Phonak Insight

June 2018

Phonak rechargeable hearing aids

Introduction

At Phonak, we are passionate about creating hearing solutions that change people's lives. Our innovations deliver compelling user benefits to address unmet customer needs spanning hearing performance, ease of use and aesthetics. With the revolutionary Audéo™ B-R, Phonak began the era of lithium-ion (Li-ion) battery technology in the domain of mainstream hearing aids. It is the first rechargeable mainstream RIC hearing aid which provides one day of hearing including unlimited streaming from audio devices. In combination with advanced hearing performance, it fulfills the key user needs: (1) a full day of battery life, including media streaming, (2) super quick charging, and (3) improved usability of the hearing aid.

The 2015 MarkeTrak IX study[1] by the Hearing Industries Association, showed that non-hearing aid wearers rated "rechargeable hearing aid" and "rechargeable batteries for hearing aids" as #2 and #4 in the top ten features that would motivate them to buy a hearing aid.

There are many forms of rechargeable battery but the most sustainable form is Lithium-ion (Li-ion). Li-ion battery technology has revolutionized how we can use electronic devices. It is used in countless portable devices such as smart phones, laptops, cameras, power tools, etc.. The advancement of this state-of-the-art battery technology has now continued into the field of hearing aids. Major manufactures have chosen rechargeable lithium-ion battery technology as their main rechargeable energy source. Since the launch of Audéo B-R in 2016, Phonak delivers the broadest portfolio of rechargeable hearing aids with Li-ion battery technology for multible target groups.

Rechargeable hearing aid battery solutions

There are two main types of rechargeable batteries for hearing aids that are available on the market today.

Silver-Zinc (Ag-Zn)
Ag-Zn is another rechargeable battery technology that has been recently introduced to the hearing aid industry. It operates with a higher capacity and greater energy density resulting in a longer battery life. Charging time to reach full capacity is 4 hours and the battery life cycle is one year. This means that every year the Ag-Zn battery must be changed. The voltage of Ag-Zn batteries is too high for most hearing aids so it has to be used in hearing aids that are specially designed to handle higher voltage levels. One way to do this is by fitting the battery door with a voltage regulator that will reduce the capacity without affecting the hearing aid electronics. A major limitation of the AgZn rechargeable hearing aid battery is the limited penetration in the market.

Lithium-ion (Li-ion)
The latest rechargeable battery type that has also been recently introduced as a hearing aid battery solution is lithium-ion. The lightest of all rechargeable batteries, it is used in many rechargeable portable devices such as mobile phones, smart watches, tablet computers, cameras, and even cars. Li-ion batteries offer the fastest charging time and the longest lasting battery on the market today. The capacity of a Li-ion battery does not decrease with repeated short charging sessions, nor is the hearing performance affected over time. Li-ion devices can be charged often for short or long periods of time without the risk of harming the battery

capacity or life cycle. And since Li-ion technology is used in many everyday devices, it is also available from a variety of sources. Like Ag-Zn, the high voltage capacity of Li-ion limits its use for hearing aids but it can also be specially adapted to be utilized in hearing aids.

Comparison of rechargeable solutions

Table 1 is a comparison of the different rechargeable solutions that are available in the market today.

	Ag-Zn	Li-ion
Voltage (V)	1.6	3.6
Capacity (mAh)	40	42
Charge time (h)	6 – 7	2 - 3
Charging cycles	400	> 1500
Expected battery lifetime (years)	1	4 - 6
Self-discharge per month	< 3%	< 1%

Table 1: Comparison between a 13 size battery consisting of Silver-Zinc (Ag-Zn) and Lithium-ion (Li-ion)

All batteries - independent of which type - lose available capacity over time. Even if fully charged, an old battery contains less energy than a brand new one. This aging effect is dependent upon the applied power management, but also upon the environmental temperature, the amount of charge/discharge cycles and additional factors.

