Honeywell

How Mobile Computer Power Management Impacts Operators' Hard and Soft Costs

Executive Summary

- Power management and battery longevity are critical evaluation criteria when selecting a mobile computer
- The need to replace batteries or recharge a device during an employees work-shift results in recognizeable lost productivity and incremental cost
- Choosing a solution that enables the ability to work for an entire work-shift or more, without recharging, can result in real cost savings

Bob delivers a package, scanning its bar code to record the delivery—and discovers that his computer has shut down. A low-battery alert had appeared moments earlier, but it provided too little warning. Bob missed it. If the driver and his employer are lucky, no data has been lost. But at best, both customer service and employee productivity have been compromised. Moreover, Bob has been subjected to stress that could lead to errors or reduced job satisfaction. Even if he'd changed his computer's battery before making this delivery, he would have lost valuable time.

Bob's employer's purchasing group has become accustomed to the costs of replacing mobile computer batteries after 20 months' service—a considerable expense. If the company could get more useful life from the batteries it purchases, it could significantly reduce costs.

Similar problems are common among transportation companies using mobile computers—and all have negative impacts on employees, operations and the bottom line. Most mobile computers can operate for no more than six hours per charge. Businesses lose countless dollars annually to battery-related hard and soft costs.

Are High-Capacity Batteries the Answer?

Many companies using mobile computers turn to high-capacity batteries to lengthen per-charge run times. This typically extends sustained operating times to less than eight hours—still less than a work shift. A battery change-out would still be required to keep most mobile computers up and running.

The Solution: Superior Power Management.

Obtaining sufficient battery life to enable a mobile computer to run for a full shift (with a significant safety margin) demands intelligent power management in addition to high-capacity batteries. There are five components to intelligent power management. Their implementation impacts not only run time per charge, but also the useful life of mobile computer batteries and management of the battery replacement process.

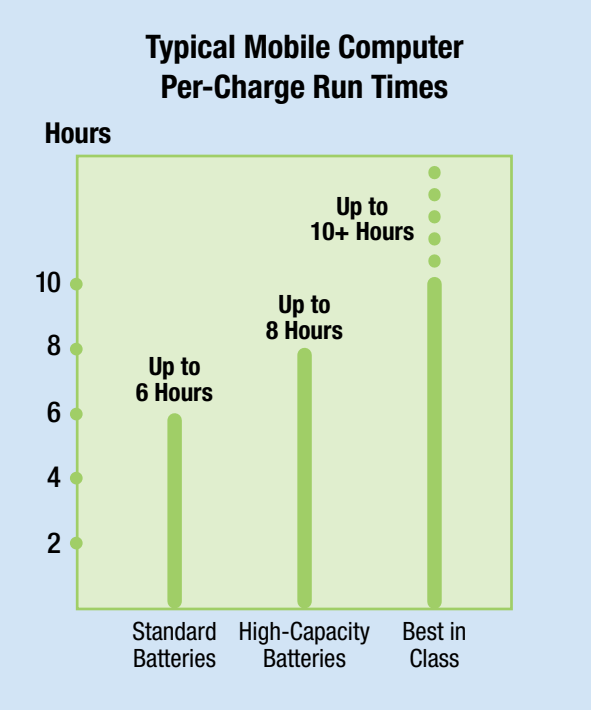
These components are:

1. The battery

Mobile computer manufacturers can choose from a wide variety of batteries. Key variables include battery capacity and intelligence that can be built into the battery pack. Unfortunately, battery specifications can be confusing. For example, a battery pack with a rating of 3000 mAh (milli-Ampere hours) at 3.7 volts has less capacity than a pack with a rating of 2000 mAh at 7.4 volts. Watt hours (Wh), a more meaningful measure of capacity than mAh, takes voltage into account. It's determined by multiplying a battery pack's mAh rating by its voltage. In the example above, the 3000 mAh battery pack has a power capacity of 11.1 Wh, while the 2000 mAh pack has a power capacity of 14.8 Wh.

More sophisticated portable designs that come with higher battery capacities usually have multiple cells and higher voltage ratings—for example, 7.4 volts instead of 3.7 volts.

Increasing capacity increases run time, but that is not the only benefit: higher capacity batteries may need less frequent replacement. Lithium-ion batteries are durable and efficient power sources, however, like virtually all battery types, their ability to store power declines with each charge. The greater the discharge and subsequent recharge, the greater the loss of power storage capability.



Most battery types used in portable computing have a typical lifespan of 500 complete charge/discharge cycles. But if the battery is routinely recharged before it is fully discharged, it can be recharged more times. Instead of being replaced after 500 discharge/recharge cycles, it may last for as many as 1,500 discharge/recharge cycles—three times as long. With a mobile computer that can operate for longer than a full shift on a single battery charge, the battery can be recharged well before it is fully discharged.

Temperature is also a factor in battery recharging. If batteries are rapidly recharged at too high or too low a temperature, damage results and battery life is shortened—a common occurrence when batteries are charged in parked trucks. When the intelligence to sense temperature and communicate with a charger is built into a battery pack, an intelligent charger can respond with smart charging that prevents battery damage. Unfortunately, most mobile computers are not equipped with intelligent batteries.

