International Journal of Engineering and Technical Research (IJETR)
ISSN: 2321-0869, Volume-2, Issue-11, November 2014

Review on Solar Trash Compaction

Prof. Mrs. Swati Shinde, Harita Bhosle, Asha Borkar, Amit Kadve, Sneha Pichad

***Abstract*— Trash compaction is a process of compacting waste. The various process of trash decomposition produces air pollution and water pollution. Nowadays trash is placed in one place greater level for decomposition. In India many garbage dust or waste left by creating pollution problem as well as environment problem. So we brought up this idea to save the time for compaction dust, recycling and to keep the earth green. This report contains the waste management solar power trash compactor use renewable energy to turn public space clean and eco-friendly. Powered by the sun encourages recycling and reduce both greenhouse gas emission and trash collection expenses. So it's good for environment and its economy. So the purpose of our project is to overcome this problem by reducing the size of trash. We hope that readers enjoy this idea by reading with imagination that you are using this trash basket in your place.**

***Index Terms*— compiling, hydraulic system, reduction, trash compactor**

I. INTRODUCTION

The problem of trash control and disposal reveals itself in many facets of our society, from carnivals and city fairs in the summer time to overfilling garbage cans in a fast food restaurant. People often attempt to cram their waste into a trash receptacle already struggling to balance the trash piled on top of it. To solve this problem, we propose an automatic trash compactor that manages the trash levels and notifies when the receptacle needs to be emptied all by itself. Utilizing a trash compactor instead of a normal trash can increases the amount of trash that can fit inside the same sized receptacle.

Therefore, the trash needs to be collected less frequently. To add further convenience, the compactor will sense when the container is full, and will automatically compact the trash as needed. When the trash cannot longer be compacted, it will lock itself and signal that it needs to be emptied. Several considerations were taken into account when determining this design including compression ratio of compaction, force of compaction, ease of use, sanitary considerations, and aesthetics. Main technical considerations included providing a compaction pressure comparable to the 15 psi seen in automatic trash compactors, as well as a container robust enough to handle pressure forces due to compaction. The method chosen as a means of compaction was a hydraulic system actuated by pressing down on a foot pedal. The hydraulic system then elevates the refuse bin [4]. This motion compresses the contents of the refuse bin against a stationary compaction plate, ultimately compressing the trash.

The objective of this project is to compact the trash without producing any pollution. With the help of microcontroller and compaction mechanism the size of trash is reduced so that in the so that in small space more trash can be stored. Again this compacted trash can be compact again and the space used to store the trash can be made free. It will also reduce the diseases wise main cause is trash.

II. PURPOSE OF OUR PROJECT

The purpose of this project is to implement various concepts of microcontroller and embedded designing environment [2]. An embedded microcontroller is a chip which has computer processor with all its support functions (clock & reset), memory (both program and data), and I/O (including bus interface) built into device. These build in functions minimize the need for external circuits and devices to be designed in the final application.
In least developed countries mostly garbage is dumped in open and freely available places and to make its final disposal

entire garbage is burnt and no one stops them because of unawareness. Burning garage not only adds land pollution after being burnt but it also become source of air pollution by emitting harmful gases while burning. It is called one of the worst air polluting acts because it remains directly in breathing zone of human beings.

The goal of this project is to essentially create a reduction bin that is for students and office workers who usually work or study sitting on the small size of desk, and they do not want to spend some time to throw trash outside every day. Even, because plastic cans waste more space than small paper in trash basket, people need to spend more time to reduce trash. This project makes this new solution as affordable as possible to achieve widespread use.

III. PRESENT SCENARIO

Ordinary municipal trash barrels often overflow. The Waste Management Solar-Powered Trash Compactor [10] holds five times as much refuse – and signals when it's ready for pick-up. Municipalities can opt for a convenient leasing program that provides an alternative to purchase. Leasing lets customers achieve immediate savings instead of expending major cash resources. , the Waste Management Solar-Powered Trash Compactor works even in areas that don't receive direct sunlight.

Manuscript received November 11, 2014.

Prof. Mrs. Swati Shinde, Assistant Professor of Electronics and Telecommunication Department, Mumbai University, Mumbai, India, Mobile No.8097041456.

Harita Bhosle, Electronics and Telecommunication Department, Mumbai University, Mumbai, India, Mobile No.8898484797.

Asha Borkar, Electronics and Telecommunication Department, Mumbai University, Mumbai, India, Mobile No.8082182947.

