WHITE PAPER

RETAIL

Introducing a ‘Green’ Option for Barcode Scanning

Lithium-Ion Alternatives Enable
Environmentally Friendly Barcode Scanning

Honeywell

introduction

Innovation in portable power sources has led to the development of the first battery-free yet wireless handheld barcode scanner. Eliminating the battery results in a green, environmentally friendly scanner that frees organizations from having to purchase, maintain and properly dispose of batteries. With no battery in the scanner, there is:

- No need to purchase and store replacement batteries;
- No special handling requirements for battery shipment, recycling or disposal;
- No labor time required for battery replacement;
- An opportunity to showcase your organization's commitment to environmental sustainability.

The first battery-free scanner was developed by adapting supercapacitors (i.e. ultracapacitors); power sources that are commonly used in industrial products. Supercapacitors are reliable, safe and environmentally friendly, though not previously used in barcode scanners or other handheld products because they were too large. Honeywell adapted and refined the technology for use in barcode scanners.

Scanners powered by supercapacitors plug and play with existing host systems and software applications just like their traditional battery-powered versions, feature the same scanning performance and ability to read challenging barcodes—but don't require the

> "… alternative energy storage technologies, are challenging the dominance of lithium batteries. This is the case with supercapacitors, which are an emerging energy storage technology whose characteristics make them strong candidates for satisfying those specific functions where lithium batteries underperform"
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> — **IDTechExeith**, *Batteries & Supercapacitors in Consumer Electronics 2013-2013: Forecasts, Opportunities, Innovation*

same battery maintenance and replacement costs typically required of battery-powered scanners. Furthermore, a 'green' scanner can be used to highlight an organization's commitment to environmental sustainability. There is no need to sacrifice performance to gain these benefits because supercapacitors do not add weight to the scanner, change its ergonomics or limit barcode reading ability. And because these scanners fully recharge in mere seconds, not hours like traditional battery-powered scanners, downtime associated with a scanner that might be out of commission due to a dead battery is now a thing of the past.

This white paper provides a brief overview of supercapacitor power sources, explains the benefits and limitations to using supercapacitor-powered scanners at point-of-sale and other use cases, and highlights the important performance, cost and environmental differences between battery-powered and supercapacitor-powered scanners in retail environments.

Understanding Supercapacitors

Supercapacitors store energy electrostatically on the surface of a conducting material. This contrasts with lithium-ion (li-ion), lead acid and other batteries, which produce power through a chemical reaction. A supercapacitor includes two plates that are suspended within an electrolyte (supercapacitors are also called double-layer capacitors, which is a reference to the two plates). When voltage is supplied, the plates serve as electrodes, with one attracting negative ions and the other positive ions. The amount of energy that can be stored depends on the size of the plates. The power needed to run a traditional handheld scanner can be produced by a supercapacitor that is smaller than the lithium-ion battery typically used in such devices.

Supercapacitors were developed in the 1950s and were originally used to provide starting power to military tanks and submarines. Today, supercapacitors are commonly used in hybrid electric vehicles, and increasingly in small appliances and handheld electronic devices. Leading automakers formed the United States Advanced Battery Consortium (USABC) to research and commercialize supercapacitor technology, and there are numerous other public, private and university-based research programs all over the world, including the University of Cambridge in the U.K. and the Centre de Recherche sur la Matière Divisée (CNRS/Université d'Orléans) in France. Considerable sums are being spent on supercapacitor research and development each year, which is leading to impressive technical advances that are enabling new use cases.

Supercapacitors used in handheld devices are characterized by short charge cycles and recharging times. Typically, these devices only hold a charge for a span of a few minutes, however they can be very rapidly recharged. This gradual power discharge limits the situations where supercapacitor-powered scanners can be used. Retail point-of-sale is an acceptable use case because the handheld scanner can recharge in its cradle when it isn't being used. In fact, any application where the scanner is typically "resting" in its charge cradle is a good candidate for supercapacitor technology.

