

## Lower Costs and Increased Productivity through Effective Battery Management

### Introduction

Your batteries are much more important to your bottom line than you think!

The batteries that power your mobile devices are critical to the success of your operations. Batteries that fail mid-shift cause unpredictable, costly interruptions and impair the productivity of your workforce.

Fortunately, there is a simple and effective procedure that improves the performance and productivity of your mobile workforce's operations, while also lowering your costs: **Battery Management**.

### Extending Battery Life through Proper Battery Management

Rechargeable lithium-ion batteries exhibit superior capacity and runtime characteristics compared to older battery technologies. Therefore, they are the most widely-used type in critical mobile device operations. Your lithium-ion batteries are a valuable asset that must be properly managed for optimum performance. This battery management guide pertains to lithium-ion batteries.

Like all batteries, lithium-ion batteries lose some of their capacity over time. However, there are specific strategies that end users can employ to make sure they get the longest life out of their batteries. By properly maintaining, charging, and storing your batteries, and adjusting your device's power-consumption settings to maximize the time between battery charges, you can make sure that your batteries last a full shift and can be utilized for up to 24 months before replacement.

### “When should I recharge my battery?”

Most people recharge their batteries at the end of their shift, and this is fine, especially for lithium-ion batteries. But....there's a lot of conflicting information out there, so let's tackle that as it relates to best battery management practices:

### Myths about Battery Charging

#### Avoid charging the battery unless it's fully drained

**False:** Waiting for the battery to be fully drained of energy before recharge does nothing to improve performance, waiting does not help it regain any lost capacity or conserve battery life, nor does waiting do anything to reduce the cost or time of the next recharge. Lithium-ion batteries can be charged at any time without any negative effects. There is no need to wait until the battery is flat to charge it back up to full capacity.

#### Lithium-ion batteries suffer from “memory effect”

**False:** Lithium-ion chemistry has no memory effect within its performance cycle. There is no false capacity step within the discharge process that prevents the battery from discharging further. It does not matter if the battery discharge regime was continuous, sporadic, or to varying depths. Capacity out of the product is not limited by any internal chemical process (as is the case, unfortunately, with Nickel chemistry).

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**Charging speed will reduce the life cycle of a lithium-ion battery**

**False:** Within reason—and always per manufacturer’s specification— slow, quick or fast charging of Lithium cells will not damage nor decrease overall cycle life of the product. Only the total amount of usage (full charge and discharge cycles over time) reduces the battery’s life (in conjunction with the environment temperature, depth of discharge, impedance growth and other factors).

**I should remove the battery pack from the charger to prolong its life**

**False:** Lithium-ion chemistry chargers terminate the charge voltage at the appropriate point, so no excess or damaging energy is flowing into the battery pack. The charger must cycle back on before energy again flows into the battery pack. The battery pack is not being charged due to termination and therefore cycle life is unaffected. So, bottom line: leave the charger plugged into the wall, leave the battery in the charger. There is no detrimental effect to the pack.

**I must charge my Lithium-ion battery fully for 24 hrs before I can use it the first time**

**False:** Lithium-ion battery packs do not require any long term charging for first use. After a normal charge (per manufacturer’s recommendations), the product is ready for use. Remember, most Lithium-based products are shipped with roughly 35% residual charge level. So your initial charge will bring the product from the residual “shipping” charge level to full charge without any ‘long’ first time charge regime.

**Practical Considerations that Maximize Battery Performance**

**1. Locate the battery’s date of manufacture. Discontinue using outdated batteries.**

Older batteries may not hold a charge as well as newer ones. Using an outdated battery can also lead to erratic operation, a shorter lifespan and impaired product performance. As a rule-of-thumb, industry “best practices” generally recommend you discontinue usage when:

- a. A battery is more than two years old.
- b. Utilized for 18 months in a typical retail application.
- c. Used for 12 months in a 2-3 shift industrial or warehouse application.

**2. Maintain 1-2 spare batteries per unit.**

Keeping extra batteries on hand allows you to fully charge the others off shift. This helps increase reliability and minimizes downtime.

**3. Assign a specific charging terminal to each user.**

Locating charging stations throughout the floor is a common practice. However, as their batteries become discharged, users tend to simply pick up a battery from any charging station, even though it may have been placed there only a few minutes earlier.

**4. Associate specific batteries to a specific unit.**

The following process helps ensure that each battery is associated with a specific device and battery charger:

- a. Label each mobile device with its own unique number.
- b. Upon receipt of new batteries, mark each one with the date received.
- c. Next, assign each battery to a specific mobile device and label each battery accordingly.
- d. Finally, assign each battery to a specific adapter, if applicable, in a specific charger, and appropriately label each battery.

#### **5. Keep your battery contact surfaces clean.**

This is critical and often overlooked!

Dirty contact points are a main source of charging problems. Regular cleaning is required for optimal performance. To clear dirt and residue, gently clean the contacts with a soft cloth. Pure alcohol may be used to remove grease and other contaminants.

#### **Manage the Power Requirements of your Mobile Device**

Virtually all mobile devices let the user select the various display and readout settings that have a significant impact on battery usage. User-selectable settings can include:

- Display brightness
- Elapsed time until display dims
- Elapsed time until device enters 'sleep' mode
- Elapsed time until device turns 'off.'
- Volume of audible error or confirmation signal
- Adjustable WLAN settings, including 'Auto off' when no data is being transmitted

So, take full advantage of your power management tools: Most mobile devices come with power management software that allows users to create custom individual user profiles that will significantly reduce power consumption, and therefore, battery usage.

#### **Proper Battery Storage for Maximum Life**

Check the thermostat: While lithium-ion batteries can survive very cold temperatures, excessive heat can harm the batteries and reduce their useful life. So if your mobile devices or spare batteries are stored for any length of time, make sure the storage environment will not expose the equipment to extreme temperatures.

Typically, lithium-ion batteries can be stored between 32 and 104 degrees Fahrenheit, but the lower end of that temperature range, out of direct sunlight, is best. Ideally, store the batteries in a cooler place.

#### **When to Replace your Batteries**

The simplest answer is to replace your battery when it is no longer capable of efficiently performing its tasks. You should consider replacing the batteries for mobile devices in demanding environments inside of 24 months to ensure optimum device performance.

Even the best batteries will degrade over time, and can lose a significant amount of their capacity in the course of a year, depending on many factors, such as:

- The battery's age
- Time from its first use
- Its charging history
- Temperature exposure/environmental usage conditions
- Storage
- Depth of discharge

To maximize your productivity and minimize your cost, it's important to keep in mind the "hidden cost" of not replacing a battery in time. When a battery dies mid-shift and can't be properly recharged, then you've lost the productivity of that worker while they hunt down another battery, replace it in their device and finally resume their task. Multiply that by possibly thousands of workers, mobile devices, and occurrences and the cost of ill-timed battery failures really adds up.

#### **Good Battery Management, Summarized:**

1. Track the age of your batteries to know when replacement is likely
2. Maintain a sufficient number of charged spares, strategically located throughout the work area
3. Keep the battery's contacts clean for most efficient charging
4. Make certain your workforce utilizes their mobile device's power management software to maximum effect
5. Store your batteries in the appropriate environment

Follow the guidelines we've presented and you'll achieve increased productivity and fewer work interruptions from battery-related issues. We want to make Battery Management simple and effective so you can complete your work in a cost-efficient and timely manner.