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Welcome to Brainstorm!

Manufacturers of portable devices are faced with the challenge of designing in the right battery pack and choosing from the many available options.

What are some of the most common mistakes engineers make when designing in batteries?

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By Chris Turner, Director of Battery Technology, Nexergy, Inc.

Among the most common mistakes that are made in the selection of batteries is not properly identifying the applicable regulatory requirements related to lithium ion battery safety and ignoring the impact those requirements have on the battery and host design in the early design stages. Environmental regulations have become rather well known, but battery-related safety standards are still new to many.

For the wireless industry, the CTIA Battery Certification Program has become even more of an issue. The program is based on the IEEE 1725, originally developed as a battery-safety standard for mobile phones. With wireless communication now being employed in a wide range of devices — from asset tracking to barcode scanners to medical devices — cellular-network providers such as AT&T and Verizon require this certification on many non-mobile phone devices using their networks. Most importantly, the program requires that a CTIA-certified battery cell be used in the battery pack to gain certification. This significantly limits the pool of potential battery cell sizes and suppliers that can be used.

Some standards are device-driven. According to the IT Equipment Safety Standard (IEC60950) or Medical Electrical Equipment Standard (IEC 60601-1), a device is required to get UL2054 on the battery pack (or the similar IEC 62133) as a prerequisite for approval. Other requirements are country-specific, such as Japan's PSE Denan Law, which went into effect November, 2008. Part of this law places requirements on lithium ion battery design and safety for products sold in Japan. Such regulatory requirements need to be identified as early as possible so that their impact on the battery or host design can be evaluated to avoid costly project delays or redesigns.

By Sol Jacobs, VP and General Manager, Tadiran Batteries

Choosing the right battery is critical to designing a remote wireless device for long-term use in extreme environmental conditions. Common mistakes include failure to specify the ideal chemistry for application-specific requirements, and failure to conduct proper due diligence when evaluating battery suppliers.

Performance characteristics vary significantly among popular primary battery chemistries such as alkaline, carbon zinc, zinc-air and lithium. For example, consumer alkaline cells may suffice if you require a few months of service life in a moderate temperature range, but they cannot handle extreme temperatures and have a high self-discharge. If the application requires 20+ years of service life under extreme temperatures, lithium thionyl chloride cells are the only choice.

Much has been said about energy harvesting devices that use light, heat or vibration to recharge a battery or capacitor to power sensors. But high cost, large size and lack of heat, light or vibrations limit the use of these devices.

Evaluating potential power management solutions can involve trade-offs. So compare chemistries using a checklist that prioritizes key performance parameters such as energy density, voltage, capacity, size and weight, expected service life, temperature and/or environmental issues, and cost. Additional design criteria may include the need for high current pulses and/or high discharge rates.

Another common mistake involves failure to properly evaluate battery manufacturers. Contrary to popular misconceptions, all batteries are not created equal. Experienced battery manufacturers continually modify cell designs and use proprietary techniques and materials to enhance battery power and performance. To differentiate batteries of superior quality and reliability, insist that potential suppliers provide fully documented and verified test results for battery pulses, low-temperature pulses, discharge, repeatability and product safety. Conducting thorough research will help ensure that your power management solution delivers decades of trouble-free performance.

By Katherine Mack, VP Sales and Marketing, Rose Electronics

Here is a list of common mistakes and how to avoid them:

Neglecting Shelf Life. Batteries have a limited shelf life which is exacerbated if stored at high temperatures. Additionally, quiescent currents may drain the battery.

Solution: Know how the battery will be used and stored in the application, and be certain communication from the battery draws the lowest possible current.

Not Leaving Enough Space. Not all "standard size" batteries are the same size; cells can vary as much as a millimeter in any direction. In addition, prismatic cells swell in thickness over time. Solution: Leave enough room for the largest of cell sizes in that product category, and for prismatics, allow 10% additional room in the application space.

Disregarding Temperature Effect. All batteries have a limited temperature range; exceeding this range will reduce battery performance and life. Solution: : Either derate your battery's performance for applications that will be cooler or warmer than room temperature, or increase battery capacity to accommodate temperature changes.

Single Sourcing Cells. Cell manufacturers often design a cell size with a particularly large volume customer. If that OEM moves on to another product size, the cell manufacturer may discontinue that cell size. Solution: Choose a cell size that is commonly used among the industry among a variety of vendors.

Omitting Cycle Life. Manufacturers specify performance to 80% of capacity at end of cycle life. Solution: Expect shorter run time as the battery ages. Know the cycle life of the cell you are using, and consider derating capacity accordingly.

Miscalculating Charging. Proper charge methods can make the difference between a battery that lasts five years and a battery that lasts five weeks. Solution: Ensure that your charge method is appropriate for the chemistry used.

Discounting Battery Behavior. Battery voltage drops as current draw increases. The problem is exacerbated with low temperature. Solution: Ensure that the nominal battery pack voltage can accommodate for pulse currents and low temperature usage.

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