Supercapacitors can be discharged and recharged hundreds of thousands of times. The discharge/recharge life cycle is another significant advantage compared to lithium-ion batteries, which have a lifespan of approximately 500 discharge/recharge cycles. At that rate, a battery that is recharged once a day will need to be replaced in less than a year and a half. Companies and consumers spend untold dollars on replacement batteries each year and countless efforts to properly dispose of old ones. The growing use of batteries, and their short lifespans, is also a growing environmental problem. Lithium-ion batteries are impractical to recycle because of the effort and expense involved. Many end up in landfills or are disposed of improperly.

BATTERY BASICS FOR BARCODE SCANNERS

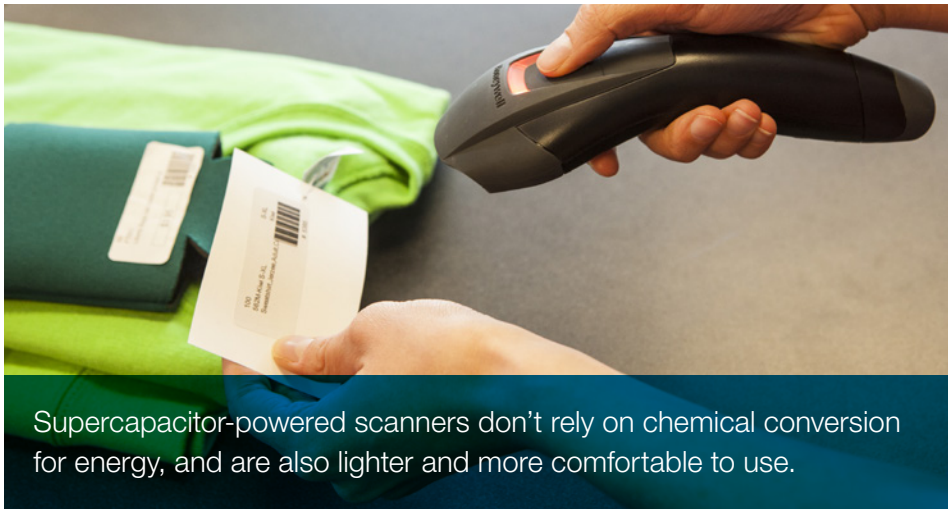
Lithium-ion is the most common type of battery used in handheld barcode scanners. The number of scans and wireless communications are important variables to battery performance, but a fully charged lithium-ion-powered scanner typically works for a full eight-hour shift before needing to be recharged. As lithium-ion batteries get older and undergo numerous discharge/recharge cycles, they gradually lose their ability to hold a charge, and typically need to be replaced after approximately 500 discharge/recharge cycles.

Replacing scanner batteries is not always as simple as replacing the batteries used in many consumer electronics. While most scanners have field-replaceable batteries, many do not. If batteries are not field-replaceable, the scanner needs to be shipped* to a service center to have the batteries replaced. This process takes scanners out of service and requires the organization to have spares ready so work processes will not be interrupted.

* In many countries, environmental regulations require a special shipping labels and hazardous material surcharges.

Supercapacitors are an environmentally superior alternative to batteries. They have a longer life cycle and are safer to use because they produce no chemical reaction. By keeping batteries out of their scanners, organizations also keep lithium-ion batteries out of landfills.

Supercapacitor-Powered Scanners at Retail Point-of-Sale



Supercapacitor-powered scanners don't rely on chemical conversion for energy, and are also lighter and more comfortable to use.

As discussed earlier, using supercapacitor-powered scanners does not require a trade-off in scanning performance. Supercapacitor-powered scanners are available with cordless Bluetooth® wireless connectivity and can read the same barcodes, at the same speed, responsiveness and range, as equivalent battery-powered models. The shorter recharge time is an added convenience because the scanner doesn't need to be out of service for hours while it is being recharged. This is one of several total cost of ownership (TCO) benefits to using supercapacitor-powered scanners.

