

TEKNOFEST

AEROSPACE AND TECHNOLOGY FESTIVAL

SMART TRANSPORTATION COMPETITION

PROJECT DETAIL REPORT

PROJECT NAME: FLAWLESS DUMPSTER (DIY Waste Collector and Segregator)

TEAM NAME: Team Elec-Tricks

TEAM ID: T3-21642-202

TEAM LEVEL: Primary School-Secondary School

**TEAM MEMBERS: MUHAMMAD HUZAIFA KABEER/ ABDUL HANNAN
RASHEED**

ADVISOR NAME: AMINA AAMIR

Project Detail Report



1. Project Summary:

DIY Waste Collector and Segregator is a compact module which takes place in two section. First is Waste Collection through RF controlled Garbage Collector Lorry, second part comprises of Waste Segregation. Garbage Collector can be a big relief for the task of cleaning garbage from the places like beach and parks. This system is a 4-wheel drive vehicle chassis equipped with a cleaning mechanism and a dirt bag (collecting tanks) for Garbage collection. It will also sort paper and plastic garbage. Then, in order to segregate this waste, we will deploy a Waste segregator. This DIY Waste Segregator is designed to sort the refuse into metallic waste, plastic waste and decomposable waste. The DWS employs parallel resonant impedance sensing mechanism to identify metallic items, and capacitive sensors to distinguish between wet and dry waste. Polyester sensors and methane and ammonia sensors would be fitted inside the vacuum pumps, so that they could attract the garbage at respective pumps.

2. Problem/ Issue:

The earth is suffering as a result of the destruction wreaked upon it by humanity. Whether it is the garbage production by humans, pesticides contaminating the rivers, chemicals from factories polluting the seas or the exhaust fumes from vehicles and industries polluting the air, the systematic destruction of our different ecosystems all over the world has led to a dreadful mess. Our main focus is on the garbage production and transportation industry which are the largest source of pollution and health hazards. As now a days the amount of plastic is increasing, and it is a major cause of global warming and extinction of sea life. Waste Management and segregation is a much-needed process in metro cities and urban areas due to spreading of diseases. It is estimated that India produces 42.0 million tons of municipal solid waste annually at present. Waste lying littered in the surrounding, dumped on open lands, becomes a major problem for various types of disease-causing bacteria and viruses hence, segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment.

Solution

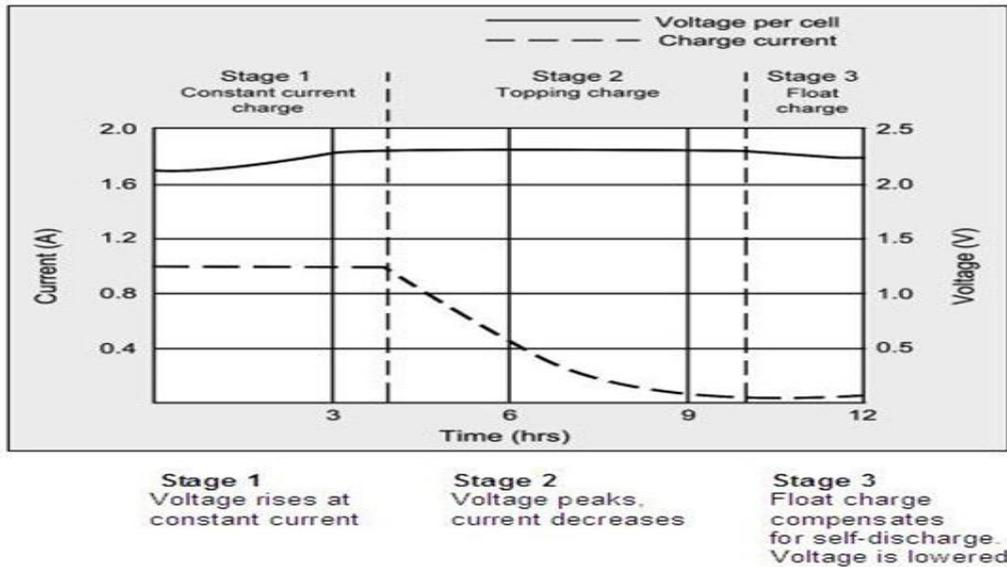
The main objective of my project is; firstly to collect the garbage, and secondly to collect the plastics and decomposable materials separately. This would help in recycling the product and also will save environment. This Solar Electrical vehicle can charge itself from both solar and electric power and is more fuel-efficient in the manner of Green-house gases emission control. Segregation makes it attainable to utilize and recycle the waste effectively. This waste segregator system can easily segregate waste. When waste is thrown in the pipe, IR sensor will sense the waste. Another sensor will sense the garbage category. As per the algorithm used, if the waste is metallic then the mechanism will bring the metal collecting bin below the pipe and with the help of servo motor the waste will fall into the metal bin. Similarly, the process will repeat if wet waste is sensed. If the sensor doesn't activate both the sensor category then the waste will be considered to be a dry waste. As plastic and decomposable products are collected separately, this provides us with lots of benefits. As all the plastic that is collected can be recycled again, rather than wasting it out. And when decomposable product free of plastic is dumped in landfills, this leads to fast production of humus and also the minerals such as coal are produced earlier than it time.

