TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

Reconditioning & Improvisation of The Lead-Acid Battery

Pandiri Shiva[1], A. Sathyaraj[2], Pusuluri Shilpa[3], Chitupaka Raju[4],Rajita.S[5]
[1]Undergraduate student, Department of Mechanical Engineering,ACE Engineering college,Hyderabad,Telangana
[2]Associate professor, Department of pharmaceutics, Omega college of pharmacy, Hyderabad, Telangana
[3]Assistant Professor, Department of Mechanical Engineering, ACE Engineering college, Hyderabad, Telangana
[4]Assistant Professor, Department of Mechanical Engineering, ACE Engineering college, Hyderabad, Telangana
[5]Assistant Professor, Department of Mechanical Engineering, ACE Engineering college, Hyderabad, Telangana

Article Info
Volume 83
Page Number: 905 - 910
Publication Issue:
May-June 2020

Article History
Article Received*: 11 August 2019*
Revised*: 18 November 2019*
Accepted*: 23 January 2020*
Publication*: 09 May 2020*

Abstract:
This paper elaborates the improvisation of lead-acid batteries and helps in reconditioning the lead-acid battery to prolong its life cycle and efficiency. Batteries are the electrochemical power sources which convert chemical energy into electrical energy. These are also considered as a storehouse for electrical energy. Batteries are a major technological challenge because they are one of the major sources for efficient energy storage in this new era. Li-ion&Lithium batteries are leading today's world because they are more efficient and portable in this electronic world. Even though there is still a lot of research going on Li-ion&Lithium batteries, we still use the lead-acid battery in our automobiles, Power stations and domestic appliances. This is because it has higher potential and is less expensive. Why lead-acid is less efficient? and how to improve the lead-acid battery to increase its efficiency?, Started an experimental-Work to improve the lead-acid battery. Gone through many literature surveys and guidance from professors who are specialized in electrochemistry. Many reactions are done to improve the battery. Finally, Succeeded in the experimental-work. There is a chance for improvisation of lead-acid battery which gives better results when compared to an un-improvised lead-acid battery.

Keywords: *Battery, Electrochemical, Improvisation, Lead-Acid, Reconditioning*

I. Introduction

Electrochemical Power Storage:

Energy storage: The first solution to the energy storage problem for electrical purposes was the production of a battery, a utility for saving electricity. There has been limited use in energy systems due to their small capacity and a high cost.

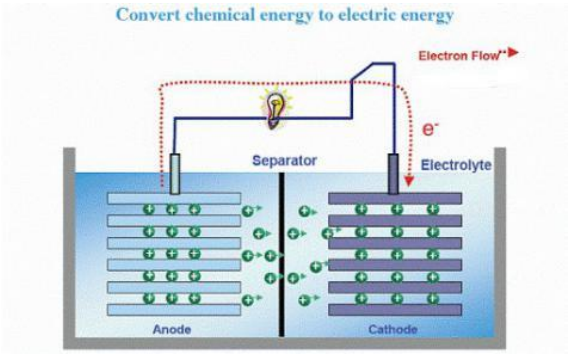


Figure (1)

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

Electrochemical power storage covers all types of primary and secondary batteries. Batteries convert chemical energy-containing its active substances into electrical energy by the electrochemical oxidation-reducing reverse reaction.

Battery power storage: A battery is a device that saves energy and then releases it by converting chemical energy into electricity. Conventional batteries generate electricity by chemical means, usually through one or more cells. ... Overall, batteries are very important in daily life.

Batteries:

Battery:

The battery may be a device that converts energy into electricity. The physics area unit keeps within the solution (chemical compounds) of the battery throughout charging and discharged once the battery is discharged. Every cell of all batteries has Three basic elements — anode, cathode and solution and their properties area unit directly associated with their chemistry. The batteries all are available in totally different sizes, shapes, voltages, and capacities (charge-charge or energy stored). Though they will be created with all differing types of electrolytes and chemicals.

Figure (2)

The batteries are further divided into the first battery and the second battery.

Types of batteries:

Primary Battery: Basic batteries cannot be recovered because their electrical reaction will not be reversed. Basic batteries are very common and are built as single-use batteries, discarded or reused after expiry. They have high incidence that results in the long-term maintenance of low current loads. The most commonly used batteries are carbon-zinc, alkaline, silver oxide, zinc-air and certain lithium-ion batteries.