In July 2009, the city of Philadelphia will deploy 500 Solar-Powered Trash Compactors [8] within the downtown district known as Center City. With the new compactors, the city expects to reduce weekly collections from 17 to only five to seven. Over the course of ten years, these reductions are projected to yield cash savings of more than $12 million and many more.

Recently, the city of Philadelphia [8] replaced 700 regular trash receptacles with 500 solar powered trash compactors and 210 single stream recycling units. Now, rather than making 17 trips each week to empty 700 receptacles (annual cost ~%2.3 million), the city now collects only five times per week at an annual operating cost of approximately $720,000-a 70% savings. Performing 17 collections each week required 33 workers on three shifts, five collections per week under the new program require only nine workers on a single shift. The other workers have been reassigned to other, more productive tasks.

IV. BLOCK DIAGRAM

Details of Solar trash compactor using PIC is shown in fig.4

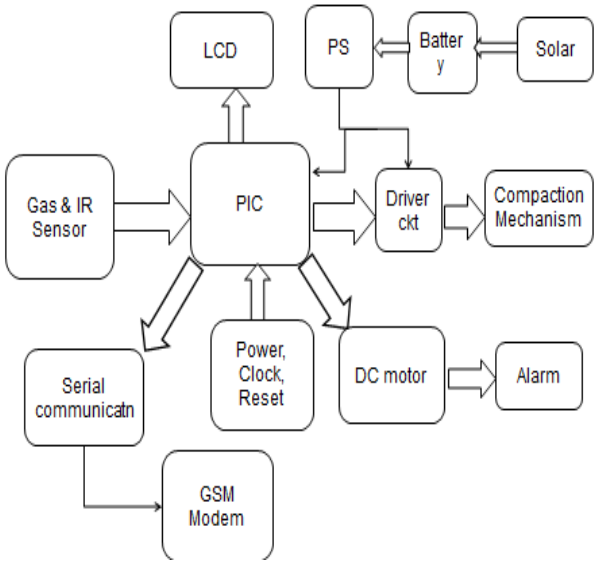


Fig 4.Block diagram for trash compactor

V. CIRCUIT DISCRIPTION

1. HARWARE COMPONENTS:
Power supply, microcontroller PIC, IR sensor, Gas sensor, Dc motor
Buzzer, LCD display and Solar.

2 SOFTWARE COMPONENTS
PIC Simulator Tool

A. Performance Requirement

• Have the ability to detect un-compacted full and compacted full (i.e. be completely
autonomous)
• Have the ability to compact paper, plastic, and light metals (e.g. aluminium cans)
• Have a functional LCD screen to display the receptacle's current status
• Transmit a full signal up to 1000 ft.

B. VERIFICATION

(1) Testing Procedures

The mechanical aspect of our design (including the motor and the metal plate) can be tested be tested by programming ago" signal into the PIC. That is, we will need to make sure the mechanical arm will be able to travel deep enough into the trash can, as well as be able to pull itself up. It will be important that the mechanical aspect of our project be completely working before we start piecing all the parts together. The optical sensors can also be tested individually. We will place the photo detector in line with a LED and measure the current generation. We will also measure the current generated when the LED is off. We will have to take noise calculations into account as well. We can the calibrate our microcontroller using this data.

To test the transceiver part, we will place the transmitter and receiver at a desired distance apart, and transmit a present bit string and see if it works. To see how much the distance can be covered by the transceiver, we will incrementally increase the distance between the transmitter and receiver and see if it still works. If we still do not have a good range, we will amplify the signal with a series of op-amps. Lastly, when we put everything together we will have to again test all of the components to make sure nothing was damaged or altered.

a) Signal generator

The inputs of this circuit is supplied by Vcc, to get the 40 Khz oscillating square wave, adjusting the R_{var_1} to the corresponding value(8.03KΩ) and measure the output from oscillator and compare the result with calculated value from equation.[3]

Set up V_{CC} = 5V the initial output frequency is about 46KHz which is not matched 40Khz from calculation. By adjust the variable resistor forward up to 9.84KΩ, finally the frequency falls to 40KHz as wanted.