3. Method

I used polystyrene sheets to construct my demonstrative model. By in real this would be a metallic robotic lorry, which would work on battery, having two separate collecting tanks at its back, one for plastic and other for decomposable products. At the lower deck of lorry two separate vacuum pumps would be fitted at the bottom of the respective tanks. Polyester sensors and methane and ammonia sensors would be fitted inside the vacuum pumps, so that they could attract the garbage at respective pumps. Nowadays the amount of plastic and other garbage product is increasing day by day in each part of mother earth. We need a vehicle that is environment friendly and consume solar garbage collector. The solution to this problem is a robotic garbage collector that uses electrical energy to perform its function. There will be two separate tanks at the back of the lorry, to collect plastic and decomposable product separately. This would help in recycling the product and also will save environment. Ammonia and polymer sensor would be fitted in the vacuum pump that would be fitted at the bottom of the respective tank, The battery to be used is a 12 V unsealed lead-acid rechargeable battery. Lead-acid batteries, invented in 1859 by French physicist Gaston Planté, are the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, their ability to supply high surge currents means that the cells maintain a relatively large power-to-weight ratio. These features, along with their low cost, make them attractive for use in motor vehicles to provide the high current required by automobile motors

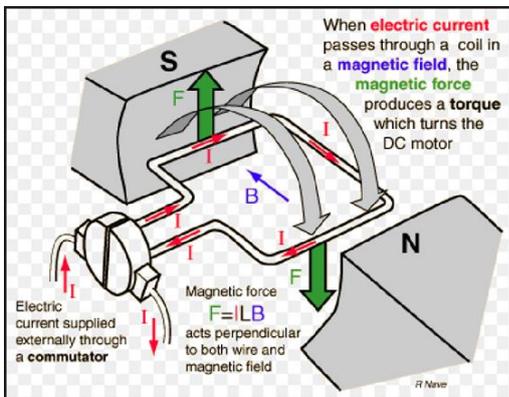
Due to the internal electro-chemical mechanism of a lead-acid battery, charging is carried out in 3 distinct stages rather than through a continuous fixed voltage/current

supply to the battery. Each of these stages is varied in the amount of voltage/current that needs to be supplied to the battery. The charge controller will detect voltage from the battery prior to charging. After reading the battery the charge controller will determines which stage to properly charge at. The 3 stages of charging are:

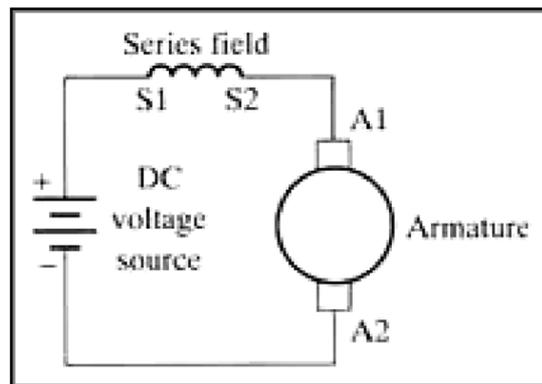


Basic charging stages of a 12 V lead-acid battery.

MOTOR WORKING MECHANISM

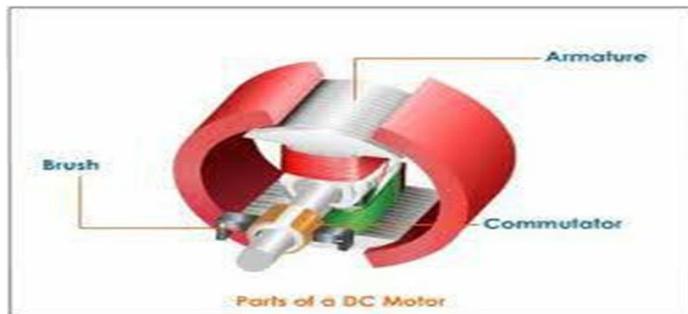


(b)



(a)

(b)



(c)

(a) Basic motor working principle, (b) internal construction of DC series motor, (c) internal circuitry of DC series motor

The DC series excitation motor is one of the simplest types. The brushed type was chosen for its simplicity and it generates torque directly from DC power supplied to the motor. This makes it easier to control its speed and direction of rotation.

The basic working principle of electric motors is shown in FIGURE 6.2.1(a). The magnetic flux generated when current passes through the rotor coils interact with the magnetic flux of the magnet causes rotational motion of the coil. In other words the electrical energy in the rotor and armature is converted to mechanical energy at the motor shaft .

For the DC series motor, the permanent magnet is replaced by another coil winding called the armature winding which generates a magnetic field when current flows through it. This is shown in Figure 6.1(b)

The internal circuitry of the DC series motor is shown in figure 6.1(c). The armature and field windings are in series with DC voltage to be applied. The greater the DC applied voltage the greater the rotational speed.