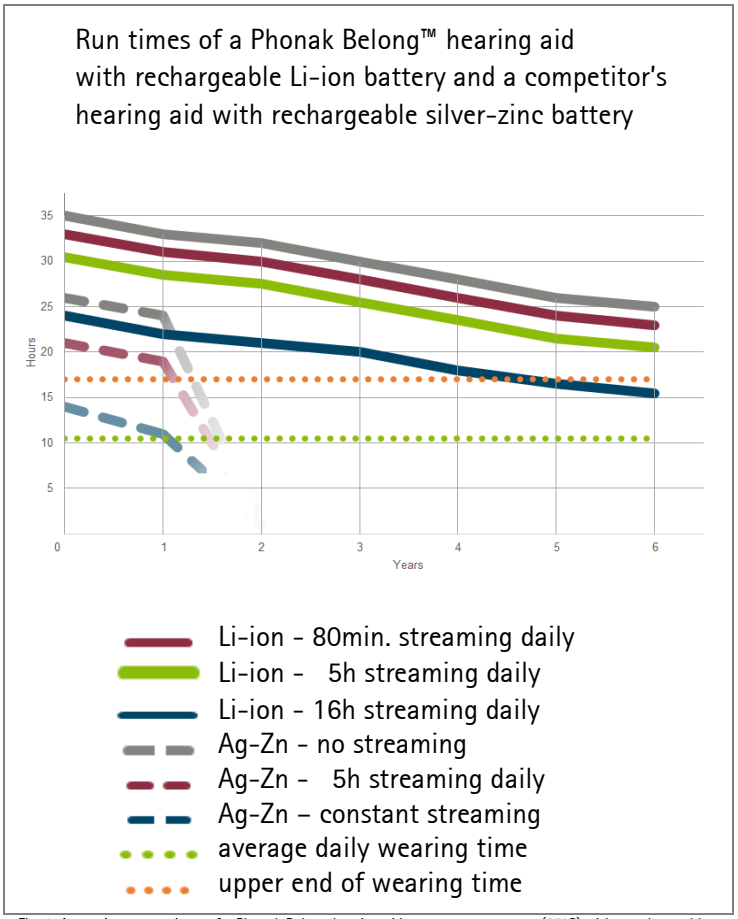


Fig. 1: Approximate run times of a Phonak Belong hearing aid at room temperature (20°C) with a rechargeable Li-ion battery and a competitor hearing aid with rechargeable Ag-Zn battery when charged daily, depending on usage. The data are derived from accelerated lab tests.

A Phonak investigation with data collection from more than 192'000 client fittings showed Phonak Belong wireless hearing aids are worn on average 10.4 hours a day[2] or longer. By using Li-ion as a rechargeable solution in hearing aids, wearers can enjoy a full day of continuous hearing including wireless streaming without any decrease in hearing performance or deterioration of the battery over time. This is a more viable solution for people who were not satisfied with the limitations of other rechargeable solutions. As most users utilize their devices for less than 17 hours per day, it is clearly visible in the graph (fig. 1), that Phonak hearing aids with rechargeable Li-ion battery technology last for the entire life of the device.

Not all hearing aids are created equal. Operation times of hearing aids with a full charge can differ depending on battery type and the efficiency of the digital signal processing.

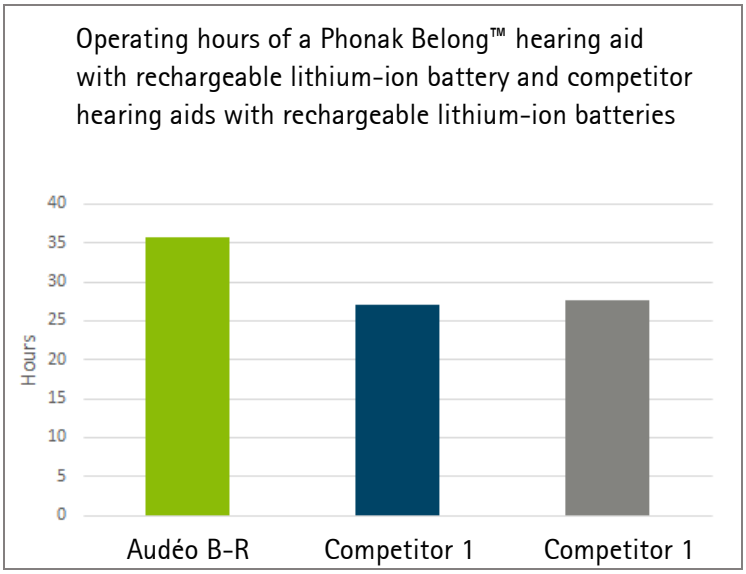


Fig. 2: Sample operation times for different Li-ion battery based hearing aids with a fully charged new battery, when concurrently run in automatic mode with a repeating sound parcours consisting of quiet, loud, speech, music etc. (without audio streaming) until battery end-of-life.

