

LEAD-ACID BATTERIES

The lead-acid battery was invented in 1859 by the French physician Gaston Plante and it was the very first rechargeable battery created for commercial purposes. Now, the lead-acid battery is the most commonly used rechargeable battery in the world.

Plante designed the battery to store electrical energy and it was originally used to keep the lights on inside train cars while the trains were stopped at stations. Its other main function was to supply back-up power. Today, the batteries are used for a great number of things, including automobiles, boats, forklifts, submarines and as sources of back-up power for computer systems. It is hard to imagine our society functioning without the lead-acid batteries. However, new technology efforts have been made to find replacements for the lead-acid in order to create the most environmentally friendly and cost-efficient battery.



What is a lead-acid battery?

The battery's function is to store electricity for future use. When two unlike materials, the positive and negative lead plates, are mixed with the electrolyte (sulfuric acid and water), the result is a chemical reaction that produces voltage. The lead-acid battery uses a reversible chemical reaction and is in a constant cycle of charging and discharging. When something needs electricity, it comes from the battery and thus, the battery begins to discharge. As it discharges, the lead plates become more alike, the acid becomes weaker and the battery does not produce as high of a voltage. But, the battery can recharge when current flows back into it and restores the differences in the lead plates.

Types of batteries

All lead-acid batteries are either starter batteries or deep-cycle batteries. Starter batteries are used in cars: They provide a quick burst of power in order to start the engine. This type of battery contains many thin lead plates, which allows them to quickly discharge a high amount of energy in only a brief time. These thin lead plates will degrade much faster and cannot be discharged too many times.

Deep cycle batteries are used in boats, campers and to power accessories. They contain thicker lead plates and can provide a slow and steady source of power for a longer time period.

The majority of lead production in the U.S. is for these two types of batteries.

Advantages

- The chemistry of has been used for nearly 150 years: The batteries are reliable and widely understood
- Mass produced in all shapes and sizes; sealed and maintenance free
- Recycled at an incredibly high rate
- Durable and dependable
- Simple and cheap to make
- Capable of high discharge, enables the boost of power to start an engine
- Longest life cycle, in their price range
- Voltage of more than two volts — highest of aqueous-electrolyte batteries
- Provides greatest amount of energy per pound
- Low self-discharge rate; can remain unused for extended period of time

Disadvantages

- Environmental concern over risk of improper disposal
- Lead smelting and battery manufacturing is hazardous to workers
- Recycling sites can be extremely high in lead
- People residing near plants are at risk of lead
- Battery capacity decreases as temperature decreases
- Overcharge will cause oxidation of the plates
- Cannot be left with a discharge of 80% or more for several days

Battery Recycling

More than 97% of all battery lead is recycled, topping the charts as the number one most recycled consumer product. Other products don't even come close to that rate: 55% of aluminum cans, 45% of newspapers, 26% glass bottles and 26% of tires are recycled.

A new lead-acid battery bought from the store will contain about 60 to 80 percent recycled lead and plastic. When a battery has "died," it is sent to the recycling center to reclaim the lead and plastic, and this process is repeated over and over again indefinitely.

HOW IT IS RECYCLED: Step 1

First the battery is sent to the hammermill, which is a machine that breaks it apart into pieces. These pieces are then put into a container that is used to separate the lead and other heavy materials — while the lead falls to the bottom, the plastics stay on top and the liquids can be drained.

LEAD: Step 3

All the lead parts are cleaned and melted together in a smelting furnace. The molten lead is poured into metal casts, ranging in size from 65 pounds (nicknamed pigs) to as large as 2,000 pounds (nicknamed hogs). The impurities rise to the top and are scraped away. When the lead cools down, it is removed from the mold and sent to the manufacturer.

SULFURIC ACID: Step 4

The battery acid is neutralized by using a compound similar to baking soda. It turns the acid into water, which is then cleaned and let go into the sewer system.

PLASTIC: Step 2

Now separated, the plastic pieces are melted together. A machine takes the molten plastic and breaks it down into tiny plastic pellets. These pellets are then sold to the manufacturer of the batteries.

