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Solar Powewred Waste Compacting Bin

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Abstract—Municipal waste management techniques can vary widely between countries and between regions within countries. Europe and several other places around the world favorEnvacation underground system of vacuum pipes to transport waste to landfills or incinerators Responsibility for waste management generally falls under the jurisdiction of local, state and territory governments. 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. 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.

Keywords: compaction, garbage dust, trash, decomposition pollution.

1 INTRODUCTION

The problem of trash control and disposal reveals itself in many facets of our society, from carnivals and city fairs in thesummer 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 piledon top of it. To solve this problem, we propose an automatictrash compactor that manages the trash levels and notifies when the receptacle needs to be emptied all by itself. Utilizinga trash compactor instead of a normal trash can increases the amount of trash that can fit inside the same sized receptacle. 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.[1] 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.[2]The method chosen as a means of compaction was a hydraulic system actuated by pressing down on a foot pedal. 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.

2 LITERATURE REVIEW

Globally, management of solid waste present huge challenges to waste management practitioners. These challenges are often felt more in the developing countries, though 20-50% of the municipalities budget are spent on solid waste management yet about 50% of their population is not served (World Bank, 2009). Solid waste collection efficiency and coverage within the urban spatial structure of developing countries has been a difficult task. In order to improve solid waste collection in Ghana, solid waste collection services were outsourced to the private sector on contract basis. The waste collection services are either by door-to –door in the high/middle income dwellings or through the communal system in the low-income areas where public containers are used for solid waste collection (Oduro-Appiah and Aggrey, 2013).

All these modes of collection are characterized with:

• Irregular frequency and a fairly precise schedule for optimal efficiency and convenience,

• Lack of sufficient number, inappropriate types and sizes of storage containers at collection points, and

• Reliance on the conventional western methods that depends on motor vehicle and crews, which is not sustainable due to lack of proper maintenance culture, ill-motivated workforce and the lack of political commitment in emerging economy countries.

S. Fisher et al

A half scale version of a device called the plastic melt waste compactor prototype has been developed at NASA Ames Research Centre to deal with plastic based wastes that are expected to be encountered in the future of human space exploration scenarios such as lunar or martin missions. The plastic melt waste compactor design was based on the types of waste produced on the international space station, space shuttle, MIR and skylab mission.

The half scale prototype unit will lead to the development of a full scale plastic melt waste compactor prototype that is representative of flight hardware that hardware that would be used on near and far term space mission.

This report details the progress of the plastic melt waste compactor development effort by the solid waste management group at NASA Ames Research Centr

W.John et al

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the prototype Plastic Melt Waste Compactor by the Solid Waste Management group at NASA Ames Research Centre.

The tests are designed to determine the prototype's functionality, simplicity of operation, ability to contain and control noxious off-gassing, biological stability of the processed waste, and water recovery potential using a waste composite that is representative of the types of wastes produced on the International Space Station, Space Shuttle, MIR and Skylab missions.

Suresh et al

This paper describes development at NASA Ames Research Centre of a heat melt compactor that can be used on both near term and far term missions. Experiments have been performed to characterize the behaviour of composite wastes that are representative of the types of wastes produced on current and previous space missions such as International Space Station, Space Shuttle, MIR and Skylab. Experiments were conducted to characterize the volume reduction, bonding, encapsulation and biological stability of the waste composite and also to investigate other key design issues such as plastic extrusion, noxious off-gassing and removal of the of the plastic waste product from the processor. The experiments provided the data needed to design a prototype plastic melt waste processor, a description of which is included in the paper.

Roberts et al

The ongoing purpose of the project efforts was to characterize and determine the fate of microorganisms in space-generated solid wastes before and after processing by candidate solid waste processing. For FY 11, the candidate technology that was assessed was the Heat Melt Compactor (HMC). The scope included five HMC. Product disks produced at ARC from either simulated space-generated trash or from actual space trash, Volume F compartment wet waste, returned on STS 130. This project used conventional microbiological methods to detect and enumerate microorganisms in heat melt compaction (HMC) product disks as well as surface swab samples of the HMC hardware before and after operation. In addition, biological indicators were added to the STS trash prior to compaction in order to determine if these spore-forming bacteria could survive the HMC processing conditions, i.e., high temperature (160 C) over a long duration (3 hrs). To ensure that surface dwelling microbes did not contaminate HMC product disk interiors, the disk surfaces were sanitized with 70% alcohol. Microbiological assays were run before and after sanitization and found that sanitization greatly reduced the number of identified isolates but did not totally eliminate them. To characterize the interior of the disks, ten 1.25 cm diameter core samples were aseptically obtained for each disk. These were run through the microbial characterization analyses. Low counts of bacteria, on the order of 5 to 50 per core, were found, indicating that the HMC operating conditions might not be sufficient for waste sterilization. However, the direct counts were 6 to 8 orders of magnitude greater, indicating that the vast majority of microbes present in the wastes were dead or non-cultivable. An additional indication that the HMC was sterilizing the wastes was the results from the added commercial spore test strips to the wastes prior to HMC operation. Nearly all could be recovered from the HMC disks post-operation and all.

