



The Buzz about Batteries

When I was in high school, I worked at Toys'R'Us in their customer service department. It was during the craze of *Cabbage Patch Kids* and *Teddy Ruxpin*. We had lots of sad *Teddy Ruxpins* being returned because he talked, but his mouth didn't move or his eyes didn't blink, or the mechanics worked, but there was no sound. The customer service girls, of which I was one, were deemed "the miracle workers" because we solved the problem. We fixed Teddy, and all his clones. The solution: alkaline. The customers were not using alkaline batteries and Teddy apparently needed the extra oomph of alkaline. I was 16. I had no idea what the difference was between alkaline and standard carbon zinc batteries. Well, only recently, did I come across this information and thought I would pass it along to you, so that you too could become a miracle worker when a family brings a toy to you saying it doesn't work. Perhaps it could be a simple problem with a simple solution.

Let me start simple. A battery is a source of electrical energy. Its smallest unit is a cell. A battery is made up of several cells, electrically connected in a series. All batteries have a positive (cathode) and a negative (anode) portion. The three basic types of batteries I'll talk about are **Carbon Zinc**, **Alkaline** and **Rechargeable**. I won't go into the actual contents of each battery, but rather give an overview of each. I have listed several websites at the bottom if you want to read up on your battery trivia and wow your friends.

Carbon Zinc (throughout this article, I will use CZ when talking about carbon zinc batteries) batteries are by far the weakest battery. They were the batteries of the 70's (alkaline batteries were not available yet). They continue to be available because they are cheaper. But, buyer beware – they don't last nearly as long as alkaline, so you will have to replace them more often. They are an economical choice for a device that requires light to moderate energy. Of all the batteries, carbon zinc are most susceptible to leaking. Don't be fooled if they say "heavy duty" or "super heavy duty". They are all fairly equal and equally fair.

Alkaline batteries last longer than carbon zinc batteries. In fact, just about twice as long as carbon zinc batteries. Alkaline batteries were designed to provide an economical power source for today's devices that require heavy current or continuous use. They are not appropriate for high powered items, such as digital cameras. Alkaline batteries have a better discharge rate capacity than carbon zinc, meaning they last longer before they die. They have a better low temperature performance rate than CZ. They are more economical in terms of cost per hour than CZ. They are relatively insensitive to changes in the discharge rate, unlike CZ that discharges quicker under such conditions.

Rechargeable batteries can be "recharged" when they run out of energy. This is due to the kind of electrochemical system that makes up the battery. It can accommodate reversible volume changes, whereas typical alkaline batteries cannot. Alkaline batteries are simpler in make up because they don't need to have the power to recharge. Charges and discharges cause reversible changes in electrode volume and structure, so a rechargeable battery has to be made to accommodate these changes. This is why rechargeable batteries are more costly. One thing to keep in mind with rechargeable batteries is that in order to get the maximum benefit and life from a rechargeable battery, it may be necessary to "break it in". By this, I mean to fully charge and fully discharge your new battery several times prior to continued use. Two main types of rechargeable batteries that you may have heard of before are NiCd (or NiCad – Nickel Cadmium) and NiMH (Nickel Metal Hydride). NiCads are considered "old school". They were the first of the rechargeable batteries available. NiMH batteries are newer in technology and therefore last approximately 30% longer than NiCads. Additionally, NiCads suffer from "memory effect". This means if you recharge a NiCad battery before it is completely dead, the battery will remember that level and will then "forget" that it can discharge further before needing to be recharged. So, make sure if you are using NiCads that you fully discharge it before you recharge. NiMH batteries do not suffer

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from this oddity. Lastly, NiCads cannot be thrown away because they contain toxic metals. NiMH do not pose an environmental hazard.

I did not put any hour ranges or talk about battery life because it depends on what the batteries are activating and how much of a draw on that battery there is; how continuous the draw is; what the operating temperature is and the storage conditions. Under normal conditions, the life of a rechargeable battery is between 500 and 800 cycles (charge-discharge) or approximately 3 years.