Figure 5.1 US1 testing signal

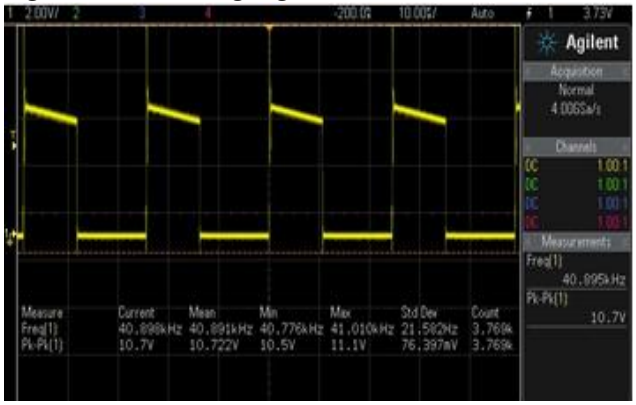
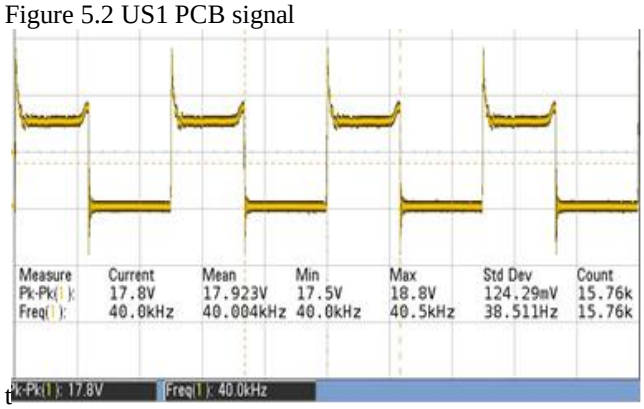


Figure 5.2 US1 PCB signal



After PCB soldering, there is slightly change on the signal with less peak ripple but longer distortion. Which is caused by the ultrasonic connected to the output pin3 of the timer, it has 2000 pF self-capacitance that's why the peak ripple has been absorbed and extended. And the peak-peak voltage is also changed due to 9V DC supply instead using 5V.

b) Signal Receiver

The input of this circuit is come from transducer [3], using Vdc generator in design lab to replace function of transducer in circuit testing. Consider about high gain that applied in the circuit, the outputs of U1&U2 will easily reach its max value when given input in 0.01-0.02V, start testing Vin from 0.001V to

0.1V and see the variation in output of U1 and U2; compare the result gain measured of U1 with

calculated value 221.

To ensure the performance of logic signal at the end side, insert LED at node of <input_2>. So LED On =

"1", and OFF = "0".

Actual Components applied:

R2 = 17.89 KΩ, R3 = 2.212 MΩ, R4 = 9.94 KΩ, R5 = 0.992 KΩ, C3 = 0.1 uF, R6 = 9.97 KΩ, R var_2(total) = 10 KΩ

Then get real Gain = 223.5

Table 5.a Test on U1

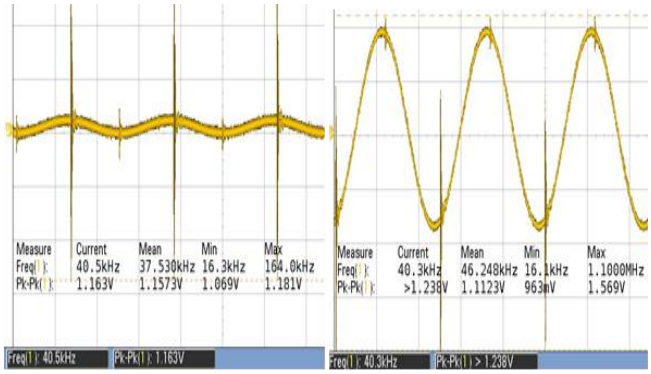
V3(V)	V1(V)	Gain	V3(V)	V1(V)	Gain
0.001	0.397	397	0.03	3.803	126.8
0.002	0.582	291	0.04	3.803	95.1
0.005	1.249	249.8	0.05	3.803	76.06
0.008	1.976	247	0.08	3.803	47.5
0.01	2.400	240	0.1	3.803	38.03
0.015	3.548	236.5			
0.02	3.803	190.15			

Set Reference voltage V6 at 2.215V by adjust the Rvar_2 value. Start test V5 from 2.215V to 2.4V and measure the output V7, get

Table 5.b Test on U2

V5(V)	ΔV(V)	Output V7(V)	$Gain_{os}$
2.215	0	0.011	N/A
2.216	0.001	0.149	149
2.218	0.003	0.577	192.3
2.219	0.004	1.493	373.3
2.220	0.005	2.658	531.6
2.225	0.01	3.972	397.2
2.24	0.025	3.974	159
2.4	0.185	3.974	21.5

Figure5.2 Input signal from ultrasonic set



(2) Tolerance Analysis

Our tolerance analysis will focus on the actual ability of our mechanism to compact trash. We will test different types of materials that typically will be thrown into a public receptacle such as plastic, paper, and even light metal such as aluminium cans. Ideally, we want our mechanics to undergo a certain level of stress, since the compacting will likely be initiated numerous times throughout the day. For this requirement, we will screw the sensors to the sides of the receptacle. Under inclement weather, we need our transceiver to be robust for long range transmission. We will hopefully be able to test the transceiver during such a condition and measure the SNR for various distances.

