steel to additionally assault. In correlation, hardened steels contain adequate chromium to experience passivation, suddenly framing an infinitesimally slim dormant surface film of chromium oxide by response with the oxygen in air and even the little measure of broke down oxygen in water. This inactive film counteracts further consumption by blocking oxygen dissemination to the steel surface and hence keeps erosion from spreading into the majority of the metal.[3] This film is self-fixing on the off chance that it is scratched or incidentally bothered by a furious condition in the condition that surpasses the intrinsic consumption opposition of that grade.

*3.11 Jumper Wires: -*

A Jumper wire (otherwise called jumper) is an electrical wire, or gathering of them in a link, with a connector or stick at each end (or now and then without them – basically "tinned"), which is ordinarily used to interconnect the segments of a breadboard or other model or test circuit, inside or with other gear or parts, without soldering.

*Fig-8: Jumper Wires*

## III. EXPERIMENTAL METHODS

There are 3 Processes of compressing unit:
1.Unit at initial stage: -
As we observed from the test runs, the compression unit is at initial stage with help of information taken from the sensors planted at each level when the bin is found to be either empty or partially filled.
2.Unit at compression stage: -
The unit leads to compress the garbage in the bin when information gets collected from the sensing devices and acts accordingly.
3. Unit at recoiling stage: -
Recoiling of the compression unit takes place as it completes its task. The unit is further reaching initial stage for next cycle.

*Fig-9: Initial stage*

*Fig-10: Compressing stage*

*Fig-11: Recoiling stage*

*Working Chart: -*

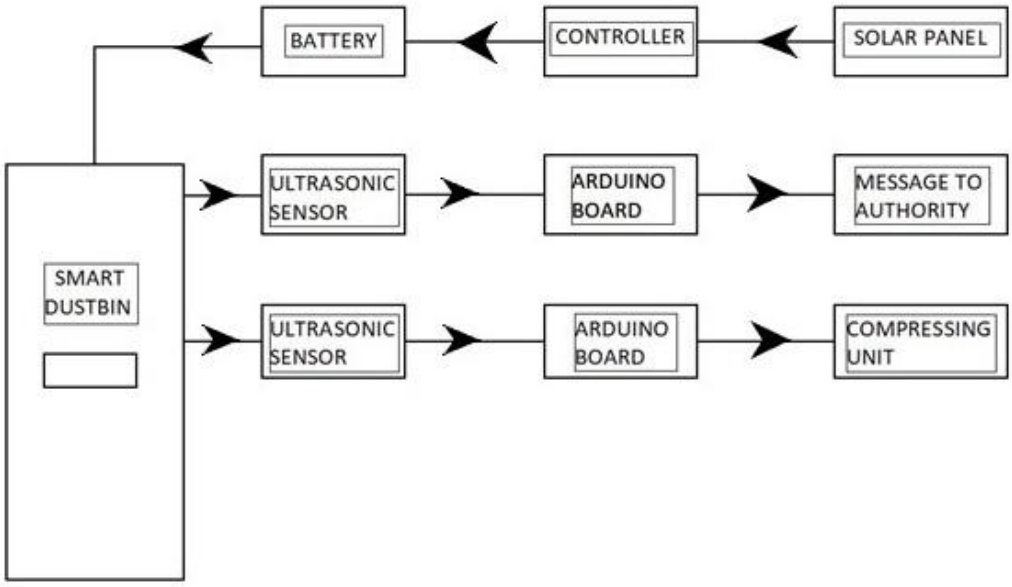


*Fig-12: flow charts*

## IV. EXPERIMENTAL RESULTS

The system is found to be useful in schools, colleges, shopping complex. As this system works when ultrasonic sensor senses the garbage and pass signal to compressing unit to start action when it reaches half of the bin, this unit is equal to three dustbins capacity of storage after compressing, there will be one more ultrasonic sensor to send signal to GSM module to send a text message to information centre, The bin ID and location.
Advantage of this project to increase customer safety.

- Can form as a 'standard future'
- Low maintenance: can be repaired locally

Result: -


*Fig-13: Message Alert*

## V. DESIGN

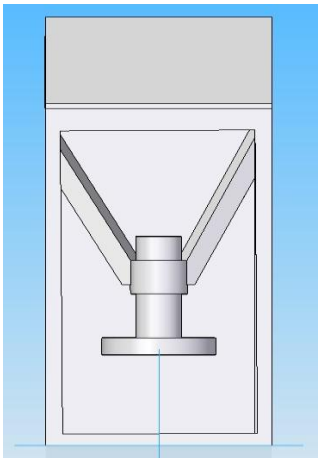

*Fig-14: Front view*

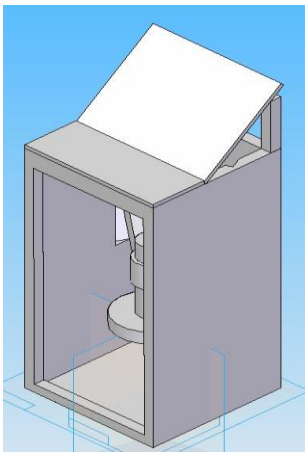

*Fig-614: Isometric view*

*Table-1: Design parameters*

| |
|---|
| **Over all dimension: -** |
| length=300mm |
| breadth=300mm |
| height=700mm |
| Circuit storage dimension: - |
| length=300mm |
| breadth=30mm |
| height=100mm |
| **Compressing unit (Initial Stage) dimension: -** |
| length=300mm |
| breadth=300mm |
| height=300mm |
| **Compressing unit (compressing Stage) dimension: -** |
| length=300mm |
| breadth=300mm |
| height=600mm |

