Powering ahead

Ian Watson considers the wider issues surrounding hearing aid batteries

Hearing aid technology has changed rapidly in recent years as devices have become smaller, more aesthetically pleasing and considerably more powerful, as well as having to respond to the ever increasing demands of new devices.

However, an almost unnoticed feature of this trend has been the ability of hearing aid battery technology to keep pace with the device revolution and to continue to meet the specific requirements of hearing aids and their users. Because in today's digital world, with new high drain wireless hearing aids and Bluetooth devices being introduced at an ever increasing pace, hearing aid batteries are more important than ever before.

For audiologists and hearing care professionals the value of hearing aid batteries to their business should not be overlooked. As something so intrinsic to their customers, the provision and sale of batteries can be used very effectively to offer extra support and services to clients – helping to boost patient satisfaction and ensure customer loyalty.

Performance

A replacement for mercuric oxide hearing aid batteries in the 1970s, today's hearing aid batteries are zinc air batteries, relying on oxygen in the atmosphere to react with zinc in the cell to power the aid. Each zinc air battery produces a huge amount of energy relative to its size and weight – but while the principle of the battery may be the same now as it was 20 years ago, many other things have changed.

Given the size of a hearing aid battery, there's only a finite amount of material that can be packed into it. The challenge facing battery manufacturers has always been to maximise the space available, and generate as much energy as possible.

This has been achieved primarily through changes to the internal structure of the cell; while outwardly they still look very similar, innovative new designs, materials and chemical formulations have enabled the amount of zinc inside the cell to be increased dramatically.

The end result is a more powerful and longer lasting battery. Compared to the first zinc air batteries, more recent changes in battery technology have produced a significant and sustained increase in the power capacity of standard cells from generation-to-generation.

For example, Rayovac's size 10 battery, first introduced in 1986, had a capacity of 50 milliAmp hours (mAh).

Advances in technology will require more sophisticated hearing aid battery design

Today the same battery has 105 mAh and would last twice as long in the same hearing device.

There are only four sizes of hearing aid battery and once the tab on the back of a hearing aid battery is removed it becomes 'activated'.

The tab is there to ensure freshness and long-term shelf life. Once removed, air from outside the battery is drawn into tiny air holes with the battery cathode acting catalytically to promote the chemical reaction in the cell. Some oxygen is actually required in the cell before this to offset the slow oxidisation of the zinc that is always occurring – but only enough to give a sealed open circuit a voltage of greater than 1 volt.

Catalysts for change

The biggest catalyst for battery change has been the shifting needs of device wearers and the technology used in hearing aids. Indeed the pace of change is likely to increase as the

device market continually reflects an ageing population and binaural usage in Europe. At present, the European market is growing steadily, growing from 150 million units to 400 million units over the past decade with the average hearing aid user increasing battery usage from 16 to 30 batteries per year.

Against this background the most prominent feature has been the explosion in demand for smaller, digital aids, which now account for over 90 per cent of the European market. In addition, the industry's drive to make devices more user-friendly means hearing aids have also incorporated more features.

The introduction of new product lines with wireless features that can connect hearing aids with peripheral devices has also increased power demands, with, for example, Bluetooth hearing aids that can only be operated by the highest performing batteries.

As a result, batteries in these new, modern devices need to operate at a higher voltage and consequently drain power far quicker. Nevertheless, close collaboration between leading battery and device manufacturers have enabled proprietary differences to be introduced that have led to real improvements in battery performance.

The net result is that battery service life has remained relatively constant (dependent on device, hours used and the user environment) while powering ever more sophisticated devices.

Green future

The ongoing technological changes in hearing devices will inevitably require continuing sophistication in battery cell design. Environmental issues are also playing a part in this.

For example, rechargeable batteries are a constant source of speculation, but they (and the devices containing them) would currently need to be much larger to store the energy needed to power most hearing instruments for more than one day. Although it is feasible that lower power drain rate devices could potentially use a rechargeable battery, this contradicts the current consumer trend for smaller devices with lots of features that increase battery drain.

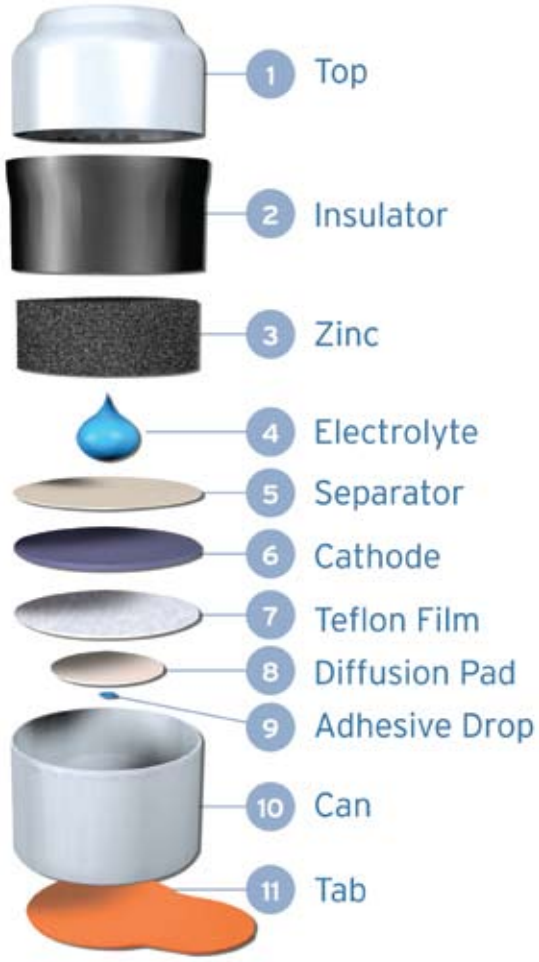
An emerging issue is also the growing use of mercury-free batteries in response to environmental legislation and consumer demands for cleaner products. Several US states have already banned the use of this heavy metal in button cell batteries and other governments around the world, including Europe are looking closely at the matter.

However, as much as the inclusion of mercury in hearing aid batteries is undesirable for the environment, it does a number of positive things in zinc air batteries and replicating its role is extremely challenging.

Nevertheless, significant progress has already been made in a relatively short time and mercury-free batteries have been introduced that are successfully meeting current market needs.

With this demand likely to increase in the future, leading manufacturers are already working on the next level of performance with a new generation of mercury-free hearing aid batteries to meet the demands of consumers and hearing aid devices in the future.

Over the years, hearing aid batteries have played a major role in the evolution of hearing aids and devices – and this important synergy will continue to be crucially important with future technology improvements.



Breakdown of a battery cell

Collaboration between battery and device manufacturers has improved battery performance

Ian Watson writes on behalf of hearing aid battery manufacturer Rayovac. www.rayovac.eu