



A **battery** is a device comprised of one or more cells filled with chemicals. These chemicals interact to produce electrons, and the movement of these electrons results in an electric current. Batteries power products that require electricity to work, and are useful because they allow us to transport electricity and use products in locations where there may be no electrical outlets available. Batteries come in different shapes and sizes, and utilize a variety of different chemicals. Once a battery is used up, it is important to recycle it because some batteries can contain heavy metals such as mercury, cadmium, and lead which can enter our air, ground, and surface water when the batteries are disposed of in landfills and Waste-to-Energy (WTE) Facilities.

did you know...

- | The most common household battery is a primary dry cell battery. **Primary batteries** can only be used once. When the electrolyte solution has been used up, the energy is no longer available and the battery is said to be expired. At this time the battery is no longer useful and should be disposed of responsibly. An example of a primary dry cell battery is an alkaline battery. Consumers refer to these batteries as AA, AAA, D, etc... These batteries power our flashlights and toys.
- | Every year, more than 3 billion batteries are used and then thrown away by American households who use both single-use and rechargeable dry cell batteries. That equals 125, 000 tons of batteries discarded every year. If these batteries were in the form of AA batteries, and placed end to end, they would encircle the planet six times...per year! These batteries would fill 600 large yellow school buses each year.
- | A **secondary cell battery** CAN be recharged and used repeatedly. When the energy is discharged, supplying electrical current to recharge the cell can restore it. A car battery (lead-acid) is an example of a secondary cell battery. It is continually recharged with the electric current of the car. When its charge becomes low (say, because you left your headlights on), we use electrical cables to "jump start" the car from another fully charged battery. However, rechargeable batteries do not last forever. Eventually, secondary cell batteries reach the end of their service life and cannot be recharged enough to restore them to a useful power level. When this happens, recycle your rechargeable batteries in your local curbside or drop-off program.
- | Most rechargeable batteries can be recharged up to 1,000 times and some can supply power everyday for up to three years. Buying and utilizing rechargeable batteries is one way you can help to keep our planet clean and safe. When rechargeable batteries are used, the overall waste is reduced because they can be recharged many times over.

how is it recycled?

Not all batteries are the same. The procedure for recycling a battery depends on what kind of battery it is. Most rechargeable batteries contain Nickel-Cadmium. Cadmium is recovered in a special high-temperature metal recovery process with no byproducts being sent to a landfill. Cobalt and lead (car batteries) are also extracted through a high temperature process. Since Carbon-Zinc and Alkaline batteries no longer contain mercury, any decision to recycle them must include the considerations of the overall cost and time needed to collect, transport and recycle them. In the United States, battery companies are investigating the possibility of recycling the zinc, manganese and/or steel in the batteries. Under federal law, Carbon-Zinc and Alkaline- Manganese batteries are no longer considered to be hazardous waste since they no longer contain mercury, and can be disposed of in the normal manner; however, they are short-lived and contribute to the municipal solid waste. Many communities have long since passed laws that regulate the sale, disposal or mandatory recycling of all kinds of batteries.

what is it made into?

The recovered cadmium is purified before being used once again to make new rechargeable batteries. The recycled nickel and iron go back to the steel industry to be used in making stainless steel products, like cooking pots and pans. The plastic cases that coat the battery are separated from the cells prior to processing and are used as a fuel in a special furnace.

activity

In this activity, students will explore what types of batteries are used in their homes, record the total number and kind of batteries as a class, and graph the information. .



What You Will Need

- I Knowledge of Primary and Secondary Batteries (see front)
- I Pencil and paper



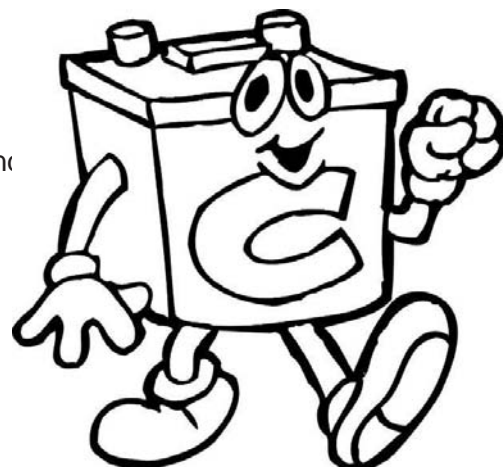
Procedure

- 1) Assign students to look at the kinds of batteries used in their home.
- 2) Take a poll of the kinds of batteries used in each student's home.
- 3) Record data on a chart that the class develops to show things like the type of battery, what it is used in, how long the battery lasts (do an experiment with a flashlight with primary and a flashlight with secondary batteries to see which one lasts longer).
- 4) Following the poll, discuss as a class how the way a product is used is the key to purchasing the most efficient battery.

Note: Use the following guidelines:

- used less than one hour/day = primary
- more than one hour/day = secondary
- low-power usage = primary
- high-power usage = secondary

For more great battery activities check out the "RBRC Lesson Plan" at www.RBRC.org.



Extensions

- I Research companies that use rechargeable batteries. Learn what they are used for and why they are used.
- I Ask the students to write a creative story in which they imagine living without the luxury of having batteries to run their appliances, games, electronic equipment, etc...
- I Research what kind of battery provides the longest charge, the strongest. Devise an experiment to measure each kind of battery to compare charges, strength, etc...
- I Invent a product that is dependent on a battery to make it run.
- I How do other countries manage battery disposal? Divide the class into teams to research other countries.
- I Create a time line with historic references and art work to show the development of the primary and secondary batteries.

for more info...

The Rechargeable Battery Recycling Corporation (RBRC), <http://www.RBRC.org>
Battery Council International, <http://www.batterycouncil.org>
The Environmental Protection Agency's "Explorers' Club", <http://www.epa.gov/kids/>
The Earth 911 Handy Kid's Section, <http://www.earth911.org/handy>



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