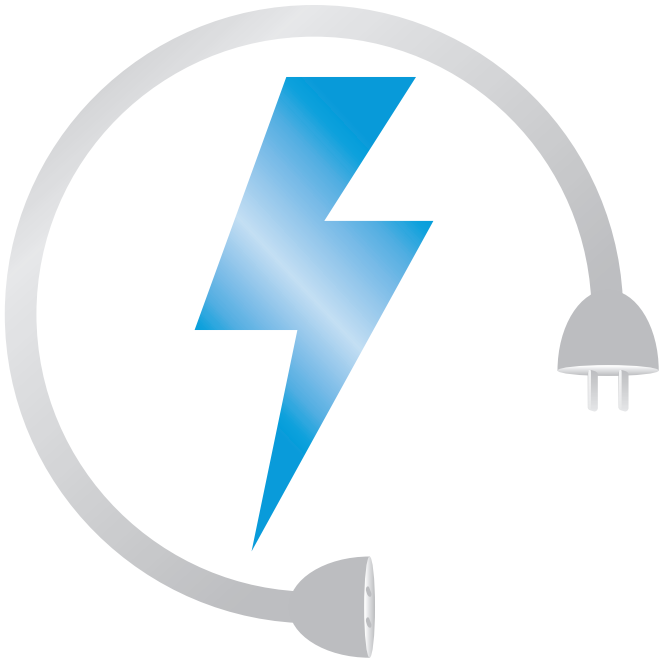

Battery UPS

A Few Simple Steps Could Save You Thousands...

By Jason Raybin

An investment in knowledge pays the best interest.
-Ben Franklin

Knowledge is power.
- Sir Francis Bacon

It is a known fact that a company cannot operate without electricity. Many contemporary industries require a source of power that is both clean and continuous. It is an unfortunate fact that a business's primary energy source cannot be completely reliable. From transmission line or cable failure to lightning-triggered flashovers, any variety of uncontrollable external occurrences can cause a power supply to abruptly drop or spike in voltage or to cease entirely. Equipment within a company building such as motors, compressors, and computers can produce high or low voltage situations and send harmonics into the system. The effects of such disturbances can be disastrous: system downtime, lost or corrupted data, and damage to equipment can all result from poor power quality.

3500 Shepherd St. • City of Industry, CA 90601 • 562.463.6040 • www.quinnpower.com

QUINN POWER SYSTEMS CAT

For any business that recognizes the potentially devastating effects of poor power quality, an Uninterruptible Power Supply (UPS) is indispensable. A battery UPS can help to decrease instances of downtime due to loss of power as well as protect equipment and data from voltage drops and spikes. A UPS is ineffective if it is not properly maintained. When a company depends on its UPS to supply it with the clean continuous energy that is imperative in daily operation ineffectiveness is not an option. While regular inspections from a qualified service provider are instrumental in ensuring that a UPS is functioning optimally, these periodic inspections are not always sufficient. There are some simple procedures that facility managers can perform between inspection periods to ensure that their UPS remains properly maintained. These procedures can increase the life expectancy of a UPS ultimately saving a company time and money.

There are some simple procedures that facility managers can perform between inspection periods to ensure that their UPS remains properly maintained.

The initial placement of a battery UPS is critical for a multitude of reasons. The UPS should be housed in a space in which temperature can be easily monitored and controlled and an area where dust levels and clutter can be kept to a minimum. This will increase both the efficiency and the life expectancy of a battery UPS.

Different UPS brands have different airflow requirements; a unit should be placed in an area in which these requirements can be met. Selecting a room with ample space so that all serviceable parts of the unit can be easily accessed can save time when maintenance is necessary.

The importance of maintaining a consistent temperature in the area in which a UPS is housed is considerable, as even relatively small variations in temperature can drastically impact battery life and efficiency. UPS batteries should be stored between 20° to 25° Celsius which is 68° and 77° Fahrenheit. At temperatures above and below this range, the standby operation time of the unit may be reduced, while battery life will be halved for every 5° Celsius or 18° Fahrenheit outside of this range. Consequentially, it is vital to monitor room temperature regularly and adjust accordingly.

