B12 BATTERIES

FACTORS AFFECTING BATTERY LIFESPAN

CHEMICAL INDUSTRIES
RESOURCE PACK

Temperature effects

The hotter the battery, the faster chemical reactions will occur. High temperatures can thus provide increased performance, but at the same time the rate of the unwanted chemical reactions will increase resulting in a corresponding loss of battery life.

Nickel-metal hydride (NiMH) chemistry in particular is sensitive to high temperatures. Testing has shown that continuous exposure to 45°C will reduce the cycle life of a Ni-MH battery by 60% and as with all batteries, the self-discharge rate doubles with each 10°C increase in temperature.

Loss of electrolyte

Electrolyte may be lost from leakage due to the deterioration over time of the seals closing the cells. Even with good seals the solvents in the electrolyte may eventually permeate through the seal over a prolonged period causing the electrolyte to dry out, particularly if the cells are stored in a dry atmosphere or if the cell contents are under pressure due to high temperatures.

However, the loss of electrolyte is not just due to the physical leakage of the electrolyte from the cell. The electrolyte may be effectively lost to the electrochemical system because it has been transformed or decomposed into another inactive compound which may or may not remain inside the cell casing. Corrosion is an example of this as are other compounds which may have been formed by overheating or abuse. Gassing and evaporation are two other mechanisms by which electrolyte may be lost thus causing an irreversible loss in the capacity of the cell.

Venting

Although most modern cells have a sealed construction to prevent loss of electrolyte, they usually have a vent to relieve pressure if there is a danger of the cell rupturing due to excessive pressure. Whenever a vent operates, it releases or expels some of the active chemicals to the atmosphere and hence reduces the cell's capacity.

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Plate thickness

Plate thickness (of the positive plate) is important due to a factor called 'positive grid corrosion'. This ranks among the top 3 reasons for battery failure. The positive (+) plate gets eaten away gradually over time, so eventually there is nothing left - it all falls to the bottom as sediment. Thicker plates are directly related to longer life, so other things being equal, the battery with the thickest plates will last the longest. The negative plate in batteries expands somewhat during discharge, which is why nearly all batteries have separators, such as glass mat or paper that can be compressed.

This material was obtained from Northern Arizona Wind and Sun. Learners - if you use any part of it you need to write it in your own words and include the following in your reference list: Northern Arizona Wind and Sun. 2010. Deep Cycle Battery FAQ. [Online]. Available: http://www.windsun.com/Batteries/Battery _ FAQ.htm. [27 July 2010].

Cell matching

A weak cell holds less capacity and is discharged more quickly than the strong one. This imbalance may cause cell reversal on the weak cell if discharged too low. On charge, the weak cell is ready first and goes into heat-generating overcharge while the stronger cell still accepts charge and remains cool. In both cases, the weak cell is at a disadvantage, making it even weaker and contributing to a more acute cell mismatch.

DID YOU KNOW?

To maximise service life, satellite batteries are kept at a cool temperature and undergo a very shallow discharge of only 10% before recharge. Nickel-based batteries in space also receive a periodic full discharge. This situation allows tens of thousands of cycles.

Closer to Earth, the ideal charge/discharge patterns cannot be scheduled; nor is the temperature always perfect. As a result, a replacement will be required sooner or later.

Interesting battery facts

- Nearly all rechargeable batteries will not reach full capacity until cycled 10-30 times. A brand new battery will have a capacity of about 5-10% less than the rated capacity.
- In situations where multiple batteries are connected in series, parallel or series/parallel, replacement batteries should be the same size, type and manufacturer (if possible). Age and usage level should be the same as the companion batteries. Do not put a new battery in a pack which is more than 6 months old or has more than 75 cycles. Either replace with all new or use a good used battery.
- Inactivity can be extremely harmful to a battery. Instead of buying batteries to "save" them for later rather buy them when you need them, or keep them on a continual trickle charge (a low-level electrical charge applied to a battery that roughly equals its rate of discharge).

New thin, flexible, light battery could bring intelligence to wallpaper, clothing

Andrew Nusca, 30 November 2009

The new biodegradable battery made of cellulose promises to offer thin, flexible, lightweight, inexpensive and environmentally-friendly batteries made without metal parts.

The battery is made from green algae known as Cladophora, found along freshwater beaches around the world.

The new batteries consist of very thin layers of conducting polymer — just 40 to 50 nanometres, or billionths of a metre, wide — that coat algae cellulose fibres just 20 to 30 nanometres wide, collected into paper sheets.

The batteries are said to hold 50 to 200 percent more charge than similar conducting polymer batteries. With more optimisation, the batteries could compete head-to-head with commercial lithium batteries, found in consumer electronics such as mobile phones and laptop computers, according to the researchers.

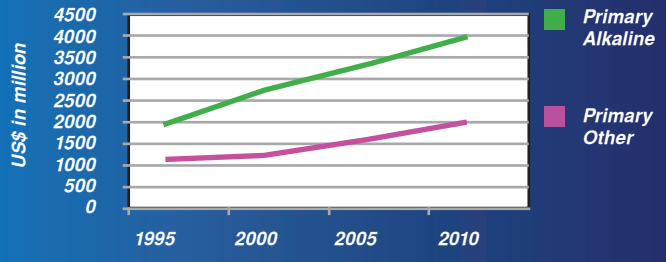
The new batteries could be used in applications such as flexible electronics (e.g. e-book readers), clothing and packaging.

This material was obtained from SmartPlanet.com. Learners - if you use any part of it you need to write it in your own words and include the following in your reference list: Nusca, A. 2009. New thin, flexible, light battery could bring intelligence to wallpaper, clothing. [Online]. Available: http://www.smartplanet.com/business/blog/smart-takes/new-thin-flexible-light-battery-could-bring-intelligence-to-wallpaper-clothing/2366/ [27 July 2010].

Definitions

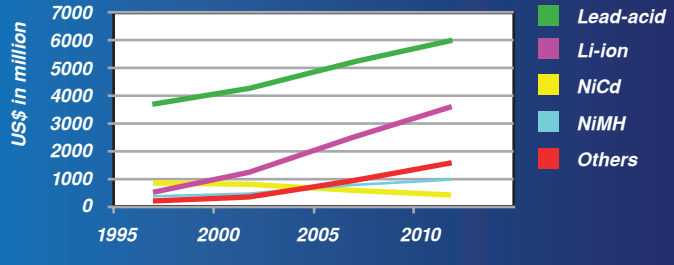
Capacity: The maximum total electrical charge, expressed in ampere-hours, which a battery can deliver to a load under a specific set of conditions.
Self discharge: A phenomenon in batteries in which internal chemical reactions reduce the stored charge of the battery without any connection between the electrodes. Self-discharge decreases the shelf-life of batteries and causes them to have less charge than expected when actually put to use.

Demand for primary batteries



Primary alkaline is leading the market. Other primary chemistries are expected to increase at a slower pace.

Demand for secondary batteries



Lead-acid will be the most commonly used secondary battery. Among portable secondary batteries, lithium-ion shows the most promise.

This material was obtained from BatteryUniversity.com. Learners - if you use any part of it you need to write it in your own words and include the following in your reference list: Buchmann, I. 2005. Battery Statistics. [Online]. Available: www.batteryuniversity.com/parttwo-40.htm [27 July 2010].

DID YOU KNOW?

If lead-acid batteries are discharged quickly (at high power), the amount of energy that can be extracted from the battery is much less than if the battery is discharged very slowly. In other words there is an inverse relationship between the power of the battery and the storage capacity.

Source: V-Fuel Pty Ltd