Alkaline Batteries

Almost all technology that we use periodically is revolved around batteries. Without them, we wouldn’t be able to develop any appliances that require a mobile power source. Even though batteries are small, they run a wide range of technology. Batteries will help the world travel through new disciplines by improving technology.

 What are Alkaline batteries?

There are many types of batteries, but the batteries we use most often for periodical devices are alkaline batteries. Alkaline batteries are commonly used for portable radios, tv's, motorized toys, clocks, electronic games, mp3 players, electronic photo flashes, and more. Alkaline batteries come in a variety of sizes like N (LR1), AAAA, AAA, AA, C, D, and 9-Volt. Different sizes are used for a multitude of appliances depending on the amount of space available and the power needed.

 History of Alkaline batteries

The battery has been around for a few hundred years, but alkaline batteries have been around for just over one hundred (“History Timeline of the Battery”) . In 1903, they were first invented by Thomas Edison (“Edison's Alkaline Battery” par. 2) . He was searching for a way to make automobiles more reliable. The lead-acid batteries that were already in automobiles were heavy and unreliable. They wouldn't last long because the acid would break down the lead that was inside the battery. Edison was looking for a replacement that would be lighter, longer use, and three times the power (“Edison's Alkaline Battery” par.1). His first attempt, of inventing the alkaline battery, was in 1903 (“Edison's Alkaline Battery” par. 1). After thousands of tests and combination of chemicals, he created a battery that used potassium hydroxide. Potassium reacts with the iron and nickel electrodes. After Edison announced his invention, many urban settlers and manufacturers began to purchase them or cars. But the batteries in cars began to fail. Most of Edison’s batteries began to leak and weren’t reliable anymore. The batteries were indeed lightweight, but they did not meet the claims of the batteries in terms of delivering more power than the lead-acid batteries ( “Edison's Alkaline Battery” par. 3). After the critics released the information on the battery, Edison shut down the factory. The factory was closed during the years of 1905-1908. His goal was to rearrange the components of the battery in order to prevent leakage and increase the power flow. He also reorganized it to have better performance and a longer life. To do all of this he had to use slightly more expensive materials, but the battery was much better than it had previously been ( “Edison's Alkaline Battery” par. 4).

Edison released the reconstructed battery in 1910, but it was too late for the automobile industry. In 1909, Edison’s friend Henry Ford invented a reliable gasoline engine for cars ( Edison's Alkaline Battery” par. 5). By the time Edison released his new battery, it was too late for the consumers. The gasoline engine was reliable and in wide use. Edison was still able to market his battery in other ways. The battery was implemented in railroad crossing signals or in mining lamps ( “Edison's Alkaline Battery” par. 5). The batteries were used in these devices because of their reliability.

In 1949, Lew Urry, a scientist, developed a small alkaline manganese battery ( “History Timeline of the Battery” par. 10). This small alkaline manganese battery overtook its predecessor, the zinc-carbon battery. This new alkaline manganese battery is similar to modern alkaline batteries in terms of size and shape. A modern AA battery would not be able to hold enough power to run an automobile engine. Now that the alkaline manganese battery is smaller, it is used in gaming devices and cameras. Its main point is the shelf life, which is the main reason why alkaline manganese batteries are used in so many appliances.

How do Batteries Produce Electricity?

We have electricity everywhere in our homes, schools, and offices. Even though we use it so often, we always have a question. What is Electricity? How does it work? Electricity is the flow of electrons through a path. This path is called a circuit. Batteries have 3 major parts: the cathode (+), anode (-), and the electrolyte. The cathode and anode, which are positive and negative sides of a battery, are hooked up to an electrical circuit. A chemical reaction takes place, which causes a build-up of electrons in the anode. This results in a difference of electrons that has built up, and the electrons are trying to be released. To balance both the cathode and the anode, the electrons want to go to a place with fewer electrons. The only place to go is the cathode. This doesn’t happen because the electrolyte keeps the electrons from going straight to the cathode. When the flow of electrons or the circuit is closed, a wire connects the anode and cathode. Then, the electrons have a path to the cathode. If there is light bulb between the wire, the light bulb works because the electrons are going through the light bulb. These electrochemical processes change the chemicals in the anode and cathode. This eventually stops the production of electrons. This means that there is limited power in the batteries. However, when you recharge a battery, the direction of the flow of electrons reverses. This enables the cathode and anode to return to their original state and can provide full power again. The recharging process is only available for rechargeable batteries.

Alkaline batteries depend on the reaction between zinc and manganese oxide.The cathode, or the positive side of a battery, is composed of manganese dioxide mixture, while the anode, or the negative side, is composed of zinc powder. The electrolyte, which controls the flow of electrons, is called potassium hydroxide. Potassium hydroxide is an alkaline substance. This is why we call these batteries Alkaline batteries.

 Battery Arrangement and Power

The arrangement of batteries help in producing different power. Parallel arrangement of the batteries help in producing current. For example, the flashlight consists of 4 batteries. These batteries are lined up parallel to each other. The four batteries will produce the voltage of one cell, but the current they produce will be four times that of a single cell. Current is rate at which electric charge passes to the circuit. The rate is measured in amperes. Batteries with high amperes or amp-hour ratings will have greater capacity in producing electricity. Another type of arrangement is the serial arrangement. The four batteries will produce the current of one cell, while the the voltage will be four times the current. Voltage is the measure of energy per unit charge and is measured in units. In a battery, voltage determines how strongly electrons are pushed through a circuit, much like pressure determines how strongly water is pushed through a hose. Most AAA, AA, C and D batteries are around 1.5 volts ( Marshall Brain par. 4). Battery technology will improve in the future to such an extent that many machines will form.