David et al

A toilet for use on a space vehicle has a toilet bowl having a storage canister at a remote end for receiving human waste. The compactor includes a cable connected to a lever which pulls the cable in a direction forcing the compactor into the storage canister to compact the captured waste when the lever is actuated.

S Michael et al

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3 Objectives

1. To save time and money —

it reduces the manpower to keep the system monitoring as this system is self monitored by the sensors

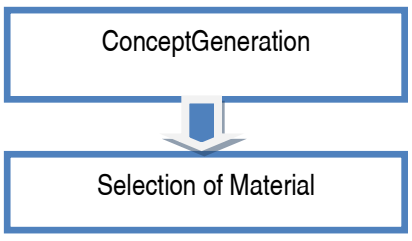
2. To develop Cleaner Environment —

It has a ton of benefits— it will save the city time and money keeps litter from overflowing, and discourages illegal dumping of trash.

3. To Reduces unwanted overflow of trash.

4. To Reduces the number of times a trash can need to be emptied.

4 Methodology



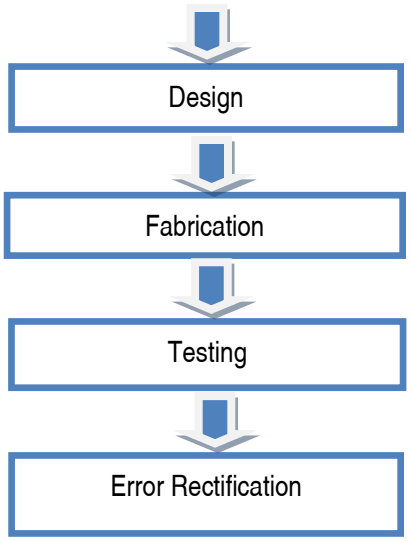


Fig.1 Block diagram of experimental setup

3.1. DESIGN REQUIREMENTS

These indicate the detailed statement, the expected specific and quantitative data with regard to the performance of the device.

• The dustbin should be able to withstand the compression pressure.

• The device should have a minimum of 75% efficiency.

• The dustbin should have wheels for easy movement from the container.

• The connecting rod should be threaded to allow for it's up and down movement.

• The artifact would be manufactured from locally available raw materials.

• The metal bin should be able to carry a maximum weight of 37.7kg • The volume of the bin is 0.10312m3

• The average input of the operator to manually turn the spindle is 70 watts.

• Density of waste = 366kg/m3

3.2. FUNCTIONAL REQUIREMENTS

Below are some of the things the device should do.

• The device should be able reduce waste into smaller volume.

• The device should have a compacting ratio of at least 4:1.

• The human effort should be able to operate and achieve the required compression ratio.

• The device should be able to convert circular motion to linear motion.

• The device should be firmly grounded

5 COMPONENTS

5.1 Ultrasonic Sensor

Fig.2 Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal.

Ultrasonic waves travel faster than the speed of audible sound.

5.2 Solar Panel

Fig.3 Solar Panel

The Solar panel absorbs sunlight with help of photo-voltaic cells mounted in a frame work for installation.

Photo-voltaic cells use sunlight as a source of energy and generate direct current electricity.

A collection of PV modules is called a PV Panel, and a system of Panels is an Array.

Arrays of a photovoltaic system supply solar electricity to electrical equipment.

5.3 Lead Screw

Fig.4 Lead Screw

A lead screw, also known as a power screw or translation screw, is a screw used as a linkage in a machine, to translate turning motion into linear motion.

Because of the large area of sliding contact between their male and female members, screw threads have larger frictional energy losses compared to other linkages.

5.4 Arduino UNO

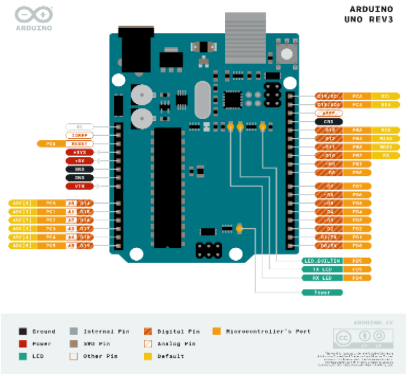


Fig.5 Arduino UNO

It is a microcontroller board based on 8-bit ATmega328P microcontroller.

Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller.

Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

5.5 Scissor Lift or X-Frame

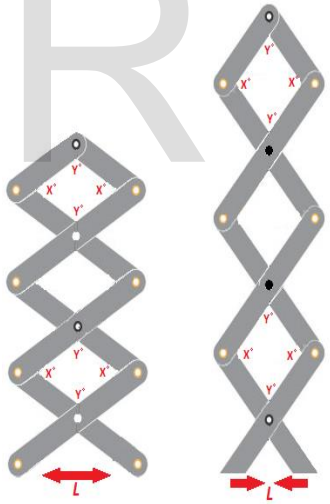


Fig.6 Scissor Lift

A scissor lift relies upon the elongationof a collapsile mechanism to provide vertical elevation in ratio to a rotational or linear input. These devices are widely utilized and are capable of lifting significant loads safely and efficiently.

5.6 DC Motor

Fig.7 DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct.At current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

5.7 Battery

Fig.8 Battery

A Battery is a device consisting of one or more electrochemical cells is the external connectionsor powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

5.8 IM800A GSM module

Fig.9 GSM Module

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system.

General Packet Radio Service (GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).

GPRS was originally standardised by European Telecommunications Standards Institute (ETSI) in response to the earlier CDPD and i-mode packet-switched cellular technologies. It is now maintained by the 3rd Generation Partnership Project (3GPP).

5.9 Mild Steel

Fig.10 Mild Steel

Mild steel is a carbon steel typically with a maximum of 0.25% Carbon and 0.4%-0.7% manganese, 0.1%-0.5% Silicon and some + traces of other elements such as phosphorous may also contain lead (free cutting mild steel) or sulphur (again free cutting steel called re-sulphurised mild steel).

5.10 Nut and Bolt

Fig.11 Nut and Boltt

A **nut** is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

A **bolt** is a type of fastener which is used to join two parts together. The bolts join the part non- permanently i.e. the parts may be separated from each other by using an appropriate tool. Nuts are also used on the bolts so as to make the fastening process more effective.

6. Working Principle

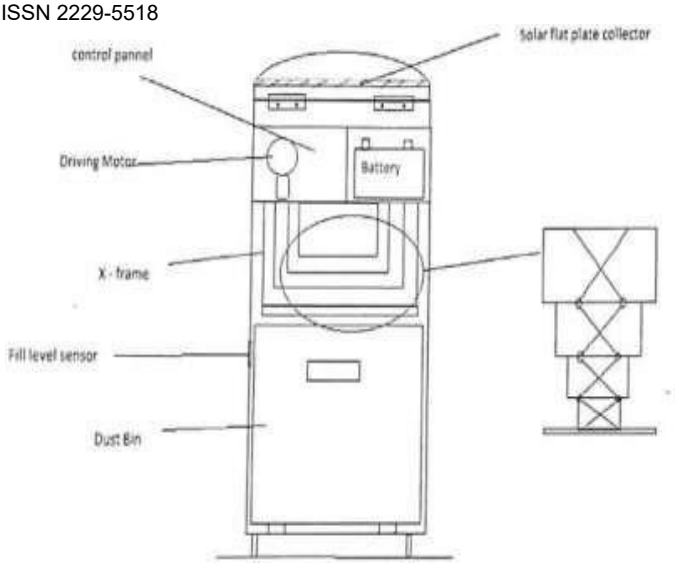


Fig.12 Internal Structure of Solar Compacting Bin

EXPERIMENTAL PROCEDURE

1. When the bin was fully filled, the ultrasonic level sensor will senses the level of the bin.
2. The controller receives the signal from the sensor and it will start the motor, which is connected to lead screw.
3. By the use of lead screw, the X-frame will compact the waste which is stored in the dustbin.
4. This process will repeated up to three to four time. After this the trash is removed from the dustbin manually.

7 Conclusion

1. We successfully Fabricated Solar Powered Waste Compacting Bin.

2. The implementation of Solar Compacting Bin leads to reduce Electricity and Time.

3. The trash bin is used batteries for power, the batteries also need to be safe, efficient, and have a long lifetime.

4. Use solar power as source of energy.

5. It is used in beaches, public area nearer to road.

Therefore, the goal of this project is to make a solar trash bin. 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

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