

BATTERY POWER PRODUCTS & TECHNOLOGY

Solutions for OEM Design Engineers, Integrators & Specifiers of Power Management Products

Preventative Maintenance is the Best Defense to Downtime

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As organizations become increasingly dependent on data center systems, there is a need for great reliability in the critical power system. For many organizations, the IT infrastructure has evolved into an interdependent business-critical network that includes data, applications, storage, servers and networking. A power failure at any point along the network can impact the entire operation and have serious consequences for the business.

To keep running through power outages, utility spikes and other unforeseeable power issues, critical systems are dependent on the reliability of the UPS system.

While the UPS systems are designed to offer the utmost reliability and performance at an affordable price, they are not failure prone. Factors, such as application, installation, design, real world operating conditions and maintenance practices can impact the reliability and performance of the UPS systems. Remember, the reliability of a system only lasts as long as the shortest component life in the unit. However, some manufacturers, including Liebert, are addressing this issue by reducing the number of parts that need to be replaced, thus decreasing the chance of a failure.

However, the reality is failures still occur, therefore being proactive with its maintenance can greatly reduce your chances for downtime.

Preventative Maintenance is the Key

One way end users can minimize unit-related failures is to institute a comprehensive Preventative Maintenance (PM) program that is implemented by original equipment manufactured (OEM) trained and certified technicians. When equipment is not maintained especially in adverse conditions, such as dirty environments and/or high temperatures, it can result in system deterioration up to and including load loss.

PM programs maximize the reliability and performance of the Uninterruptible Power Supply (UPS) systems on which organizations depend on critical systems running. When correctly implemented, PM visits ensure maximum reliability of data center equipment by providing systematic inspections, detection and correction if incipient failures, either before they occur or before they develop into major defects that could translate into costly

downtime. Typical PM programs include inspections, tests, measurements, adjustments, parts replacement and housekeeping practices.

Frequency of PM Depends on the UPS

The frequency of PM visits depends on the type of UPS being utilized in the organization. Small UPS devices, like the GXT product line, should be inspected annually. For medium and large systems, it's recommended that inspection take place at least twice a year to ensure proper function and confirm that the unit is operating within the manufacturer's specifications.

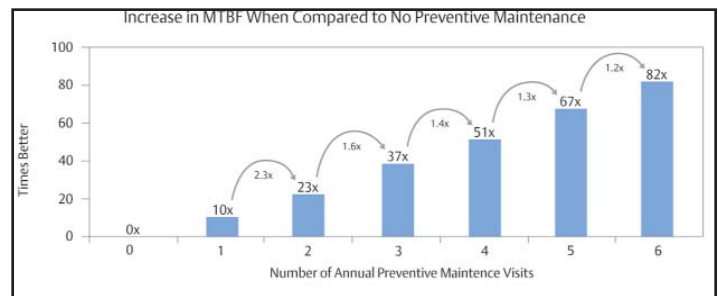


Figure 1. An increase in the number of annual preventive maintenance visits increases the MTBF.

For VRLA batteries that have been in service for four or more years, an evaluation is in your best interest. This is important because of the fact that even a single bad cell in a string of batteries could compromise your entire backup system, leaving you without protection. By proactively replacing batteries, this will help to keep your system running up to specifications and minimize the risk of downtime to your business operations.

Benefits of PM

PM has a number of benefits for the end-user. First, better reliability is delivered by adding another layer of redundancy. This is achieved by combining leading service with cutting-edge equipment.

Other benefits include extending product lifecycle and optimizing capital expenditure for the equipment. Also, by providing risk management at a fixed cost, this aids in budget preparation and promotes fiscal responsibility. Also, PM gives you

better control of the business environment.

Semi-Annual Service

- Perform a temperature check on all breakers, connections and associated controls. Repair and/or report all high temperature areas.
- Perform a complete visual inspection of the equipment including subassemblies, wiring harnesses, contacts, cables and major components. Check air filters for cleanliness.
- Check module(s) completely for rectifier and inverter snubber boards for discoloration, power capacitors for swelling or leaking oil and DC capacitor vent caps that have extruded more than 1/8 inch.
- Record all voltage and current meter readings on the module control cabinet or the system control cabinet.
- Measure and record harmonic trap filter currents.