Lithium-ion battery technology in Phonak rechargeable hearing aids

Thanks to a breakthrough in technology, Phonak offers the broadest portfolio of rechargeable hearing aids with a built-in Li-ion battery (Fig. 3). Phonak Audéo B-R is the first choice in terms of small size and big performance and it was the first rechargeable RIC hearing aid to use Li-ion batteries. The Phonak Bolero B-PR is a compact power BTE with telecoil and volume control. Phonak Sky B-PR is the rechargeable option with dedicated pediatric features to address the needs of toddlers and older children. The Naída B-R RIC is the smallest hearing aid of the Naída power hearing aid family. Phonak CROS B-R in combination with Audéo B-R is a highly attractive wireless solution for people with single-sided deafness.

Fig. 3: Rechargeable hearing aids from Phonak utilizing Li-ion battery technology, left to right: Audéo B-R, Bolero B-PR, Sky B-PR, Naída B-R RIC, CROS B-R

The built-in Li-ion battery provides Phonak rechargeable hearing aids with enough power for one day of hearing including unlimited streaming before recharging is required. As figure 4 shows, the super quick charging of Li-ion can recharge Phonak hearing aids in two hours and for a full day without any effect on the battery degradation over time. Charging for only half the charging time (1 hour) provides enough capacity to hear for 12 hours. When a wearer needs to have an even quicker battery charge, the hearing aids can be charged for 15 minutes and provide the hearing aids with at least three hours of battery life.

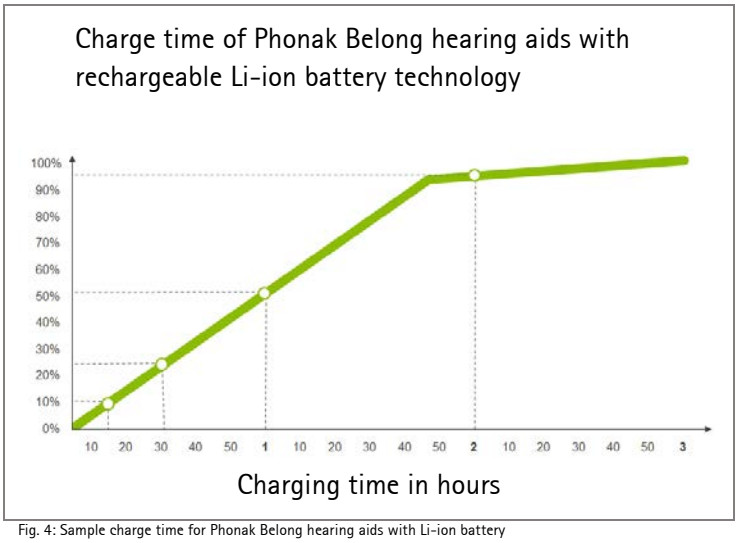


Fig. 4: Sample charge time for Phonak Belong hearing aids with Li-ion battery

Since the expected life of Li-ion is six years, it made sense for Phonak to integrate the battery into the housing of the hearing aid and eliminate the battery door. The resulting advantages include increased durability and reduced corrosion of the battery contacts that commonly affects housings with a battery door. The biocompatible titanium charging contacts on the hearing aids support the quick charge and are also resistant to corrosion. According to the global Phonak repair records (figure 5) we can see that Audéo B-R hearing aids were 15% more reliable than comparable Belong and Venture RIC models with an exchangeable battery when it came to repairs.

