International Research Journal in Global Engineering and Sciences. (IRJGES)
ISSN : 2456-172X | Vol. 1, No. 2, June - August, 2016
Pages 99-106 | Cosmos Impact Factor (Germany): 5.195
Received: 06.08.2016 Published : 29.08.2016

# ELECTRICITY FROM E-WASTE

**[1]K. Chithirai Selvan, [2]Mukul Sreewastav**
chitiraiselvank@jnn.edu.in
1Assistant Professor, Department of EEE, J.N.N Institute of Engineering
2Student, Department of EEE, J.N.N Institute of Engineering

**ABSTRACT**
This project is about how we can obtain electricity from e- waste. The e-waste which we are going to use to generate electricity is primary cells. The non- rechargeable battery which are once used and then thrown to trash can be used to generate electricity. Once we extract the charge from a used primary cell completely the It can recycled completely in a safe way. A primary cell which is dead and thrown into trash has considerable amount of charge stored in it. The voltage of a dead AA size battery ranges from 1.38V to1.48V, but it can deliver only a little amount of current which is far less than a new AA size battery can deliver. The charge which is stored in a dead Primary cell can be converted into Electricity by the following method. In this method we are going to use buck convertor to extract the charge present in a used dead primary cell. A buck convertor is used to step down the voltage and boost the current. The buck convertor boost the current stored in a dead primary cell. The boosted current from number of dead primary cells can be used to generate considerable amount of Electricity.

**INTRODUCTION**


**Battery**
An electric battery is a gadget comprising of at least one electrochemical cells with outside associations gave to power electrical gadgets, for example, spotlights, cell phones, etc. At the point when a battery is providing electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal stamped negative is the wellspring of electrons that when associated with an outer circuit will stream current to an outside gadget. At the point when a battery is associated with an outer circuit, the ions in electrolytes can move enabling the compound responses to be finished at the different terminals thus convey power to the outside

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circuit. It is due to the ions movement inside the battery which enables current to stream out of the battery to perform work. Primary (single- use or "dispensable") batteries are utilized once and disposed of. Rechargeable batteries can be drained and recharged for a number of times. The initial composition of the terminals can be reestablished by reversing current.

**Dead Battery**

A battery which cannot deliver the nominal voltage for which it has been designed is considered to be a dead battery. A dead battery is considered as an e-waste and the disposal of the dead battery should be done with proper care.

**DISPOSAL OF DEAD BATTERY**

A dead battery should be properly disposed otherwise it can cause severe environmental problems. Disposal of battery e-waste eco-friendly has come to occupy an extremely significant position in the eyes of battery manufacturers and recycling organizations.

**Land fills**

One generally utilized strategy is to send dead batteries to landfills, despite the fact that this is certainly not a agreeable choice. For people, both lead and cadmium can be taken just by ingestion or inward breath. Mercury another destructive metal can even be assimilated through the skin, in spite of the fact that this present metal's utilization in batteries has declined enormously because of laws and controls that have been set up

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(E.g. US Battery Act, 1996) to diminish its presence.

**Harmful Effects of Land fills**

These harmful substances pervade into the dirt, groundwater and surface water through landfills and furthermore discharge poisons into the air when they are burnt in city waste combustors. In addition, cadmium is effortlessly taken up by plant establishes and collects in organic products, vegetables and grass. The impure water and plants thus are devoured by creatures and individuals, who at that point fall prey to a large group of sick impacts. Studies demonstrate that queasiness, over the top salivation, stomach torment, liver and kidney harm, skin aggravation, cerebral pains, asthma, nervousness, diminished IQ in kids. Landfills additionally create methane gas prompting the 'greenhouse effect' and worldwide climatic changes.

**DISPOSAL OF RECHARGABLE BATTERIES**

Car batteries, and some other kind of large, lead-acid battery, can't go into Trash. This "lead" and "acid" - two things that shouldn't be discharged into nature. Fortunately 98% of lead acid batteries are being reused. As per the US Environmental Protection Agency, No rechargeable batteries ought to go in the waste. They quite often contain nickel cadmium, which can penetrate into the soil, water and air in landfills or incinerators. The bundle ought to caution you that you need to take the rechargeable batteries to an accumulation site. There are strict Laws overseeing the transfer of Rechargeable Batteries and more than ninety percentage of them are reused in the developed countries. There are strict laws forbidding the transfer of dead rechargeable batteries since they contain destructive substances.