Annual Service

- Perform a temperature check on all breakers, connections and associated controls. Repair and/or report all high temperature areas.
- Perform a complete visual inspection of the equipment including subassemblies, wiring harnesses, contacts, cables and major components. Check air filters for cleanliness.
- Check module(s) completely for rectifier and inverter snubber boards for discoloration, power capacitors for swelling or leaking oil and DC capacitor vent caps that have extruded more than 1/8 inch.
- Record all voltage and current meter readings on the module control cabinet or the system control cabinet.
- Measure and record harmonic trap filter currents.
- Check inverter and rectifier snubbers for burned or broken wires.
- Ensure all nuts, bolts, screws and connectors for tightness and heat discoloration.
- Verify fuses on the DC capacitor deck for continuity (if applicable).
- With customer approval, perform operational test of the system including unit transfer and battery discharge.
- Calibrate and record all electronics to system specifications.
- Install or perform Engineering Field Change Notices (FCN) as necessary.
- Measure and record all low-voltage power supply levels.
- Measure and record phase-to-phase input voltage and currents.
- Review system performance with customer to address any questions and to schedule any repairs.

Don't Forget About Battery Service

One important procedure performed during the UPS Semi-Annual and Annual PM Service is the inspection of the battery. This includes checking for NO-OX grease or oil on all connections, ensuring battery jars have proper liquid levels (if flooded cells), checking for corrosion on all terminals and cables; and examining the physical cleanliness of the battery room and jars. It's also important to measure and record DC bus ripple voltage (if applicable) and total battery float voltage. While these visual inspections are steps in PM, it is not intended to replace a full preventive maintenance program for the battery system.



Figure 2. It is extremely important to make sure batteries are operating properly and within manufacturers' specifications. In fact, your battery warranty may even be voided if proper maintenance is not provided.

Full Preventive Maintenance Service

Full PM Service usually requires a shut-down to ensure electrical connection integrity.

- Perform a complete visual inspection of the internal subassemblies, wiring harnesses, contactors, cables, major components and check for proper clearance around the unit.
- Examine all transformer, terminal block and ground/neutral bus bar connections as well as input and output breaker(s) for tightness.
- Inspect high and low voltage junction box terminals for tightness.
- Inspect all option wiring for tightness (spike suppressor, ground fault, phase rotation/loss).
- Inspect all capacitor bank connections for a solid fit.
- Verify that all cooling fans are functional and air ducts are open.
- Confirm continuity of all fuses and that they are correctly rated.
- Measure input and output phase to phase voltage.
- Determine the output, neutral and ground current.
- Verify KVA load and capacity per phase.
- Validate grounding electrode conductor and any isolated grounds.
- Measure all filter capacitor currents at no load for all three phases (if applicable).
- Measure primary, secondary, second harmonic and third harmonic (if applicable).
All should be balanced within 2.5 percent deviation.
- Verify EPO lamps are illuminated.
- Check that the local and remote EPO's are functioning properly (if permitted).
- Confirm that the monitor is recording within +/- 2 percent of those values measured.
- Activate the transformer over-temp alarm and shut down circuits to confirm proper operation (if permitted).
- Verify the operation of any option for alarm or shut-down sequence (if permitted) and of any customer alarm circuit(s) and specified messages.
- Make sure of specified restart capabilities (manual or auto-

restart).

- Verify the operation of the bypass switch and the bypass transformer over temp alarm (if applicable).

There are also preventive measures for desktop power management tools, including surge suppression and smaller UPS systems. Ensure the unit performs a battery test regularly and proactively replace batteries / UPS before they fail. These units are mainly swapped out when defective.



Figure 3. For customers who require the highest level of service response for their critical cooling and power systems they should employ a tried and true professional account management group. Securing a comprehensive offering designed to provide service support, critical facility information and customer relationship management will pay off over time.

Once You Choose Your PM Strategy, Let Professionals Handle It

Most preventive maintenance measures should be left to qualified persons. UPS and batteries contain high voltage among other things, and only qualified personnel should attempt preventive maintenance or repair. End users can provide preventive support such as replacing air filters when dirty, ensuring environmental specifications are met and monitoring the UPS for

alarms.

When choosing a service provider, seek out a group that offers a comprehensive portfolio of services. Service can be customized to satisfy customer requirements. In addition, preventive maintenance service, service contracts should include, 24 x 7 emergency services, parts replacement, a variety of end-user training seminars detailing best practices and service tips for end-users. The service provider should provide access to highly trained technicians that engage in ongoing industry training.

*For more information concerning service capability for your entire facility infrastructure contact 1-800-543-2378 or view additional information at:
www.liebert.com/servicesupport_pages/ServiceSupport.aspx?x=servicesupport.*