Secondary Battery: Secondary batteries can also be charged because their electrochemical reaction can be compensated by applying a certain voltage to the battery across the outlet. Secondary batteries are designed to be rechargeable and re-used and can be recharged 1,000 times depending on the type of battery and battery. The deepest discharge leads to the life of the shortest cycles, while the shortest discharge results in long cycles of multiple batteries. Battery status varies from one hour to 12 hours, depending on other factors. Secondary batteries are commonly found in batteries nickel-cadmium (NiCad), lead-acid, nickel-iron-hydride (NiMH) and lithium-ion (Li-ion) batteries. Other limitations caused by secondary batteries are limited life, limited energy efficiency, low power efficiency, and disposal concerns.

Why a battery requires two different materials: It is important to note that the electrodes in a battery are not always made of two dismounted/dissimilar materials (so, both are never from the same metal), which would be electric conductors. Huh. This is a key to know how and why a battery works: one, "likes" the material to release electrons, the other likes to get them. If both electrodes are made of the same material, this will not happen and no current will flow.

TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

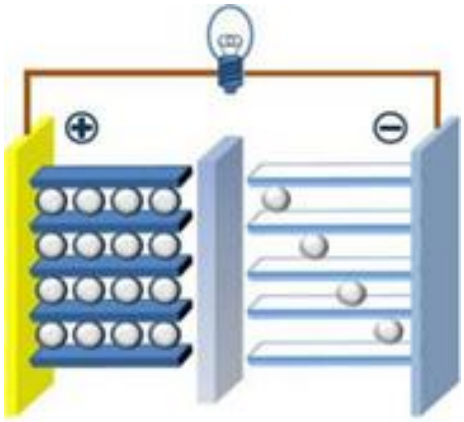


Figure (3)

Lead-Acid-Battery:

It is the primary and oldest variety of battery which will be reset out of the blue. A battery that uses sponge lead and lead peroxide to convert its energy into electricity, this type of battery is termed the lead-acid accumulator. Lead-acid batteries area unit wide utilized in power stations and installation and replacement, as a result, they need high cell power, and low price.

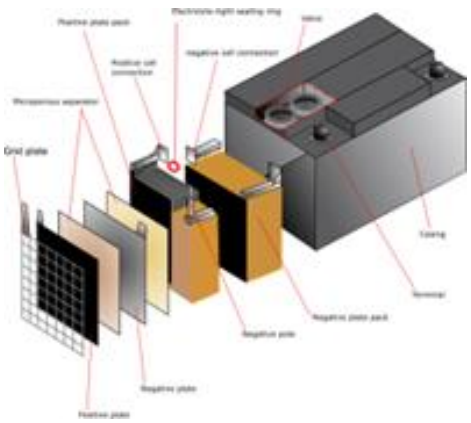


Figure (4)

II. LITERATURE SURVEY

1. EZ Battery Reconditioning.com

Equalizing method:

Generally, In lead-acid battery sulfation takes place. These sulfations are forms like crystals. So, these crystals are turned into stable crystals when the battery is discharging and charging.

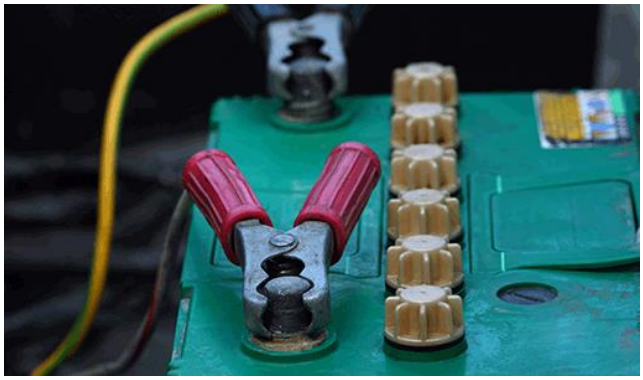


Figure (5)

Sulfation: Sulfation occurs due to the small form of sulfate crystals when the lead-acid battery is used. This is normal and harmless but results in controlled battery life. However, when the battery is only partially charged for a long period, these sulfate particles turn into a stable crystal and are formed on the negative battery plate.

Procedure to prevent battery: If we are equalizing the battery then we can prolong our battery life as well as increase the efficiency of a battery. When you perform an equalizing charge you will break up to the crystalline on the battery's plates and allow the sulfate to re-mix with the sulfuric acid. So Generally, chargers are used to equalize the battery while charging the battery. In another case to equalize battery is applying a sudden high voltage to break the crystal by equalizing the battery.