The presence of excessive dust can also decrease the efficiency of a UPS. Dust particles can clog air filters causing overheating which in turn can lead to thermal-overload shutdowns and damage to unit components. It is essential to house a UPS in an area in which dust levels can be minimized. Dust particles should be removed from the area as often as is needed to keep the air filters free of debris. Air filters should be replaced at least annually to minimize instances of overheating and optimize airflow.

Airflow requirements should also be considered during UPS installation. Different units have different requirements and an appropriate area should be selected based on the model purchased. Proper airflow allows a UPS to maintain a safe operating temperature and when airflow is insufficient, a unit is unable to expel the hot air it produces. This can result in damage to the components.

In addition to keeping the area in which a UPS is housed dust free, the absence of clutter can also allow a unit to retain its efficiency. In particular, the top of the unit should not be used as a storage space. Exhaust is expelled through the top vents of a UPS. In addition to the top of the unit expelling hot air the cool air is drawn in through the UPS cabinet doors. Blocking either of these vents with cardboard boxes or other debris can cause hot spots in the unit which can lead to component damage.

Know the UPS that you are installing. While it may seem convenient to place a unit in a closet or against a wall where it will occupy a minimal amount of space, such locations make proper maintenance difficult or even impossible. Accessibility should be considered during the installation, some units require back or side access in order to make repairs or upgrades. It may seem sufficient at the time of installation for you to leave a foot of space from the wall for your access, but like UPS's, the service technicians come in all shapes and sizes as well. For example, if back-access to the unit is not made available during installation and is needed, a business might find itself adding demolition costs to the initial cost of its unit when that unit needs to be serviced. A company might also wish to invest in a maintenance bypass cabinet during installation which can eliminate the need for a load shutdown while performing maintenance on a UPS.

Even if the initial placement of a UPS is ideal, routine checks and maintenance are essential. Periodic battery and capacitor maintenance, and a familiarity with the displays and fault messages of a UPS can all help to increase the life expectancy and efficiency of a unit.

Regular battery maintenance is critical in ensuring that a UPS will operate efficiently in the event of a power outage. Even one compromised battery in a unit can render its entire string ineffective; due to this fact quarterly inspections of the batteries are recommended. Batteries should be monitored for temperature, cleanliness, corrosion, container or terminal damage, voltage, and internal cell resistance.

In addition to maintaining an appropriate ambient temperature, the temperatures of the individual batteries within a unit should be observed. As battery temperature increases, battery voltage decreases, which can cause a unit's charger to add more current to compensate. The increased current can cause battery temperature to increase further, creating a cycle that often ends in thermal runaway. Thermal runaway is when your internal battery temperature increases which causes an unstoppable chemical reaction in the battery which results in a catastrophic failure of your battery, if this is occurring charging should be ceased. Batteries that have experienced thermal runaway often need to be replaced. The regular monitoring of battery temperature can save a company this unnecessary cost.

Batteries should be kept clean, accrual of dust, dirt, or moisture on battery covers can cause a conductive pathway between adjacent terminals or between terminals and ground. These pathways can cause short circuits or ground faults. If dust removal is needed, batteries should be cleaned while in open circuit with a cloth moistened in a solution of water and bicarbonate of soda. Many household cleaners can damage battery containers and should be avoided.

During the visual inspection of a UPS battery corrosion should be noted. Not only can corrosion interrupt the connection between batteries and current, it can be an indicator of more serious problems. For example, corrosion caused by acid fume vaporization through battery vent caps is often the result of overcharging which can lead to thermal runaway.

Battery covers, containers, and terminals should also be inspected for damage. Cracks or holes in a container can cause electrolyte to wick from the battery, creating a ground fault leading to the melting or burning of the container; consequentially batteries with damaged containers should be replaced immediately. Swollen or deformed containers are an indication that a battery has overheated and experienced thermal runaway. In this situation, it is often necessary to replace an entire battery string, as plate damage can result from the effects of thermal runaway. Bent or fractured battery terminals can cause high resistance connections, and may indicate internal damage; therefore, batteries with compromised terminals should also be replaced.

