# How to Assess Cell Suppliers for Your Portable Battery System

MICRO POWER

From field data collection, medical equipment, and test and measurement tools, an increasing array of devices are going portable, and battery systems must keep pace with the power demands of these small form-factor devices. The resulting pressure on product designers to match the right battery system to the right power-hungry device is a key concern in today's market.

Often, designers simply refer to the product specification sheets published by cell manufacturers in the design, development, and cell selection process. However, these spec sheets rarely tell the real story: the performance data is often collected under so-called 'perfect world' conditions—room temperature and a low continuous discharge rate. But the 'real world' isn't a perfect one, and battery systems must handle extreme variations in temperature and high discharge rates. These two factors can combine to reduce battery system performance, capacity, and reliability. And matching the wrong battery to the wrong device—and using it in the wrong conditions—can lead to failure or combustion in the field.

Rather than blindly trusting product spec sheets in the cell selection process, Micro Power Electronics, a pioneer in the development of rechargeable Lithium battery and charger systems, recommends that product designers evaluate cells using a 'real-world usage profile' comprised of the following eight factors:

- **Operational voltage range** – What are the minimum and maximum operating voltages required by the system? For example, will the device operate at 14.4 volts and shut down at 12 volts?
- **Current** – What is the maximum current-drain rate for the system? What are the nominal operating drains under various functions? For example, the battery system may experience a high pulse current for a short period of time at system power-on, and a different current demand level during normal operation.
- **Environmental temperature** – Will the device always be used at room temperature or will it need to function at extreme temperatures? For example, battery systems for barcode scanners must operate at temperatures as low as -20˚ C and as high as 60˚ C.
- **Ambient, or operating, temperature –** What is the temperature of the battery system within the host device? What is the impact of cell heating on the circuitry within the pack? Or the host unit electronics' heating on the battery pack? With insufficient ventilation or poor component placement, cells can be irreversibly damaged.
- **Cycling behavior** – How will the cell be used? Will the end-user completely drain the battery—as occurs with wheelchairs and toys—or will the cell only be taken to a shallow depth of discharge, e.g., an electric toothbrush that is only used for a few minutes once or twice per day.
- **Charging time and frequency** – How much time is required to charge the battery? How often will the battery need to be charged? Charging time is directly correlated to the chemistry of the cells used. Nickel-based chemistries are capable of rapid charging (in some cases under an hour), while Li-Ion batteries can be charged in less than four hours.
- **Desired run-time** – How long will the device run per charge?
- **Number of cycles** – How many times will the battery be cycled before it reaches the end of its useful life?

Once the product designer has selected the right cell for the application, it is just as important to select the right cell manufacturer. Cells can vary widely in particle size distribution, formulation, mixing, and coating of active materials—all factors that impact performance.

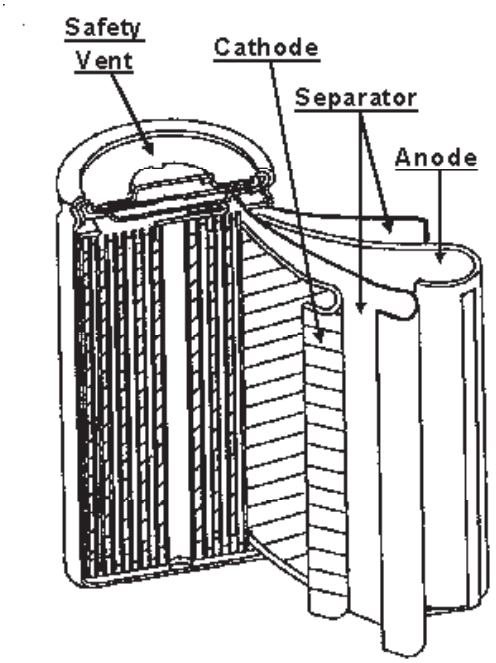
Micro Power Electronics recommends that designers follow the guidelines below when evaluating cell manufacturers:

**To certify or not to certify—that is the question.** Li-Ion cell manufacturers require distributors and OEM customers to present a certificate of competence with the technology before they will allow these companies to purchase sells. If your company is planning high-volume purchases over the long term, it may make sense to undergo the lengthy and expensive certification process yourself. If not, you will want to work with a pre-certified battery system supplier.

**Consistent core chemistry is critical.** In a battery pack, the cell with the lowest capacity will reach the low voltage cutoff threshold first, causing the entire battery to fail, even if energy remains in the other cells. Therefore, you want to ensure that the cells in the battery pack are balanced

or evenly matched. Such consistent core chemistry is most often found among cell vendors with fully automated production lines.

**Single or multilayer separators.** Electrodes in a Li-Ion battery are separated by a porous polymer separator. Cells manufactured for low-end applications are often separated by a single layer of porous polyethylene (PE), which can melt and close its pores in extreme temperatures, causing hard shorts between electrodes. In contrast, high-end cells are manufactured with multiple layers of separators consisting of porous PE laminated between porous polypropylene, which can withstand higher temperatures and maintain its integrity once the PE has melted.




Separators Partition the Cathode and Anode Particulate

**Dual-source strategy avoids vendor lock-in.** As with most supplier situations, qualifying and selecting multiple cell manufacturers that can meet your requirements is smart business. With a dual-source strategy, you can avoid stock-outs and back-orders of your product when customer demand or manufacturer capacity changes.

Product designers today are faced with the challenge of accommodating mobile power supplies in their products—and selecting the right battery cell and cell manufacturer are critical in meeting that challenge. By following Micro Power Electronic's 'real-world usage profile' and guidelines qualifying cell manufacturers, designers can simplify this complex task. And if your company does not have the requisite experience with Li-Ion or Li-Polymer cells, consider working with an experienced system supplier — such as Micro Power Electronics — to select the right cell for your application.