

Battery Testing at Retail Stores

A technology that checks the battery by digital simulation

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The insatiable appetite for information flow continues to grow, and the excess battery energy enjoyed in the past with cellular phones is gradually disappearing. This increase in energy demand is illustrated in Figure 1. The chart reflects future energy needs against battery improvements attained since lithium-ion became the popular battery choice for mobile phones and other portable devices. The s-curve demonstrates the abundance of battery capacity for the voice phone against the feature-laden mobile phones of today and the future. A new energy crisis is in the making.

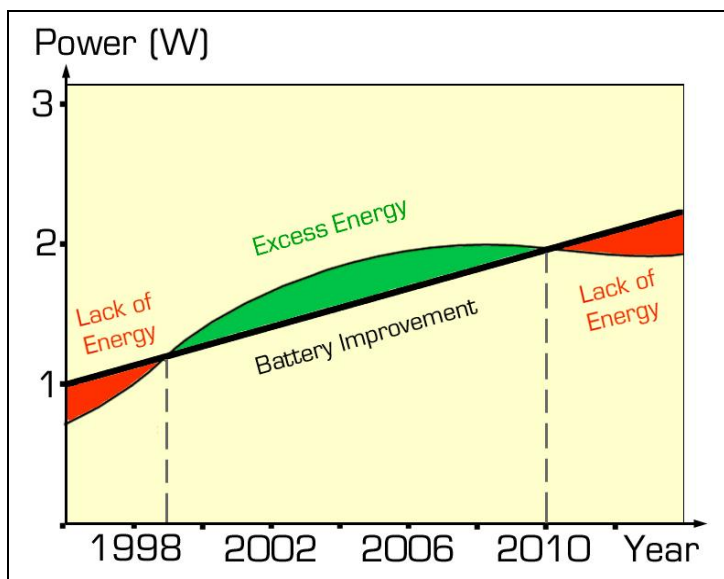


Figure 1: Power needs of mobile phones in the past, present and future

Gains in battery capacity are not in par with higher power demands of the future.

With heavier demands on the battery, mobile phone users are pressing for better services, and battery testing at storefront is such a desire. Battery testing eliminates guesswork by giving a clear assessment of battery performance. On a complaint, “My phone does not hold charge,” stores without testing services may simply replace the battery, only to have the problem recur. Lack of testing opportunities squanders many good batteries, so much so that 90 percent of returned batteries may have no fault and can be reused. The cellular industry estimates the cost of needless battery replacement at \$10 million a year.

Battery testing is not new. Storefronts have been checking cellular batteries for the last ten years but the results had been mixed. Older test methods estimated battery health by measuring the internal resistance. Modern lithium-ion, however, maintains low resistance through most of its life. This makes resistor-based methods obsolete. Figure 2 shows the relationship between capacity and resistance of modern Li-ion batteries.

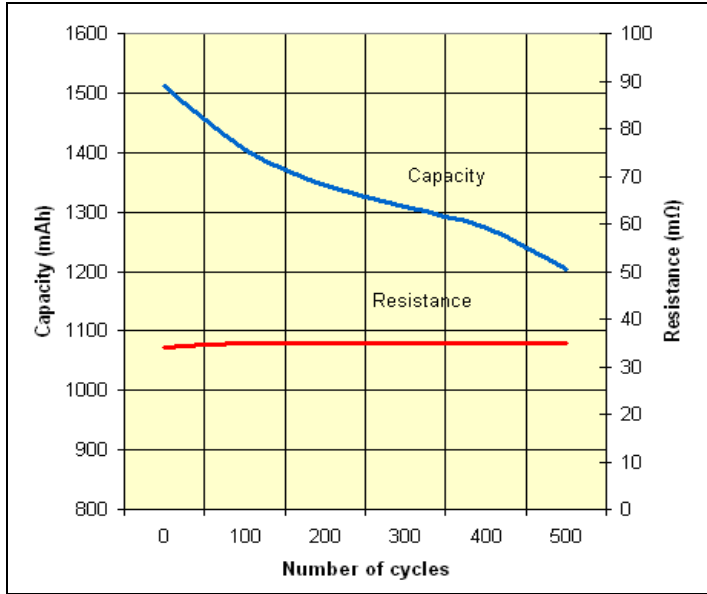


Figure 2: Relationship between capacity and resistance of lithium-ion batteries

Modern Li-ion batteries maintain low resistance as part of cycling.