VI. BENEFITS OF THIS PROJECT

1. **Saving Time and Money**
   "Instead of stopping at 100 trash cans every day, [9] our workers only have to stop at 3 or 4. Everything from gas to man power turns into savings.
2. **A Cleaner Environment**
   "It has a ton of benefits— it will save the city time and money keeps litter from overflowing, and discourages illegal dumping of trash. This will save us a lot of time for guy to fill potholes, fix sidewalks and do other things [5]."
3. Reduces unwanted overflow of trash.
4. Reduces the number of times a trash can need to be emptied.
5. LCD display status of trash can (full, less than half full, past half full).

VII. CONCLUSION

The goal of this project is to make a solar trash basket. As it is intended for commercial use, the price is an important factor. To account for that, each component that is not expensive as well as efficient is used. Also, since the trash basket is used batteries for power, the batteries also need to be safe, efficient, and have a long lifetime. Using a standby time when the trash basket is not in use, batteries last longer than just keep on it all day.

Second, to improve the understanding of technology, its appropriate application, potential consequences should be considered. This project utilizes several complex parts, which will require rigorous testing to successfully implement. The design combines electrical and mechanical parts to accomplish a task that could not be done as easily by only using one or the other.

Third, to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others, we fulfill this paper deals with the steps involved in trash compaction systems and an attempt to speed up the process.

We tried to enhance a particular process involved and would work on enhancing the other processes involved too.

ACKNOWLEDGMENT

As the authors of this paper we would like to acknowledge the Assistant Professor of Electronics and Telecommunication Department, Prof. Mrs. Swati Shinde, K..J. Somaiya Institute of Engineering and Information Technology for lending her support and help for the research and development of this paper.

We would also like thank to IJETR for providing reference papers and resources.

Last but not the least we would thank our family and friends for lending their support and co-operation in the work.

REFERENCE

[1] Texas Instruments, "PRECISION TIMERS", NE555 datasheet, SEP 1973 - REVISED JUN 2010;

[2] Jameco Electronics, "STANDARD SERVO", HS-311 datasheet, Apr 2002

[3]SGS-THOMSON Microelectronics, "PROXIMITY DETECTORS", TD0161 datasheet, Apr 1993 pg.no 125-5

[4]ZX-METAL. "The metal detector module", metal detector module documentation, 2009

[5] PerkinElmer Optoelectronics, "VTP Process Photodiodes", VTP1188SH Datasheet ,2010

[6] futurlec, "Infrared Detector 940nm 5mm Round LED", Dimension Drawing, [Online] at: http://www.futurlec.com/LED/INFD5940.html

[7] Institute of Electrical and Electronics Engineers, Inc. (2012, September 10) IEEE Policies, Section 7[Online] at: http://www.ieee.org/about/corporate/governance/p7-8.html

[8] BigBelly Solar. Conserving resources while providing a superior experience. 2012. Retrieved on: December 2 2012 from: http://www.bigbelly.com/wp-content/uploads/2012/11/BBS_Parks.pdf pg.no 13-1

[9]US Environmental Protection Agency. 2010. Light Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2010. Retrieved from: www.epa.gov/oms/ /mpg/fetrends/420s10002.pdf

Credgington,A. (March 2012). Dirty to Digital Changing the Way we Think About WasteR4News. University of Washington Recycling and Solid Waste. Retrieved from: http://www.washington.edu/facilities/building/recyclingandsolidwaste/files/newsletter/issue1-12/page1.html.

Harita Bhosle, Currently studying in final year BE-Electronics and Telecommunication Was the Technical Co-ordinator for annual technical festival in Renaissance'13 and was assigned to design PCB layout, designing and stimulation, Encode program for game in Blind Programming**.** Members of KJSIEIT- IETE committee. 8898484797

Asha Borkar, Technical Coordinator in Renaissance IETE (2012-2013), Participated in Robotics workshop. Participated In Android Application Development., 8082182947

Amit Kadve, -Internship in Central Railway. 8097960436