 Economy

There are many types of batteries on Earth. In this world, there are more than 100 companies that produce batteries in 10 types. Common battery types include alkaline batteries, carbon zinc batteries, lithium batteries, lithium-ion batteries, manganese dioxide batteries, nickel cadmium batteries, nickel metal hydride, lead acid, silver oxide, and zinc air batteries. Two battery types that are usually compared over their pros and cons are alkaline and nickel metal hydride batteries. Nickel metal hydride batteries (NiMH) and alkaline batteries have the same number of products. The company Duracell is known by many people throughout the world. Alkaline batteries and nickel metal hydride batteries have different prices and product descriptions. Duracell batteries, a supplier of NiMH batteries, sells them for a price of $14.11 cents, while alkaline batteries sell for $6.43 cents. NiMH, rechargeable batteries, have a voltage of 1.2. Alkaline batteries are non-rechargeable only and have a voltage of 1.5. In result of alkaline batteries not being rechargeable, NiMH batteries are usually favored when appliances are used often. As a consequence of this useful feature, this is why the prices for NiMH batteries are higher than alkaline batteries. The type of battery that the consumer will favor depends on the products they are providing power for. NIMH batteries are more often used in toothbrushes, cameras, mobile phones, and medical instruments. NiMH batteries aren’t as widely known compared to alkaline batteries because they are used in fewer products. Alkaline batteries are known more because they are used in general appliances.

Future Construction of Alkaline Batteries

In the future, carbon nanotubes may be used as a replacement to zinc in today’s alkaline batteries because of the multiple benefits that it has over the modern battery. One of these benefits is the storage capacity of alkaline batteries, which will double in size. This is because of the structure of the carbon atoms that make the tubes. This structure enables the carbon atoms to bond with six electrons inside the tube, instead of just three. In addition, carbon nanotubes have excellent durability compared to zinc, so the tubes will be able to increase the length possible of the battery. For now though, carbon nanotubes are too expensive to mass produce; the carbon nanotubes take too long to make. A single laboratory will make around a half of a gram of carbon nanotubes daily. To keep up with the battery industry, producers would have to make over a kilogram daily. Once a faster and more efficient process is created for producing carbon nanotubes, alkaline batteries will be able to have a higher storage capacity and longer life. They will be smaller and because of this they will be able to be implemented in more appliances.

Biology of Batteries

Biology is also associated with batteries, too. Microbiologists, at the University of Massachusetts, discovered a type of bacteria of the family Geobacteraceae in the ocean. These bacteria produce electricity by creating a stream of electrons. This type of bacteria breaks down organic matter on the seafloor to get energy. After that, they create a stream of electrons which could be channeled to create electricity. This is done by inserting a copper rod into the ocean floor. As the bacteria break organic compounds down, they created a stream of electrons which traveled through the cathode producing an electric current. Also, these bacteria have shown the ability to degrade toxic organic compounds, such as benzene, by converting them to carbon dioxide and other benign wastes. Researchers think this minimal current will be used to power remote sensor stations. This will avoid the necessity of changing batteries when going on long trips. If enough of these bacteria can be used as an efficient battery, then it would be an alternative to alkaline batteries that is environmentally safe.

Environmental Science

 Batteries still have their drawbacks, especially when they get old. On occasion, a battery may corrode or leak out its contents. These chemicals are harmful to the environment, as they may get into our groundwater and crops. Alkaline batteries are also more prone to leakage than NiMH batteries lithium batteries. Alkaline batteries should never be tasted because of the dangerous chemicals it contains. These chemicals can cause severe pain, abdominal pain, vomiting, and diarrhea ( Bethesda par. 8)

Comparison of batteries

Rechargeable batteries are in different countries and states. Rechargeable batteries have pros and cons. Everybody would likely prefer alkaline rechargeable batteries over regular alkaline batteries because of their charging ability, but alkaline rechargeable batteries have cons that prevent people from buying them. The prices are only one example that causes people not to buy them. On average, rechargeable alkaline batteries can only accommodate 10 recharging cycles before their usefulness is over. REI, a sporting goods store, criticizes them as a failed design and doesn’t stock them ("Batteries: How to Choose" par. 10). Even though there are many cons, there are also some pros. Regular batteries, after they stop working, are useless. There isn’t any way to “restart’’ them, but rechargeable batteries have the ability to charge back after they lose power. This ability helps them to provide more energy than regular non-rechargeable alkaline batteries by providing energy again. Some families prefer these batteries because they work productively and also have the ability of discharging more than once. The people would buy their choice considering the pros and cons. Since stores mostly depend on people, it is the peoples choice whether to choose rechargeable or regular.

Conclusion

Alkaline batteries faced many critics and solution. Some people prefer about Alkaline rechargeable batteries while other like non-rechargeable batteries. Batteries run through many disciplines with success and drawbacks. Alkaline batteries even touch the idea of bacteria living on the seafloor. Alkaline batteries will become major achievements in the future also. These batteries may improve to include carbon nanotubes. There might be more bacteria on the seafloor which will help in producing more energy. New technologies might be implemented to create a environmentally safe battery using bacteria. Alkaline batteries will have the ability to run even a wider range of technology in the future. These small cylinder shaped batteries, may even power even stronger stuff in the future, because of carbon nanotubes. Alkaline batteries will also have the power to succeed into in many everyday products. We will most likely see them integrated even more in our lives in the future to come.

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