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The Role of Batteries in Cell Site Survivability

VRLA Battery Management can be a Logistics Nightmare

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If you're responsible for operations at remote cell sites, you must address a number of issues before you even think about making a decision. How can you ensure that your batteries will perform to design standards in an emergency? How can you maximize the lifecycle of your batteries without threatening serviceability? How do climactic and installation variations affect battery life expectancy? Is there a central resource for all this information or a way to store your company's historical data? To help answer these questions, it's important to take a look at the role of batteries in cell site power plants and the history of how they have been deployed.

The decade of the 90's will be remembered for the exponential growth and mass-market acceptance of handheld wireless devices. As cellular telephone user demand grew, so did the need to supply ubiquitous, uninterrupted service on a nationwide basis.

Wireless carriers responded by rapidly building out their networks. This was accomplished through internal expansion, expanded coverage within existing footprints, entry into new markets and acquisitions. Due to this phase of network expansion, telecommunications providers have needed numerous facilities to handle the growth.

Companies that service or manage remote transmission facilities are forced to maintain battery backup power supplies in each of these installations, an issue that's urgency was underscored by the Northeast blackout of August 2003. That said, the wireless industry is finding that the logistics associated with VRLA battery lifecycle management, including testing, installation, forecasting and disposal can be both imposing and costly. The dollar value of this line item has been increasing at an exponential rate, and for most carriers this now represents multi-million dollar annual purchase commitments. Adding insult to injury, these batteries are often times replaced on an emergency-call cost basis because of the lack of information on projected life expectancy and the lack of a standard methodology for replacement.

According to industry estimates, there are over 400,000 remote transmission facilities nationwide, with virtually all of these installations housing VRLA battery backup power systems. The challenge for facilities owners and managers is that these batteries die. The question is not will they fail, but when will they fail. VRLA batteries found in a typical remote configuration have a life expectancy of two to eight years, regardless of design life. Actual performance varies based upon a number of criteria including climactic environment, load and number of cycles.

Moreover, even if the batteries have not failed, what is the status of their health? How much capacity do they possess? If one or two jars are weak, how will it affect the other jars in any given string? Should you replace only the bad jars, or the entire string? The actions you take, or do not take, have both operational and budgetary ramifications.

But replacing jars, strings or entire battery plants is just the start. There are a slew of battery manufacturers and suppliers in the market. Many products have equivalents (less expensive or equal alternatives). Oftentimes purchasing agents are only provided with BTS equipment part numbers and struggle to cross-reference the corresponding battery configuration. Forecasting needs across a network is difficult due to inadequate information, so arbitrary budgets are created that can vary substantially from actual requirements.

An additional challenge facing telecommunications providers is proper disposal of spent batteries, which are required to be disposed of in accordance with EPA standards. Spent batteries must be sent to an EPA approved smelting facility and disposal documentation must be maintained.

Batteries are insurance that your cell sites can survive power outages to the level specified by company standards. However, cell sites are dynamic; output power is increased as customer traffic grows, often with no corresponding increase in backup capability. In addition, batteries age and produce less output, lowering run-time. There are several key areas that must be considered before implementing a battery management program: testing and forecasting, procurement, warehousing and disposal.

Testing and Forecasting

Typical preventative maintenance procedures for VRLA batteries are neither adequate nor standardized. Some carriers rely on manufacturer specifications and perform only occasional visual inspections and float voltage tests. Other carriers perform stand-alone ohmic testing (such as impedance or conductance testing) but either do not record the results or simply print out the information and leave the report at the site. This state of affairs is due to a number of factors, not the least of which is the challenge of implementing and verifying a company-wide preventative maintenance procedure.

However, having technicians test batteries without a standard process increases manpower costs but does little for forecasting anticipated failure or for assisting in the prediction of replacement needs. On the other hand, the implementation of a standardized testing and maintenance program utilizing a centralized data collection repository can significantly reduce maintenance, procurement and management costs while improving reliability. Should your company investigate how to improve the management of its mission-critical battery plant?

Procurement

There is a wide assortment of equipment configurations in the field, requiring carriers to procure parts from multiple vendors. Some carriers are procuring batteries from over 30 different vendors nationwide. This lack of centralized purchasing inhibits the ability to leverage purchasing power and reduces forecasting capabilities, resulting in excess or insufficient inventory levels. Replacing field-deployed units often requires a stream of documentation from field technicians to regional offices to corporate offices. This document trail of paperwork is increasingly costly and can contribute to latency in response to field requests.

Many companies are reviewing their vendor base and relationships and seeking alternative methods, such as e-commerce and B2B hubs, to minimize their vendor base and drastically reduce paperwork costs. Many carriers have mandated moving toward these solutions wherever possible and economically feasible. Industry analysts estimate that it costs a typical company $200 to initiate, process and settle a single purchase order. An effective on-line procurement program can significantly reduce this cost; the financial benefits may be ever greater for a remote site. Can your business benefit from looking at the software and online resources that are currently available?

Warehousing

For purchasing agents, determining how much to buy and when to buy it becomes a critical consideration, because batteries are perishable items. Battery inventories lose money every month they sit unused, both from an inventory carrying cost standpoint and from a lifecycle standpoint. Batteries that remain warehoused and unused beyond six months from the date of manufacture may need to be recharged prior to field deployment.

Decreasing warehouse and inventory carrying costs and increasing lifecycle utilization dramatically increases ROI on a per product basis. Buying in bulk quantity and warehousing at a centralized location may end up costing your company more than you think when shipping costs are factored in. Due to the weight of VRLA batteries the shipping cost per unit can approach 10 percent of the purchase price. This problem is further compounded when distributing batteries to remote sites. You should consider both the direct and indirect costs when sourcing batteries for remote facilities, as hidden costs like these can eat at your profit margins. Outsourcing distribution may make sense for large network operators, particularly if this function can be managed electronically. Is there a battery vendor with the capability of shipping just-in-time (JIT) from multiple warehouse locations throughout the country?

Disposal

The last thing anyone needs is a call from a local, state or federal environmental department notifying you of fines levied against you because batteries found in the dumpster behind your building were tracked back to you. All VRLA batteries must be disposed of in an EPA-compliant fashion. What are the regulations? Do all contractors carry the right insurance coverage? What is the most cost-effective methodology to manage this process? How can a remote facility handle the necessary logistics?

Summary

There are a number of issues that must be addressed in order to harden locations and best utilize batteries for mission-critical cell sites. VRLA batteries have a limited lifecycle and you must consider how to maximize the useful life of these batteries without threatening serviceability and reliability. You must take climate and installation issues into consideration. You must consider replacement cost, logistics, warehousing and disposal issues as well. There are many factors to consider, especially for remote facilities, but in the end the time and effort will be a cost-effective investment if you do your homework properly.

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