Cadex developed *QuickSort™*, a technology that applies a load signature resembling a digital device. The *electrochemical dynamic response* of QuickSort™ sorts the batteries into GOOD, LOW and POOR at a correct prediction of nine times out of ten. The test takes 30 seconds and works with a state-of-charge of 40–100 percent.

QuickSort™ is available in the Cadex C5100 shown in Figure 3. This compact battery analyzer is built for storefront use and comes with a universal battery adapter. The system is simple to operate and needs minimal staff training. An optional printer generates customer receipts with test results; optional PC-BatteryStore™ software allows exporting the information to allow central supervision of participating stores.



Figure 3: Cadex C5100 battery analyzer for storefront

Program buttons select QuickSort™, Charge and Cycle.

(Patented technology)

Testing cellular batteries in a retail store improves customer satisfaction, increases revenue and reduces costs. To examine the cost savings, 10 stores participated in a pilot study to test batteries at storefront using Cadex battery analyzers. These participating stores get an average of 10 batteries per day at an estimated handling cost of US\$15 per pack. During the one-month trial, the stores saved 1981 batteries, resulting in a saving of about \$30,000.

Li-ion batteries contain a protection circuit that shields the battery against abuse. This important safeguard has the disadvantage of turning the battery off if over-discharged. Storing a discharged battery for any length of time can do this. Cadex explored the cause of battery failure found that three out of ten packs die due to over-discharge. The *Boost* program of the Cadex battery analyzers activates the battery's protection circuit and restores the pack to full service.

Boxes overflowing with batteries can turn into money by testing and recirculating them. Figure 4 illustrates storefront testing while the customer waits. If the battery needs charging or has a genuine fault, an alternate pack is given from the pool of previously tested batteries. This model fulfills the motto: "To the storefront and no further."

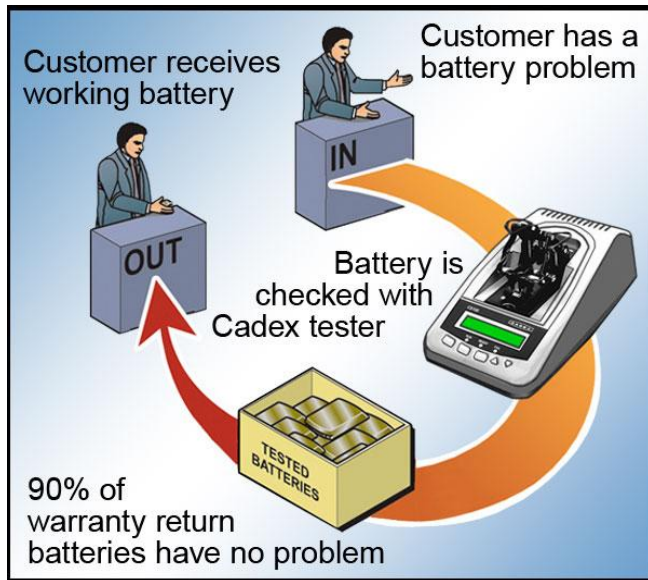


Figure 4: Storefront battery testing

On-site service reduces handling, lowers disposal and improves customer satisfaction.

Battery analyzers also play a pivotal role at service centers to refurbish batteries that had been returned. Clever entrepreneurs discovered a new business opportunity by collecting returned mobile phone batteries and refurbishing them. Large battery service centers have sprung up in the USA, UK and Israel that buy these surplus batteries by the ton to test and re-circulate them as "Class B" packs. Some service centers handle as many as 400,000 batteries per month with plans to increase to one million. Stores receiving the B-Class batteries have good results with no increased returns over new packs. Refurbishing batteries offers the added benefit of reducing waste, protecting the environment and keeping our planet green.

About the Author

ISIDOR BUCHMANN is the founder and CEO of Cadex Electronics Inc., a company that manufactures innovative battery test and diagnostic equipment. Active in wireless communications, Isidor has studied the behavior of rechargeable batteries in practical and everyday use. To share battery knowledge, he wrote many articles, delivered technical papers around the world, published several books, and created www.BatteryUniversity.com. For product information, please visit www.cadex.com.