## VI. SUMMARY AND CONCLUSION

Over flow of waste and disposal of waste in open area can cause diseases but with the help of our accessories we solve this problem. The objective of this project is to maintenance of waste management and safety mechanism. Moreover, it should be economical for every class of society. Basically, we have used an ultrasonic sensor which senses the level of garbage and the whole system is connected to the IIOT network. GSM module is used to send the message to the respective authorities with the unique ID given to the dust bin. We have introduced the compressing unit (compressor) into our dust bin. When the garbage level reaches up to the mark the compressor starts to compress the garbage as per the instructions given to it by the Arduino which is programmed. The power which is required to run the compressing unit as well as the whole system is provided by the solar panel. Design of the entire smart bin is simple and compact which makes it different from the other smart bins. From above review, it fulfils consumer needs and provides versatility moreover, as it is new product it will promote employment and vast field development for new engineer in day period.

## VII. SCOPE OF FUTURE WORK

Present our project is based on mechatronics, instead of some mechanisms according to literature survey, we have overcome many design aspects and made full of automated

- To Segregate waste (wet & dry) based on the content of the moisture using Photoelectric, Methane and smell sensors.
- To segregate waste based on Hazardous and Non- Hazardous content.
- To dispose the generated waste in an effective manner.

## REFERENCES

[1] Somu Dhana Satyamanikanta, M.Narayanan, "smart garbage monitoring system using sensors with RFID over internet of things" *Journal of Advanced Research in Dynamical and Control Systems,* Vol. 9. Sp– 6 / 2017. Pp.133-139.

[2] Monika K A, Nikitha Rao, Prapulla S B, Shobha G, "Smart Dustbin-An Efficient Garbage Monitoring System" *IJESC,* Vol. 6.Sp-6/2016. Pp. 7113-7116.

[3] Priya G, Ronit Chaudhuri, Pritthish Chattopadhyay, Sreyam Dasgupta, "Smart Garbage Monitoring System", *IJERT,* Vol. 6. Issue- 5 / 2017. Pp. 705-710.

[4] Asifa Indi, Nikitha Sukrithalal, Gayatri Babu, Jayshree Jha, "Smart System for Garbage Management" *IJIRCCE,* Vol.5. Issue-3 / 2017. Pp. 4506-4511.

[5] Pallavi S. Varude, Rohini R. Ranpise, Renuka B. Kedari , Kiran B. Darekar, "Top-k Query based Dynamic Scheduling for IoT-Enabled Smart City Waste Collection" Volume: 05 Issue: 10 | Oct 2018

[6] Mohd Helmy Abd Wahab, Aeslina Abdul Kadir, Mohd Razali Tomari, Mohamad Hairol Jabbar, "Smart Recycle Bin", IEEE, /2014.

[7] Ngosa Willie, Kapata Lucy, Katawa Shadrick, Phiri David Victor, Sinonge John, "GSM and GPS Based Garbage and WasteCollection Bin Overflow Management System forKitwe City Council" Vol. 7 Issue 04, April-2018

[8] Aaditya Jain, Ranu Bagherwal, "Design and Implementation of a Smart Solid Waste, ICCCNT 2017

[9] K. Sridevi, "IOT Based Smart Garbage Management System using PIC Controller" IJSTE Volume 4, Issue 9, March 2018

[10] Xinwen Chi, Martin Streicher-Porte, Mark Y.L. Wang, Markus A. Reuter, "Informal electronic waste recycling: A sector review with special focus on China," Waste Management 31 (2011) 731–742.

[11] Kurian Joseph "Electronic Waste Management in India – Issue and Strategies", *Proceedings Sardinia 2007, Eleventh International Waste Management and Landfill Symposium S. Margherita di Pula, Cagliari, Italy; 1 - 5 October 2007*

[12] H Kasliwal Manasi and B Suryawanshi Smitkumar, "A Novel Approach to Garbage Management Using Internet of Things for Smart Cities," International Journal of Current Trends in Engineering & Research (IJCTER), e-ISSN 2455–1392 Volume 2 Issue 5, pp. 348 – 353, 2016.

[13]Zamali Tarmudi, Mohd Lazim Abdullah, Abu Osman Md Tap, "An Overview of Municipal Solid Wastes Generation in Malaysia", *Jurnal Teknologi*, 51(F) Dis. 2009: 1–15

[14]Kanchan Mahajan and Prof.J.S.Chitode, "Waste Bin Monitoring System Using Integrated Technologies," International Journal of Innovative Research in Science, Vol. 3, Issue 7, July 2014, pp.14953-14956, july 2014.

[15]C. K. N. Gupta and G. L. Shekar, "Electronic Waste Management System In Bangalore – A Review", J. of Management & Technology,Vol. 1. No. 1. Pp. 11 – 24, 2009.

[16]B. Slater, G. Smylie, S. Thompson, H. Bruemmer, "Advancing Information Technology in the Waste Management World, WM2008 Conference, February 24 -28, 2008, Phoenix, AZ.

[17]Waheed Ahmad Arbab, Faheem Ijaz, Tae Min Yoon, Chankil Lee," A USN based Automatic Waste Collection System", ICACT 2012, February 19 – 22, 2012.