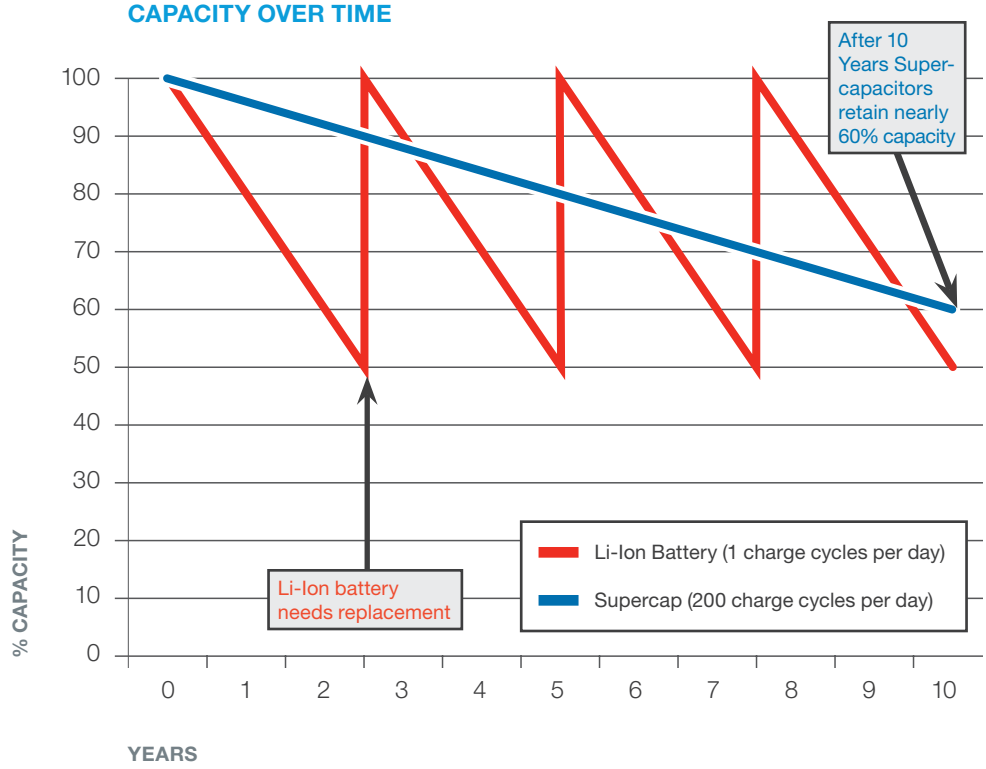
To understand why scanners with supercapacitors are an environmentally friendly and operationally efficient option for retailers, consider a typical point-of-sale use case. In this example, the retailer uses a fixed-position omnidirectional scanner (also called a 'bioptic' scanner) to scan most items, and supplements the fixed reader with a wireless handheld scanner to make it more convenient for associates to read large and bulky items. A typical order has approximately 20 items, of which three are scanned with the handheld unit.

In the scenario described above, a handheld scanner powered by a lithium-ion battery would need to be recharged approximately once a day. Because lithium-ion batteries have a lifespan of approximately 500 discharge/recharge cycles, the scanner battery would reach its end-of-life in 500 days, or between 16 and 17 months (1.4 years). If the scanner was expected to remain in service for only three years, the battery would need to be replaced twice during its life cycle. Battery replacement would add between $80 and $120 to the direct cost of owning the scanner based on average replacement battery prices, which range from $40 to $60. The direct replacement cost does not account for the

labor required to replace batteries and dispose of the old ones, the potential productivity loss from scanner battery failure, or the cost of maintaining a pool of spare batteries, which includes inventory holding costs.