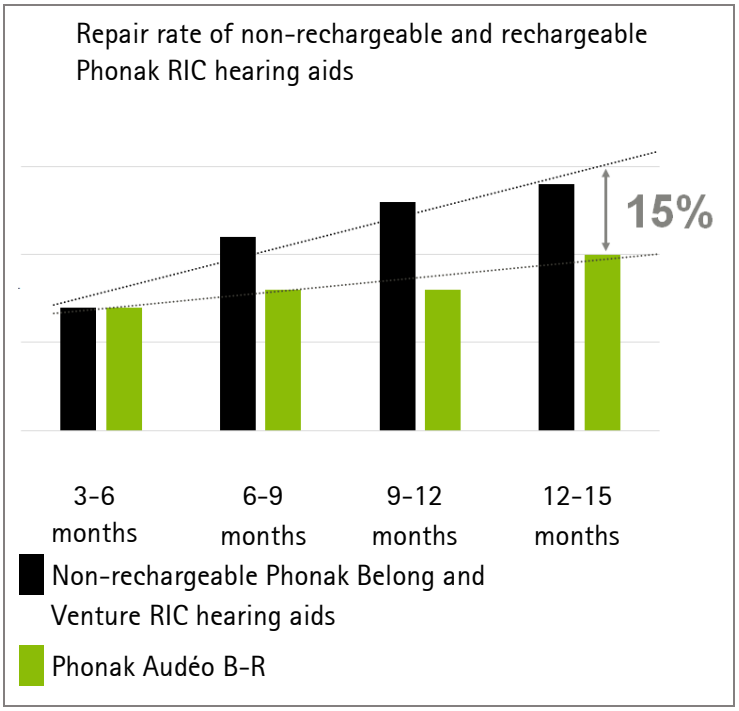


Fig. 5: Repair rate of non-rechargeable Phonak Belong and Venture RIC hearing aids and Audéo B-R

One clear advantage of integrating the battery means that handling is also simple. Without a battery door, the wearer never needs to worry about opening and closing a battery door as well as changing a battery. Instead, the hearing aids are placed directly into the specially designed charger where it automatically begins charging. Figure 6 shows the various charging options offering wearers a simple and effective user experience. To charge the hearing aids, there are two charging options available: the Phonak Charger Case and the PowerPack (fig. 6) as well as the Phonak Mini Charger (fig. 7).

Fig. 6: Audéo B-R in the Phonak Charger Case RIC and the Phonak Power Pack

In addition to protecting the hearing aids, the Charger Case also charges and dries the hearing aids in a compact and stylish package. For charging-on-the-go, the optional Power Pack for the Charger Case allows up to 7 full charges for a pair of Phonak rechargeable hearing aids (fig. 6). This means that wearers who are constantly on the move do not have to worry about always searching for a power supply. The Mini Charger is a smaller option for wearers who want a charger that takes up very little space on a desk or nightstand or as secondary charger.

Fig. 7: Phonak Audéo B-R in the Phonak Mini Charger

Conclusion

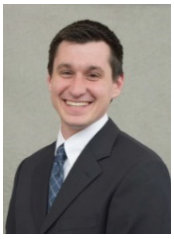
The outcome of multiple surveys have clearly defined rechargeable hearing aids as one of the top requirements for consumers. Phonak rechargeable hearing aids with built-in Li-ion battery fulfill the expectations of: (1) a full day battery life, including media streaming, (2) two hours to fully recharge, and (3) improve usability due to increased durability and handling of the hearing aid. The challenges and inconveniences of replacing batteries is now a thing of the past. Rechargeable hearing aids from Phonak provide wearers with one day of uninterrupted hearing including unlimited streaming.

References

1 Abrams HB, Kihm J. An Introduction to MarkeTrak IX: A New Baseline for the Hearing Aid Market. Hearing Review. 2015;22(6):16. Published on May 15, 2015 *http://www.hearingreview.com/2015/05/introduction-marketrak-ix-new-baseline-hearing-aid-market*

2 Phonak big data analysis 2017: "Wearing Time of Hearing Aids: Which are the Key In_ uence Factors?" (approx. 500 participating POS enabled a logging function in Phonak Target to allow data collection from more than 192,000 client fittings) *https://www.phonakpro.com/content/dam/phonakpro/gc_hq/en/resources/evidence/white_paper/documents/infographic_wearing_time.pdf*

Authors



David Hirchak is the Phonak Clinical Trainer for Northern California territory. David has been with Sonova and Phonak since 2014 where he previously held the Post-Graduate Trainee rotational position. He graduated with his Doctor of Audiology degree from Rush University in Chicago. His clinical experience includes diagnostic audiology for adults and geriatrics, hearing aid and assistive listening device evaluation and fitting, and ototoxic monitoring. David currently lives in San Francisco.

Davina Omisore is an Audiology Manager for the marketing team in Phonak in Switzerland. Davina has been with Phonak since 2006 specializing in audiology and hearing aid product training for Phonak Group Companies as well as Hearing Care Professionals. She previously worked for the National Hospitals in the United Kingdom and graduated with a Masters in Audiology from Dalhousie University, Halifax, Canada.

Contributors of the 2nd edition:
Jan Mattmüller, Strategic Product Manager, and
Lutz Müller, Manager Product Audiology

V2.00/2018-06/DaO © 2018 Sonova AG All rights reserved