Voltage should be inspected during routine battery maintenance, as inconsistencies in the voltage of individual batteries, battery strings, and float voltage can all impact battery life. Low voltage in an individual battery could indicate that a cell has been compromised and may need to be replaced. While low voltage in a string could imply a poor connection between individual cells. If low voltage is observed in cells or strings the cause should be determined and addressed.

The float charging voltage of a battery UPS should also be monitored, as this voltage is an indicator of the current acceptance of the battery system. For example, a float current of zero indicates an open circuit in the battery string. An unusually high float current can indicate a shorted cell or an elevated battery temperature, which can lead to thermal runaway.

Battery monitoring systems that report the status of a battery can help to maximize the amount of time that a battery can be safely used.

Most battery failures arise between years three and four of a five-year UPS battery, it is recommended to replace batteries at least every four years. Battery monitoring systems that report the status of a battery can help to maximize the amount of time that a battery can be safely used. Resistance testing can be used to approximate battery capacity, as internal cell resistance and capacity are closely linked.

Internal cell resistance can help predict how your batteries will react when they are needed. The internal resistance and the battery's actual capacity are closely related. It is important to perform a baseline reading on your batteries either after startup or after a battery string replacement. These baseline readings make it possible for trend analysis. Over time it can be determined if the same string is having issues or if you continuously replace one of four batteries in roughly the same location which could mean there is another issue present in that cabinet that needs to be corrected.

Capacitors should be changed periodically. It is recommended to change DC capacitors every five years and AC capacitors every seven. Capacitors that are not routinely replaced as recommended can fail, leading to unnecessary system downtime.

A familiarity with displays and fault messages of a UPS can also increase the effectiveness of the unit. Most importantly, consumers should be aware that the run time calculation provided by their UPS is only an estimation of real time availability. This calculation should not be considered a substitute for regular maintenance. Consumers should also familiarize themselves with the various fault messages of their units, and discuss with their service providers which of these messages require immediate action.

By ensuring that their UPS's are properly installed and maintained, facility managers can be instrumental in maximizing the efficiency and lifespan of these units. Clean, consistent power is essential for the daily operation of any business, and a company's UPS should be maintained accordingly. While a qualified service provider can aide in this maintenance, facility managers should routinely inspect their units. By doing so, potential failure points within a UPS can be minimized, thereby minimizing the risk of system downtime, lost data, and damage to equipment.

AUTHOR:

Jason Raybin has 5 years experience in the United States Navy as a Navigation Electronics Technician on Fast Attack Submarines. From his Naval training and real life experience he developed an unmatched skill set in preventative and corrective maintenance on multiple electrical and communication systems. His next move was to expand his knowledge from sea to land by working for MGE UPS Systems as a Field Engineer on single and multi module double conversion UPS Systems. After his time at MGE he moved over to Cisco Systems where he was the Critical Environment Engineer where he was responsible for scheduling and maintaining all electrical and mechanical equipment for the 8 Million square foot San Jose Campus. Now you can find Jason as the Service Sales Representative for Peterson Power Systems for Santa Clara County where he uses his field experience and facility management background to provide unprecedented customer service to the Silicon Valley Area.

WORKS CONSULTED:

"Dynasty VRLA Battery Periodic Maintenance Instructions." Rev. Aug 1999. C&D Technologies. 08 Sep 2010 <www.cdtechno.com/custserv/pdf/7546.pdf>.

Koffler, Robin and Jason Yates. *"Ups Batteries – Taken for Granted Too Long!"* 13 Apr 2008. Article Base. 08 Sep 2010 <http://www.articlesbase.com/computers-articles/ups-batteries-taken-for-granted-too-long-385781.html>.

Wickham, Rhonda. *"Thermal Runaway."* 01 Oct 1998. Connected Planet. 08 Sep 2010 <http://connectedplanetonline.com/wireless/mag/wireless_thermal_runaway/>.