Supercapacitors can serve as permanent power sources for scanners. Given the average lifespan of a handheld scanner, the supercapacitor will never need to be replaced. Using the same retail scenario above, a supercapacitor-powered scanner used in the same application above would need to be recharged 160 times throughout the day; essentially, it is being recharged every time it is returned to the base. This is practical in point-of-sale operations because the handheld scanner can rest in a charging cradle when not in use. Supercapacitors have a lifespan of at least 500,000 discharge/recharge cycles, so at 160 cycles per day the scanner would last at least 3,125 days, equating to more than eight years of use—more than six times longer than standard lithium-ion batteries.

CAPACITY OVER TIME



These calculations show that green, supercapacitor-powered scanners can cost effectively meet retailers' operational needs. They do not quantify the environmental and goodwill benefits that companies can gain by introducing an innovative, environmentally friendly tool for a process that is highly visible to their customers.

Additional Use Cases

Supercapacitor-powered scanners are a good option for any use case that does not require continuous, high-volume scanning where the operator has easy access to a recharging cradle. Retail point-of-sale is an excellent environment for supercapacitor-powered scanners because they can be conveniently recharged, and the process takes less than a minute. Similar use cases include library, other check-in/check-out processes, and office file and document tracking.

Conclusion

Supercapacitor-powered scanners are the most environmentally friendly option available to read barcodes. Their scanning performance matches that of traditional battery-powered scanners, the only significant differences between the two product categories relate to their power sources. The short use time per charge of a supercapacitor creates some application limitations. However, this is offset by the extremely fast recharge time and long life cycle that spans a half million discharge/recharge cycles.

Supercapacitor-powered scanners provide several environmental and cost-saving benefits:

- Environmentally safe and friendly operation;
- Improved scanner reliability because there is no risk of battery failure;
- The labor and effort to replace and dispose of batteries is eliminated;
- Replacement battery purchase and inventory holding costs are avoided;
- Organizations can promote an environmentally friendly, innovative reputation.

These benefits are available today from supercapacitor-powered barcode scanners that are currently on the market. The benefits, options and capabilities should continue to grow as supercapacitor technology continues its rapid evolution.

Voyager 1202g-bf

About the Honeywell Voyager 1202g-bf Battery-Free Wireless Laser Scanner

Honeywell is a pioneer in applying supercapacitor technology and introduced the world's first supercapacitor-powered barcode scanner: the Voyager 1202g-bf (the 'bf' designation denotes battery free). The Voyager 1202g-bf is a handheld laser scanner with Bluetooth connectivity that can be used up to 10 meters (33 feet) from its base station. It can read standard GS1 DataBar linear barcodes, and is very tolerant of damaged and poor quality symbols. The Voyager 1202g-bf can read up to 100 barcodes on a single charge and needs only 35 seconds to fully recharge. It is plug-and-play with leading point-of-sale systems, is built on the proven Voyager scanner platform and has a three-year warranty. For more information visit **www.honeywellaidc.com**.

About Honeywell

Honeywell (www.honeywell.com) is a Fortune 100 diversified technology and manufacturing leader, serving customers worldwide with aerospace products and services; control technologies for buildings, homes, and industry; turbochargers; and performance materials. For more news and information on Honeywell, please visit **www.honeywellnow.com**.

Honeywell Scanning & Mobility (HSM) is a leading manufacturer of high-performance image- and laser-based data collection hardware, including rugged mobile computers and barcode scanners, radio frequency identification solutions, voice-enabled workflow and printing solutions. With the broadest product portfolio in the automatic identification and data collection industry, HSM provides data collection hardware for retail, healthcare, distribution centers, direct store delivery, field service and transportation and logistics companies seeking to improve operations and enhance customer service. Additionally, HSM provides advanced software, service and professional solutions that help customers effectively manage data and assets. HSM products are sold worldwide through a network of distributor and reseller partners.

For more information on Honeywell Scanning & Mobility, please visit **www.honeywellaidc.com**.

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