Electricchemical ammonia sensors:-

Substance-specific electrochemical sensors are available for many of the most common toxic gases. EC sensors are compact, require very little power, exhibit excellent linearity and repeatability, and are comparatively inexpensive. The detection technique is very straightforward in concept. Gas that enters the sensor undergoes an electrochemical reaction that causes a change in the electrical output of the sensor. In the case of ammonia sensors, the electrolyte includes an active ingredient that is consumed in the electrochemical reaction used to detect the ammonia.



4. Innovative Aspect

This project is also articulated to propose a Solar Electric Powered Hybrid Vehicle (SEPHV) system which solves the major problems of fuel and supports Green energy. An electric Solar car performs on the principle of photovoltaic cells that transform sunlight into energy, Lithium-ion batteries are used in Hybrid cars for reserving the Electric Power generated from Photovoltaic Cells. This Solar Electrical vehicle can charge itself from both solar and electric power and is more fuel-efficient in the manner of Green-house gases emission control. The

sun gives off radiated energy in the form of light photons which is converted into electrical energy by the solar panels. Solar panels are composed of silicon based semiconductors and when the radiation comes in contact with the silicon atoms, the photons are absorbed and the electrons are separated from the rest of the atoms. These free electrons are responsible for carrying and creating an electrical current. The electricity generated is most usually stored in batteries to be used later.

5. Applicability

The garbage collected could be resorted to an end, not alike that it would be picked up and then again dumped ,instead like an example of Singapore that has shredded this garbage out and making islands with it and planting trees on it.

At a future development face it could be installed with IOT based components and be made more artificially intelligent ,like it could be equipped with a metal detector to get the price full raw material ,or it could be added with a cam that could be remotely foreseen in order to split the things out .

And when decomposable product free of plastic is dumped in landfills, this leads to fast production of humus and also the minerals such as coal are produced earlier than its time.

6. Estimated cost and Project Scheduling

Period	Functionality	Progrm
2 Days	Components Testing	20%
2 Days	Components Assembling	50%
2Days	Getting the outputs	55%
3 Days	Adding redundancy by replacing components	60%
2 Days	Retrievin g Data	80%
2 Day	Testing Project	95%
1 Day	Finalizing the Device	100%
Total days (15 days)		

7. Target Group of the Project Idea (Users):

The purpose of this project is the realization of a compact, low cost, and user-friendly segregation system for urban households to streamline the waste management process. When the waste is segregated into basic streams such as wet, dry and metallic, the waste has a higher potential of recovery and consequently recycled and reused. The wet waste fraction is often converted either into compost or methane-gas or both. Even though there are large-scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of the material is retained for recycling which means that more value

could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant than to the recycling plant. This project is also articulated to propose a Solar Electric Powered Hybrid Vehicle (SEPHV) system which solves the major problems of fuel and supports Green energy. An electric Solar car performs on the principle of photovoltaic cells that transform sunlight into energy, Lithium-ion batteries are used in Hybrid cars for reserving the Electric Power generated from Photovoltaic Cells. This Solar Electrical vehicle can charge itself from both solar and electric power and is more fuel-efficient in the manner of Green-house gases emission control.

8. Risks

In fact, there is no risk associated with this project, but the proposed method opens the door of a relatively less pollution and safety for living things as it is environment friendly.

Project Components And Estimated Cost

Metallic Robotic Lorry	Spindle Wheel \$4
Vacuum Pump \$133	Chain Sprockets \$20
Polyester Sensors and Methane and Ammonia Sensors \$46	Bearings \$1
Photovoltaic cells \$1/watt	Screw \$10
Lithium-ion batteries \$2.10	Moving Roller \$35
12 V unsealed lead-acid re-chargeable battery \$30/piece	Supporting Frame \$10
DC motor \$4	Mounts
Bending Rollers \$33	Joints & Screws

9. Project Team

Name Surname	Mission In The Project	School	Project or problem related experience
Muhammad Huzaifa Kabeer	Team Leader/ Programming & Presentation	Pak-Turk Maarif International Schools & Colleges Lahore	Class 6 Student Participated in Inter School Science

		Pakistan	Exhibition Project Pelton Wheel Generator
Abdul Hannan Rasheed	Assemblage & Execution	Pak-Turk Maarif International Schools & Colleges Lahore Pakistan	Class 6 Student Participated in Inter School Science Exhibition Project Pelton Wheel Generator

11. Resources

- <https://www.mepits.com/project/166/diy-projects/diy-simple-electronic-project->
- The Art of Electronics Textbook (by Paul Horowitz and Winfield Hill)
- Electronic Devices and Circuit Theory Book (by Louis Nashelsky and Robert Boylestad).
- Electronic Circuits for the Evil Genius: 57 Lessons with Projects (Book by Dave Cutcher)
- Make: Electronics: Learning Through Discovery Book (by Charles Plat)
- <https://nevonprojects.com/automatic-waste-segregation-system/>