2. Power conversion

The power-consuming components in a mobile computer—memory, the display and its backlight, the processor, the imaging system, and the wireless communication system—operate at a number of different DC voltages. DC voltage regulation reduces or boosts voltage from the battery to supply the proper voltage to all components. Mobile computer manufacturers have a wide variety of voltage regulators available. All lose some power in conversion, but high-efficiency regulators lose relatively little, thereby lengthening per-charge run time. Most mobile computers are built with less-costly, comparatively inefficient voltage regulators.

It's more efficient to convert voltage down to meet a component's requirements than it is to convert it up to a higher voltage. And it's far easier to avoid up-conversion with stacked-cell battery packs providing 7.4 volts than it is with battery packs producing 3.7 volts.

3. Load management

Optimum load management requires the selection of the most energy-efficient mobile computer components. As with batteries and voltage regulators, these high-quality components are typically more costly than the less-efficient equivalents found in most mobile computers. Maximizing per-charge run times also requires intelligent operation of all power-consuming components to minimize power consumption. Some of this intelligence is built into the computer's operating system (most commonly Windows CE™ or Windows Mobile™). Manufacturers can build additional efficiency intelligence into the computers themselves.

4. Battery charge monitoring

Like the gas gauges found in cars, the accuracy of mobile computer battery monitoring varies greatly. Many mobile computers have battery monitoring that is insufficiently precise. If a mobile computer user cannot be sure how much battery charge remains, the only way to avoid the risk of having the computer shut down prematurely—with potential loss of valuable data and compromised customer service—is to change batteries more often than necessary. Without precise battery monitoring, mobile device users must carry spare batteries—an additional cost.

5. Battery condition analysis

Because the ability of lithium-ion batteries to accept a charge declines with use, battery condition analysis is a useful tool to help determine when a battery should be replaced—typically when a battery's capacity has been reduced to between 60 and 70 percent of what it was originally. Analysis capability can be built into a battery charger, enabling easy condition monitoring. With constant, accurate condition monitoring, it's easy to replace batteries as required—avoiding premature replacement, a potentially great expense for companies with many mobile devices.

The Upside to Optimum Power Management: Enhanced Productivity and Lower Hard Costs.

If mobile employees can be assured of a full work shift's computer uptime, they won't have to worry about tracking power use, carrying spare batteries (or getting to where they're available if not carried). Nobody will have to interrupt what they're supposed to be doing to change batteries. Or lose real-time LAN communication for data downloads or information access. Or risk losing data. With a major headache eliminated, mobile employees can focus on what's really important: delivering consistent, excellent service to customers.

If an employee has to change batteries twice in a shift, that can easily consume 10 minutes a day—far more if the employee has to walk to another location to access a fresh battery. That's almost an hour in a five-day workweek, with a likely soft cost of more than $20, or about $1,000 per year. Plus the cost of 40 hours of lost employee time in a year. Plus the difficult-to-measure, but significant, costs of employee stress caused by the risk of a computer shutting down with little warning.

It's easy to see that the ability to operate mobile computers for more than a full shift without changing batteries can mean a dramatic difference in your operation's soft costs.

More than a full shift without changing batteries can mean a dramatic difference.

What's the Best Value for Your Business?

To find the best value in mobile computing, it's essential to look at the big picture—and consider soft costs, including employee time and stress as well as hard costs, including number of batteries required and battery service life. You'll see that the ability to operate for more than a full shift on a single battery charge can make a big difference in employee productivity, expense, customer satisfaction and your bottom line.

Intelligent Power Management Provides shiftPLUS™ Performance in Dolphin® Mobile Computers by Honeywell.

Honeywell has developed and integrated exclusive power management technology into Dolphin Mobile Computers. This technology addresses all five components of intelligent power management, with:

- High-capacity, intelligent batteries standard at no extra cost.
- High-efficiency voltage regulation to minimize power loss.
- Optimized load management with high-efficiency components and a proprietary system that enables Dolphin Mobile Computers to use more of the power that's in each battery charge—from 10 to 20 percent more.
- Highly accurate battery monitoring via a proprietary utility.
- Easy battery-condition monitoring, built into Honeywell's four-bay charger. An LED array provides instant condition status.

A key result of this 360° approach to power management is shiftPLUS™ performance—with 10+ hours of continuous use, the longest run time in mobile computing. With it comes the opportunity to recharge batteries before they're fully discharged—and longer battery life.

Maximum Productivity and Value.

With Dolphin Mobile Computers, your mobile employees won't waste time changing batteries. With a lot less to worry about, they'll be able to focus on what really counts: doing the job right. You'll be able to extend battery-replacement intervals, reducing soft costs. And because Dolphin Mobile Computers are true industrial-grade devices, they're built to stand up to the harsh conditions common in transportation's real world. So they minimize the need for repairs and replacements. That adds up to a competitive edge for your business—and an unmatched mobile computing value.

Dolphin Mobile Computers—

10+ hours of continuous use.

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