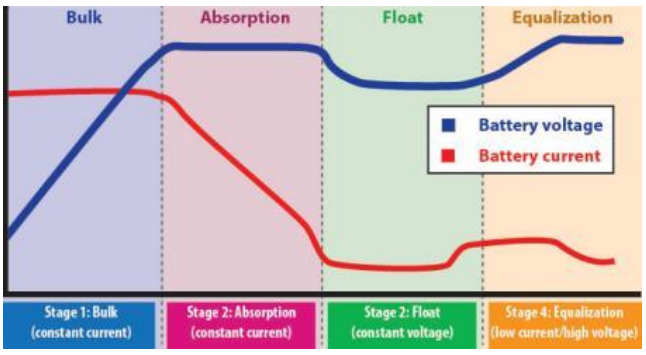


Figure (6)

Avoid corrosion method:

Lead-Acid battery both electrode terminals are exposed to the atmosphere so, there is a chance of

TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

formation of the corrosion/rusting of the electrodes heads. These results in the downfall of the life cycle and efficiency of the battery as well.

Figure (7)

DIY coca-cola is used to remove the rusting and petroleum oil is used to prevent the electrodes from corrosion.

Figure (8)

In case rusting is not occur use petroleum oil to prevent the electrodes from rusting. Which results in maintain constant efficiency and avoid shorten battery life.

III. METHODOLOGY AND EXPERIMENTAL WORK:

First, we do tend to work on an electric vehicle project in 2017. At that point, we have targeted a lot on the battery half as a result of the battery is the main a part of any electrical, or electronic devices. Firstly, we do tend to thought-about lithium-ion batteries for the project, however, those batteries were obtaining dearer when put next to different styles of instrumentation of that project that was crossing the budget of our project. So, By considering lead-acid accumulator for the project that came at a low price. However, not smart concerning potency when put next to the lithium-ion battery. Then, Started acting on improvisation of lead-acid batteries. Wherever found by learning the behaviour of lead-acid accumulator by longing some literature surveys then conjointly did realize any result to predict the issues of battery that could be a reason for shorten the battery life and cut back its potency. On a specific day once we saw the reactions of a lead-acid accumulator, Then we to tend to predict the matter that presence of OH- ions can result in the formation of a binary compound which ends during a reduction of potency and life cycle also.

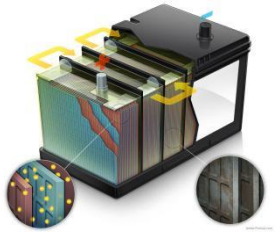


Figure (9)

Problem:

The aqueous formation has occurred because of OH^- ions which reduce the efficiency of the battery.

Solution for avoiding the formation of aqueous:

Silicon is the best material which avoids the formation of aqueous by absorbing the OH^- ions.

There are 3 Methods for avoiding the formation of aqueous and boost up the battery in terms of efficiency and life.

Method:1

Applying the silicone material to the conventional electrode which results to maintain the same efficiency and life of the battery. Silicon layer is coated on any one of the electrodes of a conventional battery and use it.

Method:2

Replacing the positive electrode of lead peroxide by silicon dioxide electrode in the conventional lead-acid battery. Which results in higher potential but efficiency and life will remain constant.

Method:3

Making an electrode by taking silicon tetrachloride and sodium hydroxide/potassium

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

hydroxide acts as the best positive electrode which step-up regarding higher potential, efficient, and prolong battery life.

Environmental use of liquid waste:

The bi-products of battery after disposal used as biomass, they are:

Potassium-sulfate:

Potassium sulfate (K2SO4) (in British English potassium sulfate, also called sulphate of potash, arcanite, or known as potash sulfur) is a white-hot salt burning flame that dissolves in water. The chemical compound is widely used in fertilizers, providing potassium and sulfur completely. When potassium sulfate is heated in water and placed under a beaker, the crystals form a structure around many arms when allowed to settle. Potassium sulfate can be used to study synthetic structures in a laboratory. They do not form a hydrate, unlike sodium sulfate. The salt is placed as a six-way pyramid, classified as a rhombic. They are transparent, harsh and have a bitter and salty taste. The salt is not dissolved in water but does not dissolve in a solution of potassium hydroxide (Sp. Gr. 1.35) or absolute ethanol. Two types of crystals are known. Orthorhombic β-K2SO4 is a common mechanism, but it evolves to α-K2SO4 over 583 °C. These structures are complex, although sulfate accepts standard tetrahedral geometry.

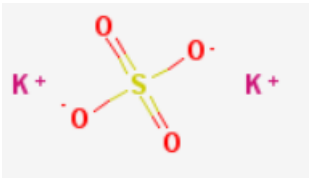


Figure (10)

Sodium-sulfate:

Sodium sulfate (Na2SO4) is a white-hot salt flame that dissolves in water. The chemical compound is widely used in fertilizers, offering Sodium and sulfur. Sodium sulfate, also known as a soda sulfate, is an inactive ingredient containing formula Na2SO4 and many related hydrates. All varieties are white sludge that is readily available in the water. Decahydrate is the largest chemical product of goods, with an annual output of six million tons. It is used mainly in cosmetics, and in paper towel making. Sodium sulfate is very strong, it does not reach many oxidizing or reducing forces at normal temperatures. At high temperatures, they can be converted to sodium sulfide by carbothermal reduction.