The best way to store batteries is in the refrigerator. The higher the storage temperature, the worse the retention capacity is and vice versa. A refrigerator with a temperature of 0°C-10°C is a good place to store batteries. Rechargeable batteries can also be stored in the refrigerator; however, due to their ability to be recharged, it is not necessary.

Care:

- Never store batteries next to metal objects (such as in your pocket with coins). They can short, leak or explode.
- Do not recharge batteries unless they are specifically designed to be recharged.
- Replace all batteries within a unit at the same time. Mixing old and new will reduce the overall performance and may cause leaking or exploding.
- Keep all batteries out of reach of children.
- To keep contact surfaces clean, you can rub a pencil eraser on the battery contacts and on the ends of the battery.
- Remove batteries from a device if not in regular use.

Disposal:

Battery disposal is a hot topic with much controversy. Some say it is safe to throw away batteries and others argue it is an environmental hazard and they need to be disposed of through a hazardous waste facility. One main reason for this argument is mercury. Mercury was used in batteries to increase shelf life and performance and prevent corrosion. However, it was a major environmental hazard. Therefore in 1996, mercury was banned from use in batteries. As a result, some argue that batteries are now safe to dispose of in normal household trash. In speaking with Duracell, they state it is safe to throw away all batteries, except for NiCads. Alkaline batteries are composed of common metals – steel, zinc and manganese. They are not a health hazard. NiCads need extra care when being disposed of because they contain toxic metals. One website mentioned you could recycle NiCads at ACE Hardware, Circuit City, Sears, Target and Walmart and Radio Shack. If you bring alkaline or carbon zinc batteries to these places, they will merely throw them away for you in their trash. You can also 1) contact your local government; 2) look up your local household hazardous waste facility for battery disposal; 3) go to the Rechargeable Battery Recycling Coalition website at www.rbrc.org (800-8BATTERY) to find a local drop off center; or 4) send them to Battery Solutions, Inc. www.batteryrecycling.com (see below). A couple hints when throwing batteries away: It is better to throw them away singly. Batteries that you have replaced often still have a little “juice” or life left in them. Grouping them together may cause shortage, leakage or explosion. Never dispose of batteries in a fire – they will explode.

Resources:

Radio Shack Customer Care
817-415-3200
Duracell Consumer Services Department
www.duracell.com

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800-551-2355

www.thebatterystall.fsnet.co.uk/FAQ

www.sonluk.com/faq

www.michaelbluejay.com/batteries/

Recycling

Battery Solutions, Inc.

7266 Kensington Rd.

Brighton, MI 48116

www.batteryrecycling.com

800-852-8127

They are able to manage every type of spent battery. The cost is 85¢ per pound, plus the cost of shipping. They said that regular household batteries, like the ones you use, are not regulated under federal code and can be thrown out; however, they will recycle them if you want.

www.rbrc.com (Rechargeable Battery Recycling Coalition)

352-376-5135

They can help find your local NiCad recycling center.

Purchasing

www.rebatt.com (as low as 15¢ ea)

www.fast-pack.com/batteries (carbon zinc)

www.batterycountry.com (energizer industrial alkaline)

www.crazybatteries.com A 4-pack of Reliant AA alkaline batteries is 75¢, however, it looks like there is a minimum order of 100 packs

www.batterybob.com – Duracell AA – box of 24 = \$8.65 (36¢ ea); Energizer Industrial Alkaline – box of 24 = \$9.20 (38¢ ea)

A word of caution: When you are purchasing batteries via internet, make sure you take into account the cost of shipping. For example, if I purchased one box of Energizer AA at \$9.20 (38¢ ea), when I checked out and requested shipment here to the National Lekotek Center, I would pay \$4.57 in fees - raising the price per battery from 38¢ to 57¢. In my experience, it is cheaper to purchase batteries at a warehouse club store, such as Costco or Sam's Club. The batteries come out to approximately 41-45¢ ea.