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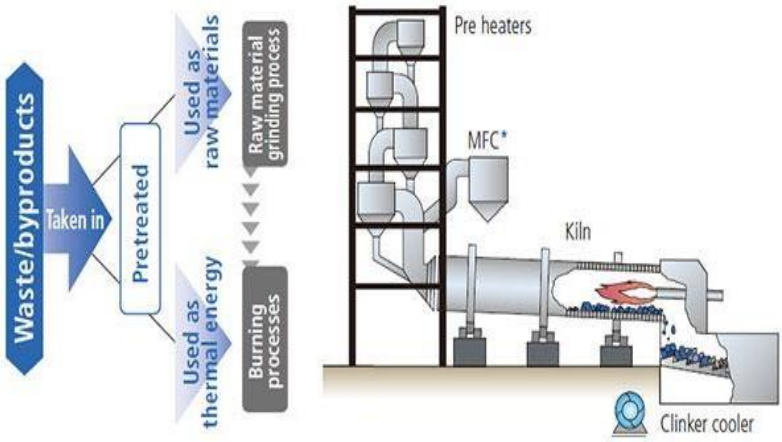
**DISPOSAL OF NON RECHARGEABLE BATTERIES**

Americans buy more than 3 billion dry-cell batteries a year, as indicated by the University of Illinois at Urbana- Champaign. We were never supposed to trash AA, AAA, or other letter-named batteries. They were produced using harmful substantial metals like mercury, lead, cadmium, and nickel . Yet, many organizations began expelling these fixings from their items in the mid-1990s, and the 1996 Battery Act implied they all needed to eliminate mercury, so the batteries we utilize today are more secure to toss straightforwardly into the waste. Duracell says its family unit batteries are made of steel, zinc, and manganese, and can be discarded in your ordinary waste. Many individuals would now be able to toss their batteries into the junk, tons they can likewise be reused into of various things - from concrete to new batteries.

**Utilization of dead batteries in Cement Industry**



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**Charge stored in a dead Non-Rechargeable Battery**

A primary cell which is used and thrown into trash has considerable amount of charge stored in it. The voltage of an used AA size battery ranges from 1.38V to1.48V,But it can deliver only a little amount of current which is far less than a new AA size battery can deliver. The charge which is stored in an used Primary cell can be converted into Electricity. Once we extract the charge from an used primary cell completely the It can recycled completely in a safeway.

**METHODS USED TO HARVEST THE CHARGE STORED IN A DEAD NON-RECHARGEABLE BATTERY**

- By using Voltage Regulator IC's
- By using a series Rheostat.
- By using a Buck convertor.

**Using voltage regulator IC**

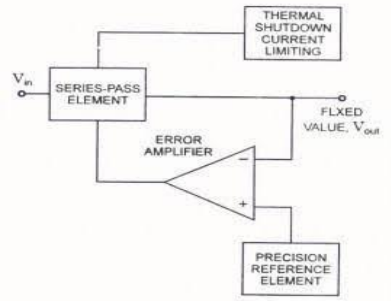
The dead Non –Rechargeable batteries have voltage less than its nominal voltage. When a number of dead batteries are connected in series the voltage of each dead battery gets added. Now this voltage is given as input to the voltage regulator IC. The voltage regulate the voltage to a value for which it has been designed.

**IC based voltage regulator**

An example of IC based voltage controller is the 7805 IC which manages the yield voltage at 5 volts. Presently let's go to the essential meaning of an IC voltage controller. It is Integrated circuit whose essential design is to control the unregulated input voltage (definitely over a predefined value) and give a steady, regulated output voltage.

**Block Diagram of 3 Terminal IC based Voltage Regulator**

These controllers give a steady output voltage. A prevalent illustration is the 7805 IC which gives a consistent 5 volts output voltage. In the IC terminology – 78XX ; the part XX means the output voltage the IC is manufactured for. Illustrations:- 7805, 7806, 7809 and so on.