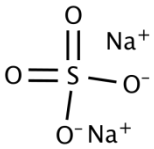


Figure (11)

Orthosilicic acid:

Orthosilicic acid is a chemical compound containing the formula Si (OH)4. It is made using aqueous solutions. It is thought to be present when silicon dioxide (silica) SiO2 dissolves in water at a millimoles concentration.we can't sketch it, but maybe I'll attach the picture, but let me see with the silicon atom in the centre, it is attached to the OH groups on Four sides. These OH groups are walking around like you're crazy. If we were in the water, it would occasionally be hydrogen, and then another H2O water molecule. This would be a good group to leave, and some would take its place. Sometimes, H simply leaves the water molecule into H3O.

Salicylic acid is keratolytic (a peeling agent). Salicylic acid causes external skin damage. Salicylic acid topical (skin) is used to treat acne, dandruff, seborrhea, or psoriasis, as well as to remove breasts, callus and warts. There are many products, and types of salicylic acid available.

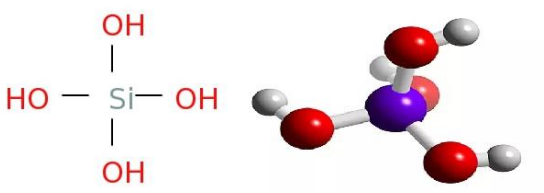


Figure (12)

May-June 2020
ISSN: 0193-4120 Page No. 905 - 910

About,Lead-Acid-battery:

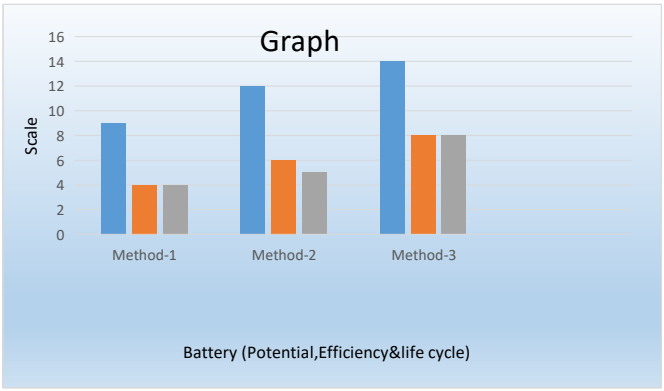
Why everyone prefers lead-acid battery because of Low cost. Not reliable Over 140 years of development. Fitness. Tolerance of abuse. Allowed for over performance. Interior interruptions. It has the ability to deliver extremely high currents. Chronic shelf life when stored without electrolyte. It can be left with billing or floating tactics for a long time. Full width and size are available. Can deliver very high currents. The world's most recycled product.

Results:

1. By the first method, the battery efficiency and life will be maintained constant.

2. By the second method, the battery potential will increase but efficiency and life will be maintained constant.

3. By the third method, the battery potential and efficiency are step up and prolongs the battery life.



Results on graph Figure (13)

Above graph shown is not exact numerical results. These research results are shown with numerical comparison for better understanding. Its shows, the improve in characteristics of battery when we try with the corresponding method of these methodologies. These methods give 100 per cent results for improvisation of a lead-Acid battery and give an idea to the innovation of new batteries to overcome the lead-acid battery drawbacks.

Conclusion:

The following conclusions are drawn from the experiments

- Constructing the new batteries with low cost and higher life.
- Here, We found that acid concentration on both sides which means during charging and during discharging, It equalizes the battery and stands higher potential without loss.
- Here, developments in liquid batteries are making it useful in ultimate ways.
- Here, we observe the decrease in the potential of battery due to the formation of aqueous in the electrolyte.
- It will lead to a new evolution in automobile and storage industry.
- Liquid batteries will help to build our complex industrialized societies.
- The combination of silicon dioxide and potassium hydroxide/sodium hydroxide electrode and lead sponge electrode will give much higher results when compared to other Methods.
- The design of the liquid battery is in safe mode and reduces the wastage of the solid batteries.
- The liquid batteries wastage can be recycled into biomass for fertilizers.

REFERENCES

1. Pandiri Shiva, etal. " Eco Electron Energy Storage Technology". IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 17(1), 2020, pp. 25-34.
2. EZ Battery Reconditioning.com(URL:: https://www.dpmclimbing.com/ez-battery-reconditioning-review/)

URL'S ::

3. www.moraassociates.com
4. en.wikipedia.org
5. batteryrestoreguide.blogspot.com
6. www.mpoweruk.com
7. energyeducation.ca