*Fundamental Block Diagram of a Three-Terminal IC Voltage Regulator*

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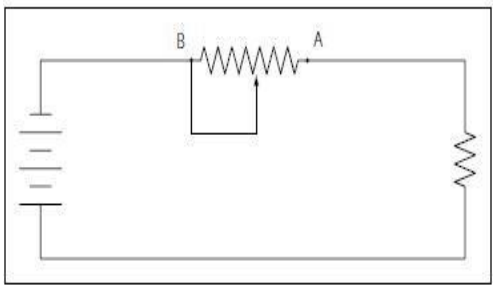
**Reason for the failure of the IC voltage regulator**

The dead batteries have voltage slightly less than the nominal voltage but they can deliver a very small current which is far less than the current delivered by a new battery. The current delivered by the dead battery is not enough to run the internal circuit of the voltage regulator. Hence the IC voltage regulator gets fail in harvesting the electricity from the dead Non-Rechargeable battery.

**Using a series rheostat to harvest electricity from the dead batteries**

A rheostat can be connected in series with a dead batteries which are also connected in series. Since the dead batteries are connected in series the voltage of each dead battery gets added. The load connected to this arrangement can be a rechargeable battery. The terminal voltage is adjusted to the rechargeable battery nominal voltage by adjusting the rheostat. By this way the charge stored in the dead batteries are transferred to the rechargeable batteries. The input is given by two dead batteries connected in series and the output 1.23v can be used to charge a rechargeable battery of 1.2v nominal voltage. By varying the rheostat resistance the output voltage can be controlled.




**Advantage of using Rheostat for harvesting electricity from dead batteries**

The main advantage is that only one component is used i.e the rheostat is only used in the process. It does not need a complex circuit for the operation.

**Disadvantage of using Rheostat for harvesting electricity from dead batteries**

The main disadvantage of using this method is that the power dissipated in the rheostat is high. The power dissipated in the rheostat is given by

$P=V \cdot I$

where P stands for power, V for voltage and I for current.

**USING A BUCK CONVERTOR TO HARVEST ELECTRICITY FROM THE DEAD BATTERIES**

**Buck convertor**

A buck converter is a DC-to-DC step-down converter which step down voltage while boosting up current from its input supply to the Load.

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LM2598 based buck convertor

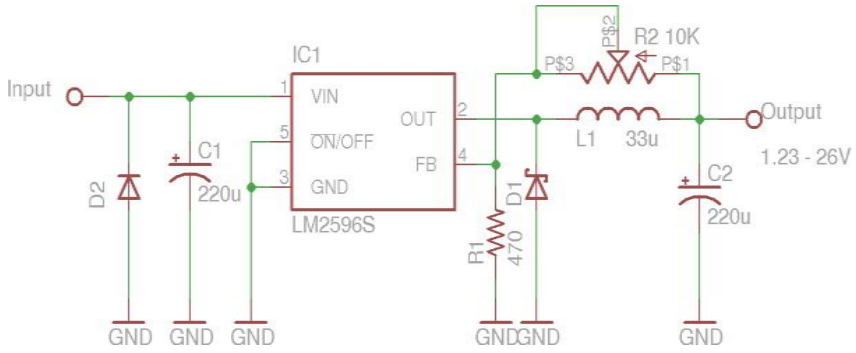
The LM2596 controller is solid integrated circuit in for simple and advantageous design of a step−down regulator (buck converter). It is equipped for driving a 3.0 A load with incredible line and load direction. This buck convertor is accessible with variable output.

Since LM2596 converter is a switch−mode power supply regulator, its efficiency is altogether higher in comparision with well known three−terminal line voltage controllers, particularly with higher input voltages. The LM2596 works at 150 kHz switching frequency.

**Features of LM2596 Buck Convertor**

- Adjustable Output Voltage from 1.23 V to 37V
- Input Voltage Range up to 40 V
- 150 kHz switching Frequency Internal Oscillator
- Thermal Shutdown and Current Limit Protection
- Internal Loop Compensation
- Pb−Free Package.

**Circuit diagram of buck convertor with LM2596**




For LM2596, the output voltage is dictated by the condition underneath. The above circuit can give the output voltage between 1.23V and 25V.

V0=1.23[(R2/R1)+1]

## CONCLUSION

The efficiency of this converter differs a considerable amount based on the input voltage, output voltage and the load current. The efficiency can go from 60% to 90% based on the working conditions. The input is given by two dead batteries connected in series and the output 1.23v can beused to charge a rechargeable battery of 1.2v nominal voltage.

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